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Arizona Geological Survey
416 W. Congress St., Suite 100
Tucson, Arizona 85701
520-770-3500
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inquiries@azgs.az.gov

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James Doyle Sell Mining Collection

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FACSIMILE MESSAGE

DATE: 5/16/97

TO: Gary Parkinson
Chief Geologist

FROM: Cambior USA Inc.

PHONE/FAX: from JD Sell

SUBJECT: Superior East Report

NUMBER OF PAGES INCLUDING COVER One

Thank you for all your comments. I have included most of them into this final draft. As you will see, I only had time for:

I Introduction
4 Figures
1 Table

II Property Status and Location

III. Summary of Geology

IV Target Definition & Exploration
2 Figures
1 Table

V Description of Porphyry Target
8 Figures
3 Tables

VI Description of Whitetail Conglomerate Target
4 Figures

VII Description of Mineralogy

IX Recommendations For Further Exploration
1 Figure

VIII Potential for Future Development

Published References

X Summary and Conclusions

Addendum: Graphic Log and Assay Results of Porphyry Target Area Drill Holes

This will be sent by Priority Mail on Monday May 19th to Denver along with my Invoice

| | | | | | |
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Originating Fax: (303) 773-0733
Facsimile Transmittal Sheet

# CAMBIOR USA, INC.

TRANSMISSION TYPE: ○ NORMAL ○ PRIORITY ○ CONFIDENTIAL

NUMBER OF PAGES (Including Transmittal Sheet) 3

DATE Aug. 29, 1997 TIME

TO Jim Sell COMPANY J.D. Sell & Assoc.

FAX (520) 578-7196 ORIGINAL TO BE ○ MAILED ○ FILED

FROM Gary Parkison

MESSAGE

Jim, I hope you had a good vacation (last May - June) and an even better summer. I have gotten sidetracked on other things several times since we last talked, but I would be interested in having you finish up the rest of the report on Superior East. I am including your note to me on the draft of the chapters you sent up last May. We have typed them up and they look great. With the report as it is, I think only Section VII Mineralogy; Section VIII Potential for Future Development and Section IX Summary and Conclusions need to be written up. Give me a call next week so we can discuss. Thanks,

Gary

Please call (303) 694-4936 if you have problems with this transmission and ask for:

8101 East Prentice Avenue, Suite 300, Englewood, Colorado 80111
303-694-4936 Fax 303-773-0733

FROM : A & C Arnold - Tucson PHONE NO. : 520 742 0991 P01

FROM : Evelyn K. McLerna PHONE NO. : 520 546 9

→ Jim Sell

Ezldata1

| | | |
|---|---|---|
| Cananea SE | CS 080696-8 | 23 |
| Cananea SE | CS 080696-9 | 21 |
| Cananea SE | CS 081596-1 | 11 |
| Cananea SE | CS 081596-2 | 17 |
| Cananea SE | CS 081596-3 | 12 |
| Cananea SE | CS 081596-4 | 17 |
| Cananea SE | CS 081596-5 | 20 |
| Cananea SE | CS 081596-6 | 17 |
| Cananea SE | CS 081596-7 | 18 |
| Cananea SE | CS 081596-8 | 10 |
| Cananea SE | CS 081596-9 | 20 |
| Cananea SE | CS 081596-10 | 17 |
| | | |
| | | |

CS 8-13-96-1 — these depths listed on Perez sheets

9

phoned the second batch of 080696 the 081396

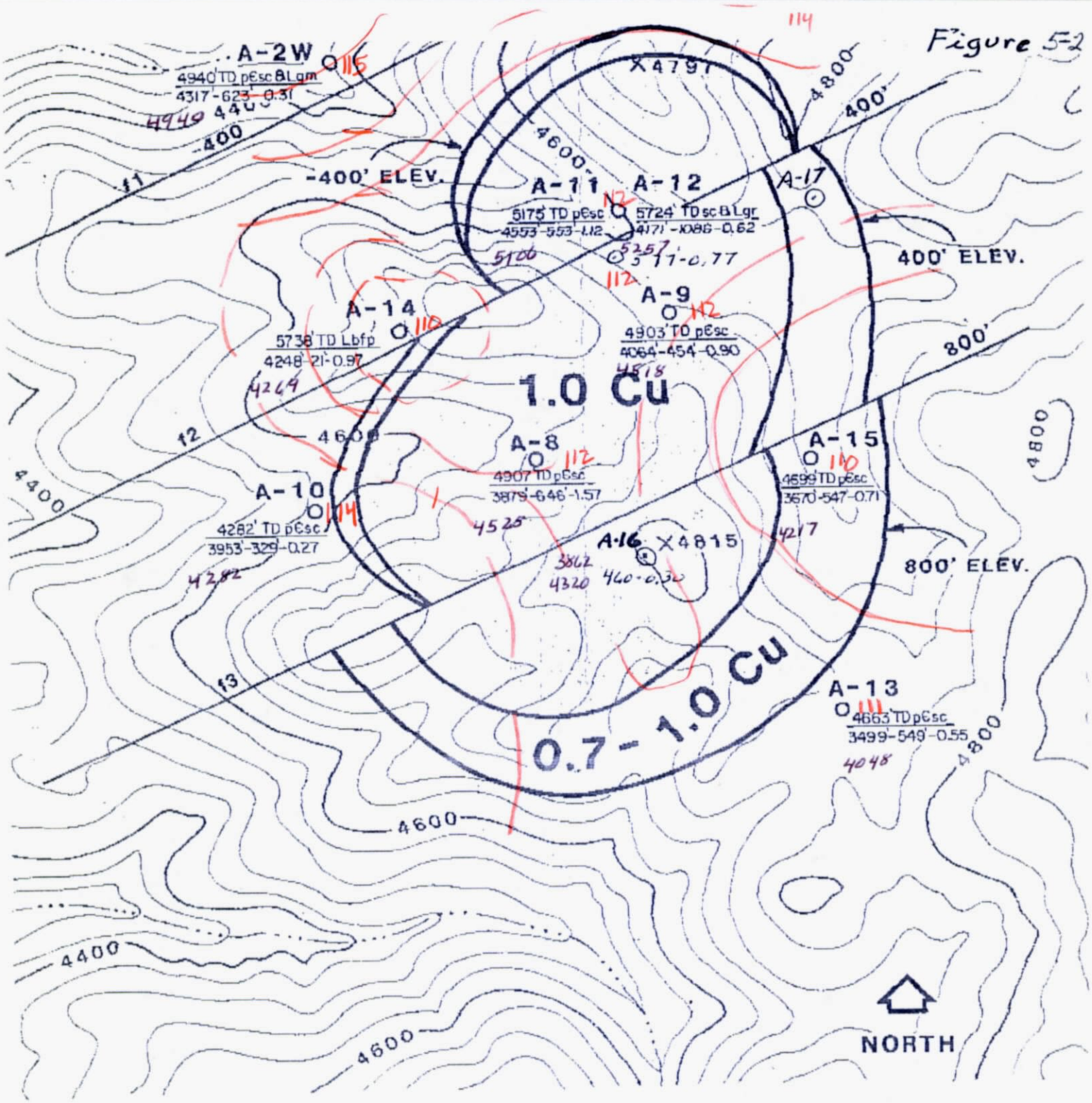
yes! thanks for catching error. Need to corr. same tables! EZLDATA! corrected

Jump table corrected

we faxed to EKMcL w/ field sheets 1/20/97

95-96 EKM

Figure 5-2




A-8 ASARCO hole & designation
4907' TD pЄcs — *total depth rock type*
3879'-646'-1.57 — depth-length-%copper

PRE-MINERAL ROCK TYPE

- *Lbfp* *Laramide biotite feldspar porphyry*
- Lqm Quartz monzonite
- Lgr Granite
- pЄsc Schist

T. 1 S., R. 13 E.

# MODELED MINERAL ZONE OUTLINE

SUPERIOR EAST PROJECT
PINAL COUNTY, ARIZONA
1" = 500'

JDS

DEC 1985

6340 12/85

The CBM Way

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# CAMBIOR USA, INC.

TRANSMISSION TYPE: ○ NORMAL ○ PRIORITY ○ CONFIDENTIAL

NUMBER OF PAGES (Including Transmittal Sheet) 2

DATE 4/29/97 TIME

TO Jim Sell COMPANY

FAX (520) 578-7196 ORIGINAL TO BE ○ MAILED ○ FILED

FROM Gary Parkison

MESSAGE Jim, per our conversation of last week, here is an outline of the report we would like prepared regarding Superior East. As a basis, much of your 1995 paper would probably be useable. Also, any other topics ~~would~~ which you feel need to be conveyed would also be welcomed.

In terms of length of report, probably something on the order of 20 pages or so would be appropriate. Please call at your convenience so we can discuss. Thanks,

Gary

cc Bob Walish
Jerry Fountain

Please call (303) 694-4936 if you have problems with this transmission and ask for:

8101 East Prentice Avenue, Suite 800, Englewood, Colorado 80111
303-694-4936 Fax 303-773-0733

Proposed Report Outline
ASARCO Superior East Project
Pinal County, Arizona

I. Introduction - reiterate work performed when and by whom, largely from Sell (1995), and *update on current property status*, ASARCO plans, etc.

II. *Property Status and Location - overview of location of project, agreements in effect*, ASARCO claims, fee land, Π Ranch withdrawl areas, etc. (Figure 1)

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IX. Recommendations for Further Work

X. Summary and Conclusions

Tables

| | |
|---|---|
| Table 1 | *Summary drill logs with geology and mineralized intervals above cutoff* (0.2-0.3%), noting mineralogy of Cu, largely based on Appendix 1 from Sell (1995) |
| Table 2 | *Resource estimates for porphyry target* |
| Table 3 | Resource estimates for Whitetail Conglomerate target |

Figures

1. Topographic map at scale of 1"=2000' showing all drill hole locations (see Fig 6, Sell 1995)
2. *Idealized* stratigraphic column
3. Cross sections through both deposits extending from Magma #9 shaft to Eder South (hole U-1), various scales
4. Grade x thickness map of porphyry target, sharing structural information
5. Grade x thickness map of Whitetail target, *sharing structural information*

FACSIMILE MESSAGE

DATE: May 11, 1997

TO: Gary Parkerson
Chief Geologist

FROM: Cambrian USA Inc.

PHONE/FAX: from JW Seal

SUBJECT: Part IV of report

NUMBER OF PAGES INCLUDING COVER Six

Hi Gary,

Here are the first five pages.

I'm not taking the time to computer the words at this time, & hope you'll add your comments & return for the fund.

I have also constructed Line 1 and Line 2 cross-sections and the graphic log-assays for hole A-16

Time has also been used to locate the needed materials.

Let me hear from you

Jim

FAX 1-520/578-7196

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# CAMBIOR USA, INC.

TRANSMISSION TYPE: ○ NORMAL ○ PRIORITY ○ CONFIDENTIAL

NUMBER OF PAGES (Including Transmittal Sheet) 6

DATE 5/13/97 TIME

TO Jim Sell COMPANY

FAX (520) 578-7196 ORIGINAL TO BE ○ MAILED ○ FILED

FROM Gary Parkison

MESSAGE Hello Jim!,
Here are my comments on your draft. Please give me a call if you have questions, etc. I'll look forward to receiving some more! Thanks,
Gary

Please call (303) 694-4936 if you have problems with this transmission and ask for:

8101 East Prentice Avenue, Suite 800 Englewood Colorado 80111
303-694-4936 Fax 303-773-0733

908
5 of 5

through drill holes A-8, DCA-3A, DCA-2A, BL-2, and off the plateau to the Eden group in the exists copper area of Cambior. This section indicates the porphyry copper area and the potential for expansion toward the overlying holes which had pervasive alteration with low copper values.

Jim, This looks good. Please note the few comments. You seem to have described some of what would be discussed in Section V and VI in this write-up of Section IV. That's OK, but if you want to 'beef' up your description of the porphyry and white tail targets in Section IV, then maybe we can forget Section V and VI. What do you think?

Jim

FACSIMILE MESSAGE

DATE: May 14, 1997

TO: Gary Parkinson

FROM: Chief Geologist
Cambrian USA, Inc.

PHONE/FAX: from JD Seel

SUBJECT: Part V of report

NUMBER OF PAGES INCLUDING COVER 21

Hi Gary

Thanks for your comments, I'll clean up the draft & incorporate - add them.

Here is part V  Look forward to your comment.

Time is short as I'm off to the SME AZ meeting in ~~Hermosillo~~ Canarea this weekend (+ 2 days, including one travel back & forth).

Hope to get the TW & Future out before I leave on 20th.

:)

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DATE May 15 1997 TIME _____

TO Jim Sell COMPANY _____

FAX (520) 578-7196 ORIGINAL TO BE ○ MAILED ○ FILED

FROM Gary Pankison

MESSAGE

Seems like everything is moving along well. Have fun on the Cananea trip!
Here are my comments on your latest installment. Please call if not clear, etc.

Gary

P.S. Table 2 looks OK, only include those figures with comments.

Please call (303) 694-4936 if you have problems with this transmission and ask for: _____

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303-694-4936 Fax 303 773-0733

FACSIMILE MESSAGE

DATE: 5/14/97

TO: Gary Parkinson
Chief Geologist

FROM: Cambrian USA Inc.

PHONE/FAX: from JD Sell

SUBJECT: Superior East Report

NUMBER OF PAGES INCLUDING COVER One

Thank you for all your comments. I have included most of them into this final draft.

As you will see, I only had time for:

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8 Figures
3 Tables

VI Description of Whitetail Conglomerate Target
4 Figures

IX Recommendations For Further Exploration
1 Figure

Published References

Addendum of:
Graphic Log and Assay Results of Porphyry Target Area Drill Holes

This will be sent by Priority Mail on Monday May 19th to Denver along with my Invoice

Faxed 5/14/97

2 copies

(FAX) or E mail

1974 Summary Report (3/10/75)
Interim Hole A-5 - & A-6 May 30 1978
Assay Results A7 August 5 1974
Whitetail Rot. Nov 5 1974
Sulphides A-8 & A9 March 11 1980
Assay Results A-15 Aug 23, 1984
Update A-15 & A-16 May 26, 1992
Revised Sections - Plan & Hole Dec 29 1985
Hole A-16 Prog. & Cost Jan 30 1985
Removal A-14 Feb 11 1985
Drill Log:
A-1 A2 A4 A5 DCA-1A M-1A
A-2W

Graphic Logs of Holes

Originating Fax: (303) 773-0733
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# CAMBIOR USA, INC.

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NUMBER OF PAGES (Including Transmittal Sheet) 1

DATE May 16, 1997 TIME

TO Jim Bell COMPANY

FAX (520) 578-7196 ORIGINAL TO BE ○ MAILED ○ FILED

FROM Gary Parkison

MESSAGE Jim, Thanks for your note. I'm faxing you back because I assume you are headed down to Cananea. If not please call me back today or on Monday, if possible. You have covered most of the areas noted in the outline, but what would be the possibility and/or timeframe required to finish up the rest of the areas, particularly, VIII, (Potential for Future Development). Thanks!

Gary

Please call (303) 694-4936 if you have problems with this transmission and ask for:

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303-694-4936 Fax 303-773-0733

# FACSIMILE MESSAGE

DATE: 5/16/97

TO: Gary Parkinson
Chief Geologist

FROM: Cambior USA Inc.

PHONE/FAX: from JR Sell

SUBJECT: Superior East Report

NUMBER OF PAGES INCLUDING COVER One

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# CAMBIOR USA, INC.

TRANSMISSION TYPE: ○ NORMAL ○ PRIORITY ○ CONFIDENTIAL

NUMBER OF PAGES (Including Transmittal Sheet) 3

DATE Aug. 29, 1997 TIME

TO Jim Sell COMPANY J.D. Sell & Assoc.

FAX (520) 578-7196 ORIGINAL TO BE ○ MAILED ○ FILED

FROM Gary Parkison

MESSAGE

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Gary

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303-694-4936 Fax 303-773-0733

jdsell@AZSTARNET.COM

Proposed Report Outline
ASARCO Superior East Project
Pinal County, Arizona

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5. Grade x thickness map of Whitetail target, showing structural information

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| W | 081 | N3115.98580 | W11034.85954 | 02-APR-96 | 22:02:09 | -9999 | 02-APR-96 | 22:02 |

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# CAMBIOR USA, INC.

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NUMBER OF PAGES (Including Transmittal Sheet) 4

DATE Jan. 26, 1998 TIME

TO Jim Sell COMPANY

FAX (520) 578-7196 ORIGINAL TO BE ○ MAILED ○ FILED

FROM Gary Parkison

MESSAGE Jim,

HAPPY NEW YEAR!

YEA BRONCOS!

Anyway, thought I'd pass along this fax again about finishing up some stuff on the Superior East report. Perhaps things could be slowing down for you, and you might get a chance to pick this up again. I'm off to Mexico now, but I'll try and touch base with you next week!

Gary

Please call (303) 694-4936 if you have problems with this transmission and ask for:

8101 East Prentice Avenue, Suite 800, Englewood, Colorado 80111
303-694-4936 Fax 303-773-0733

jdsell@AZSTARNET.com

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VIII. Potential for Future Development - include description of conditions related to underground mining, i.e., water, heat, rock conditions, depths, possible mining methods, in-situ mining possibilities

IX. Recommendations for Further Work

X. Summary and Conclusions

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4. Grade x thickness map of porphyry target, showing structural information
5. Grade x thickness map of Whitetail target, showing structural information

FACSIMILE MESSAGE

DATE: 02/14/98

TO: Gary Parkinson, Ch. Geol. Cambrian USA Inc

FROM: JW Sell

~~PHONE~~/FAX: to: 303-773-0733

SUBJECT: Completion of Superior East Report

NUMBER OF PAGES INCLUDING COVER 17

Gary:

At long last, I'm faxing you the last 15 pages of the Superior East report, along with your Proposed Report Outline, checking ✓ off the three new sections.

I hope your secretary will have an easier time transcribing the writing this time.

Hope you had a great time in Mexico. Mine was very good also.

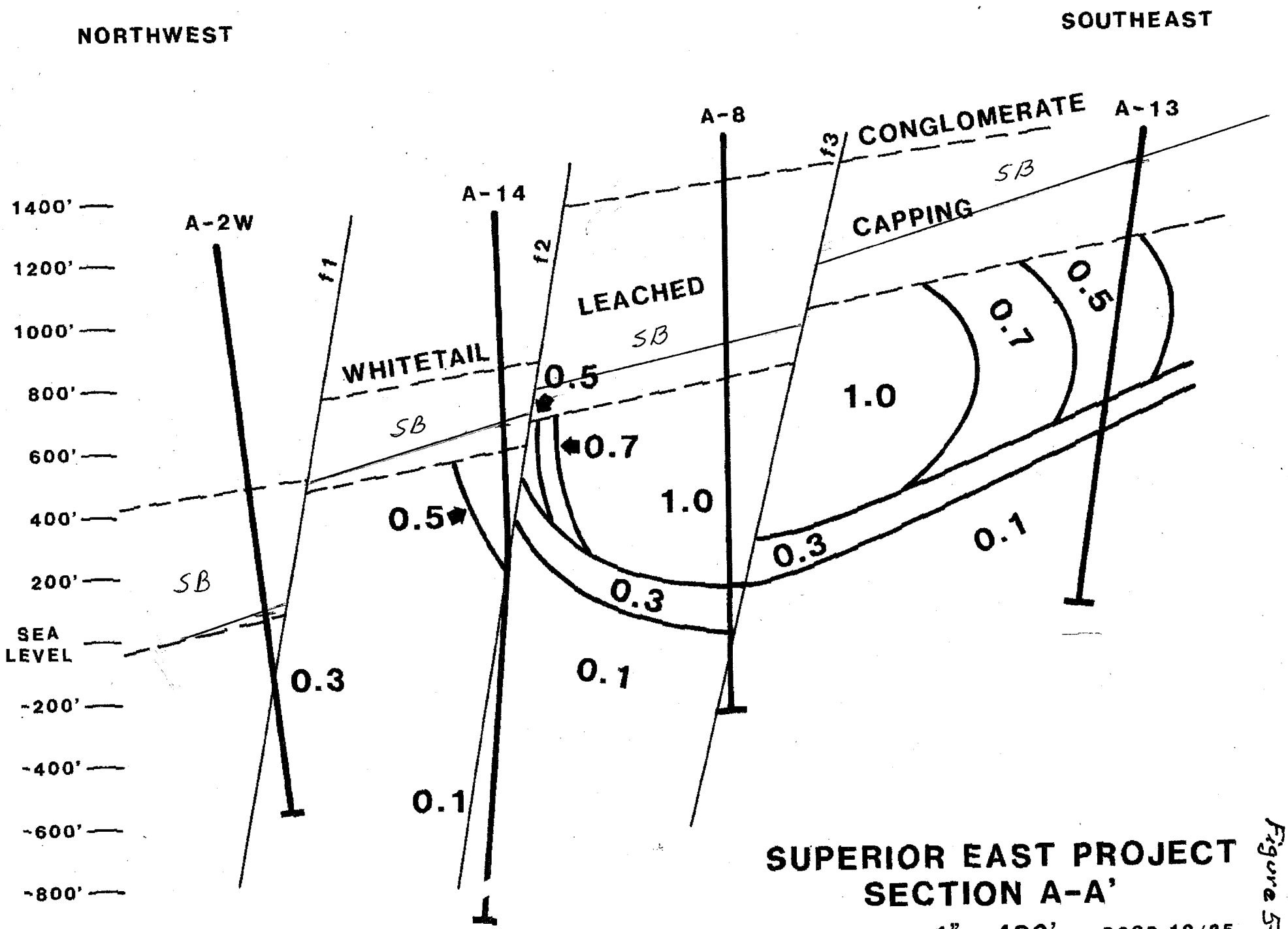
I'll be out of town until next Tuesday, but will try & get this all in the mail along with my invoice.

Call if needed.

Sincerely

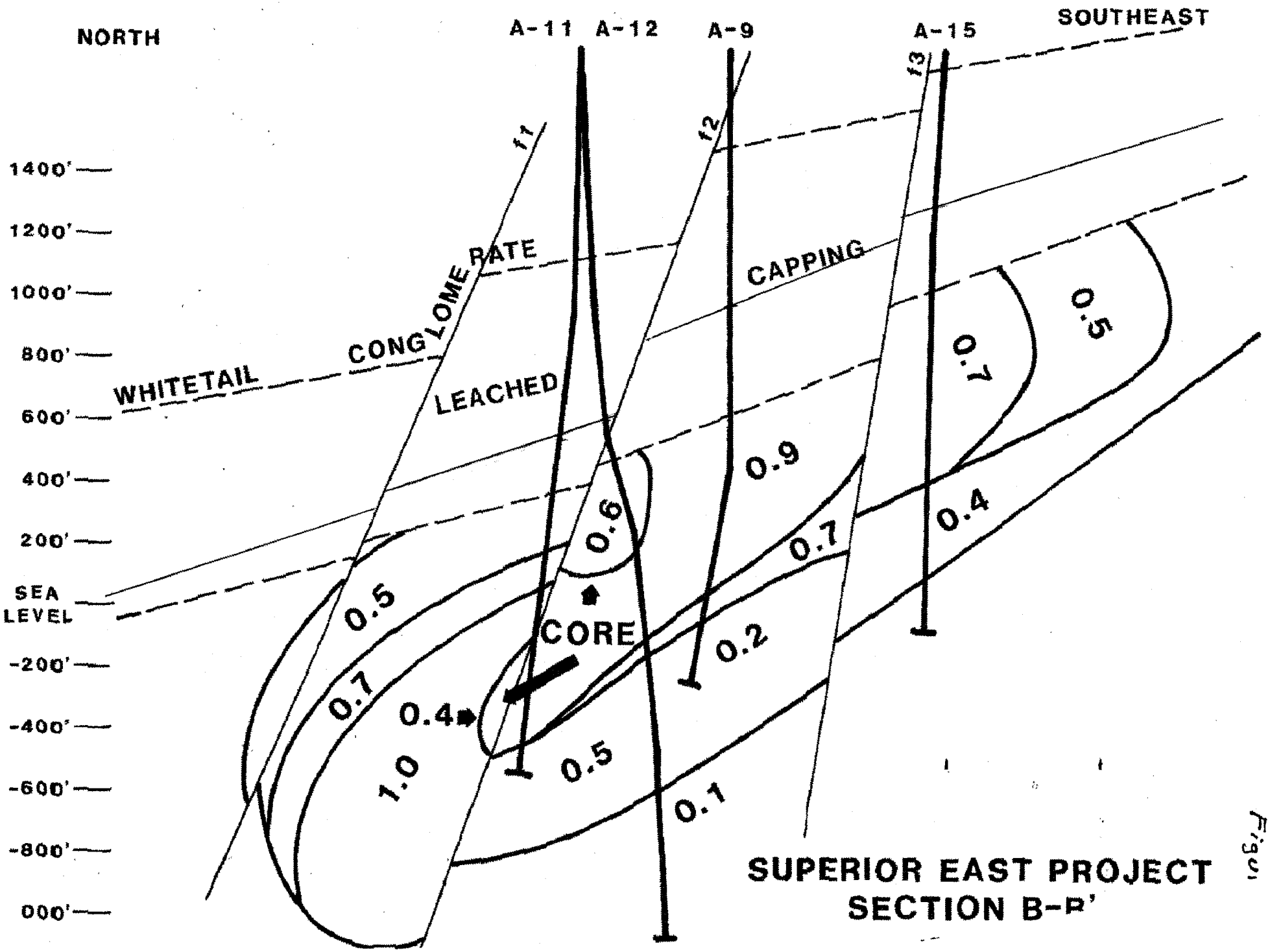
Janeth Sell

Fax # 520-578-7196



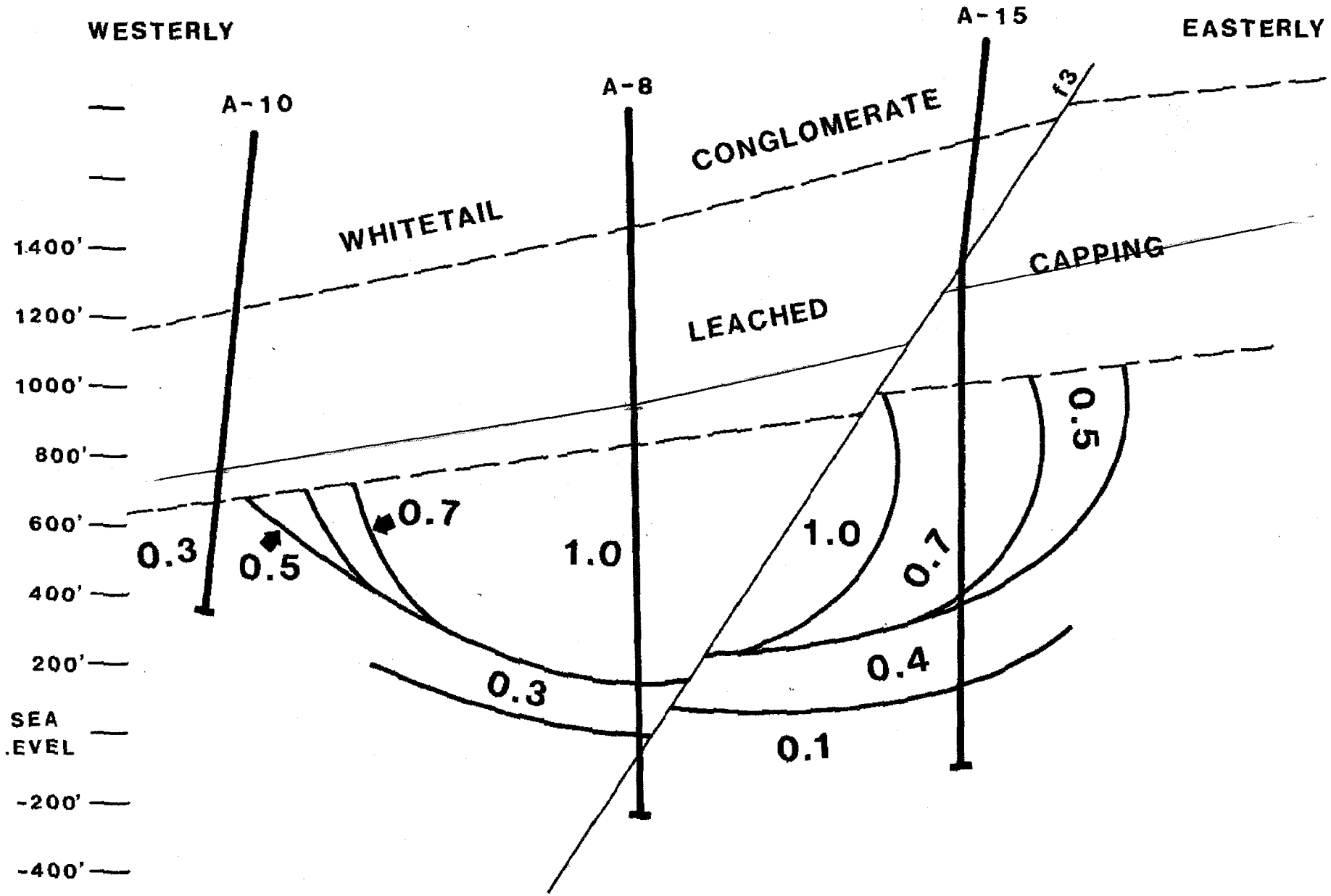

SUPERIOR EAST PROJECT
SECTION A-A'
1" = 400'

Figure 5-3




SUPERIOR EAST PROJECT
SECTION B-B'

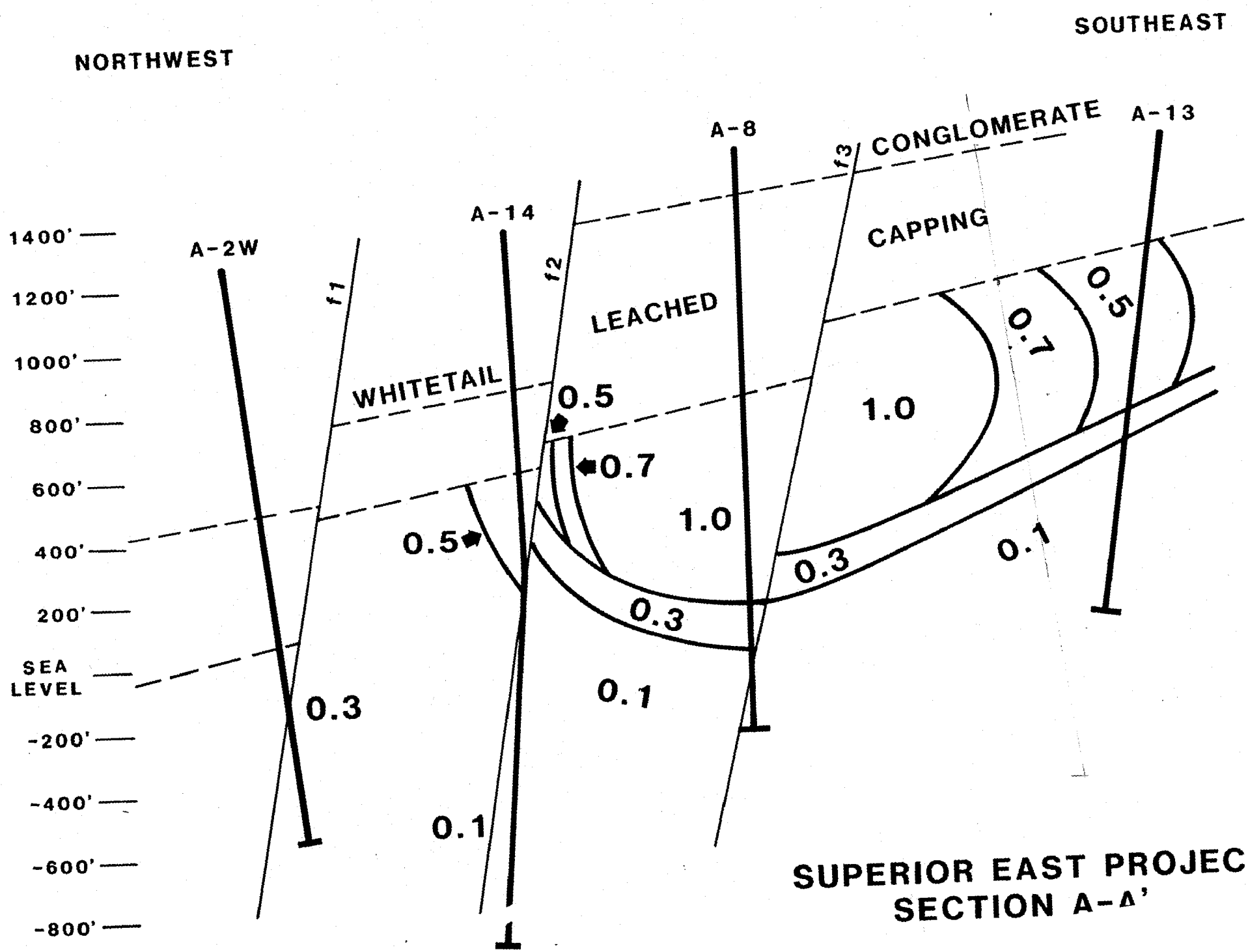
Figure




**SUPERIOR EAST PROJECT**
**SECTION C-C'**

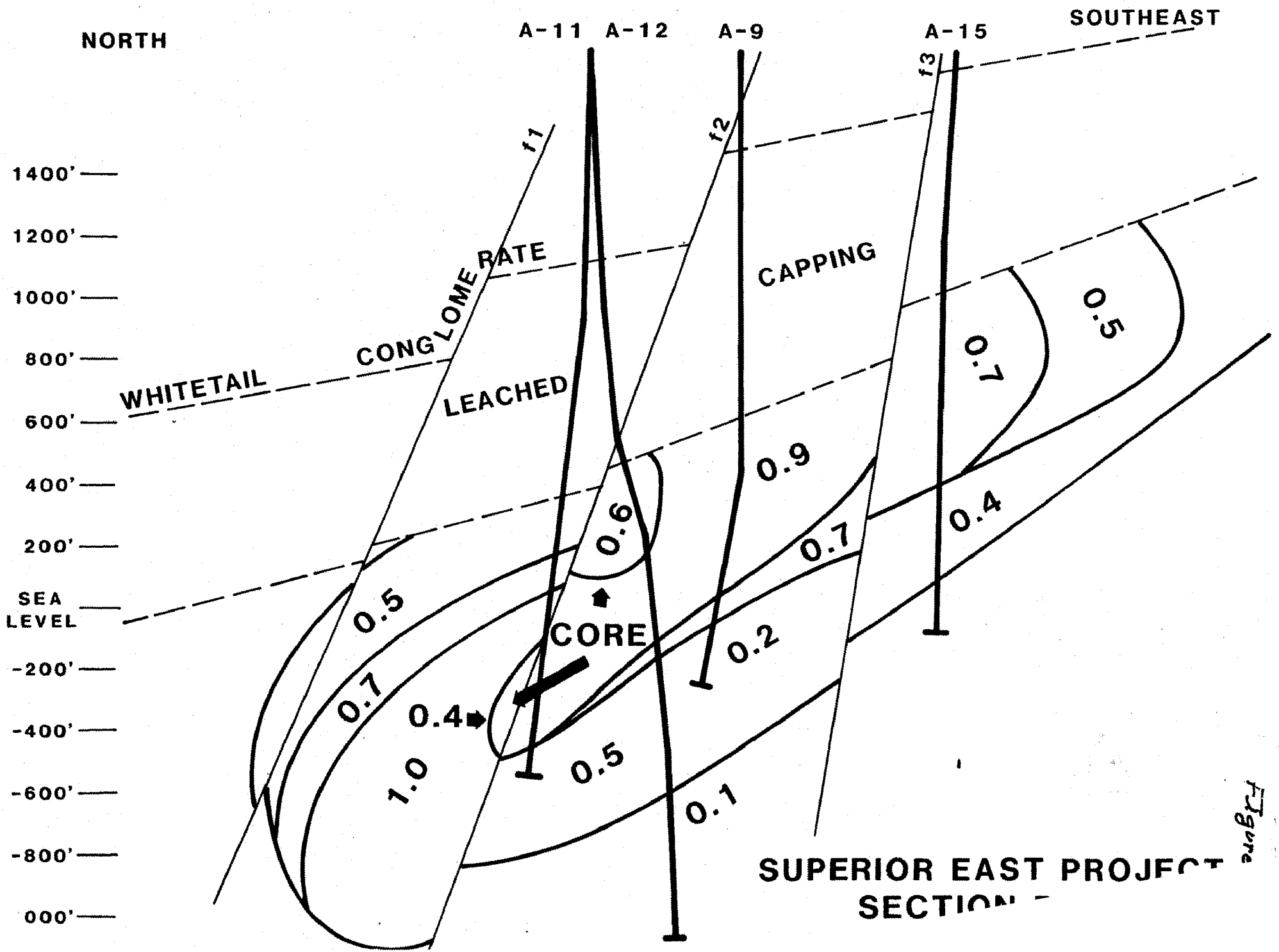
1" = 400'

Figure 5-5



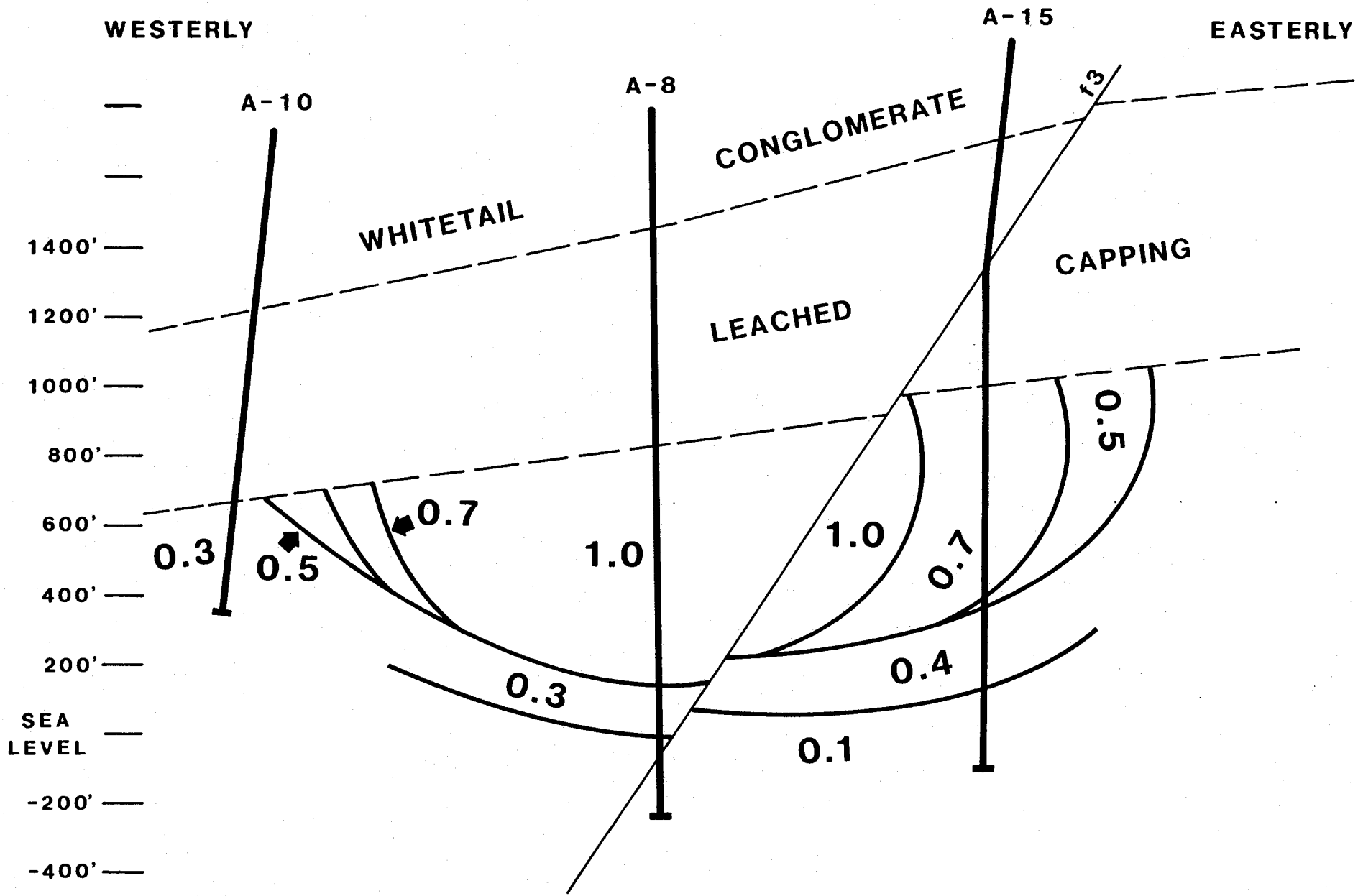

SUPERIOR EAST PROJECT
SECTION A-A'

Figure 5-1




SUPERIOR EAST PROJECT
SECTION

Figure




**SUPERIOR EAST PROJECT**
**SECTION C-C'**

1" = 400'  6324 12/85

Figure 5-6

P 332 521 788

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| Post Office, State, & ZIP Code Englewood CO 80111 | |
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| Certified Fee | 110 |
| Special Delivery Fee | |
| Restricted Delivery Fee | |
| Return Receipt Showing to Whom & Date Delivered | 110 |
| Return Receipt Showing to Whom, Date, & Addressee's Address | |
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| Postmark or Date | |

PS Form **3800**, April 1995

GEOLOGICAL SURVEY
RC 1008
1 of 1

# Report on the SUPERIOR EAST PROJECT

with recommendations for extended exploration drill holes

for

CAMBIOR USA, Inc

by James A. Sell
May 1997

Gary_Parkison@cambior.com

Proposed Report Outline
ASARCO Superior East Project
Pinal County, Arizona

I. Introduction - reiterate work performed when and by whom, largely from Sell (1995), and update on current property status, ASARCO plans, etc.

II. Property Status and Location - overview of location of project, agreements in effect, ASARCO claims, fee land, JI Ranch withdrawl areas, etc. (Figure 1)

III. Summary of Geology - overview of stratigraphy and structure, description of rock types, geologic history (Figure 2)

IV. Target Definition and Exploration - discussion of target types and program objectives, exploration drilling program and logistics, costs, and results (Table 1, Figure 3)

V. Description of Porphyry Target - form and dimensions of deposit, genetic aspects, resource estimates at various cutoff grades, potential for expansion (Table 2, Figure 4)

VI. Description of Whitetail Conglomerate Target - same as for porphyry target (Table 3, Figure 5)

✓ VII. Description of Mineralogy - describe Cu minerals, approximate quantities, zoning, metallurgical results, if any (Table 7-1, Figures 7-1 thru 7-5) + addendum File 2F)

✓ VIII. Potential for Future Development - include description of conditions related to underground mining, i.e., water, heat, rock conditions, depths, possible mining methods, in-situ mining possibilities (Table 8-1, Figure 8-1)

IX. Recommendations for Further Work

✓ X. Summary and Conclusions

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| PREPARED BY | JDS |
| --- | --- |
| TC | 1011 |

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PREPARED BY JBS
DATE 7 1011

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I-1. Company groups and their drill holes

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V-1. Footage of leached capping in drill holes.
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# Addendum

Graphic Log and Assay Results of:

Drill Hole A-2
Drill Hole A-2W
Drill Hole A-8
Drill Hole A-9
Drill Hole A-10
Drill Hole A-11
Drill Holes A-12 and A-12A
Drill Hole A-13
Drill Hole A-14
Drill Hole A-15
Drill Hole A-16
Drill Hole AI-2
Drill Hole AI-1
Drill Hole DCA-3A.

# I Introduction

The A-8 discovery hole, of the ASARCO Superior East project, is approximately four and half miles south south-west of the Cambior Carlota project. The Superior East project area lies in eastern Pinal County (Figure 1-1).

The project area lies within the mineral belt extending from Globe through Superior (Figure 1-2). It lies under the great mass of volcanic Apache Leap Tuff extending from Pinal Ranch westward to Superior (Figure 1-3).

The Superior East project was initiated in 1970 with a review of the regional geology, available drill hole information, Magma mine information, and several concepts on mineral occurrence and zoning within the Schultze Granite to the east.

ASARCO drilling commenced in 1971 and continued through 1992. Figure 1-4 plots the drill holes within the surface area of the Apache Leap Tuff, with the latest holes being in 1993.

BHP Ltd purchased Magma Copper Company and continued Magma's exploration program, south of their #9 Shaft, into early 1997.

Table 1-1 lists the various companies with drill holes in the Apache Leap tuff.

Table 1-1. Company Groups & Their Drill Holes

| Company | Drilling Years | Hole Series |
|---|---|---|
| Ariz. Mining | 1973 | LB-4 |
| ASARCO | 1971-1992 | A-Series, Reentered various other |
| Can-US | 1972-1978 | MS-Series |
| Cibola Expl. | 1930's | CE-Series |
| Cont. Materials | 1970 | M-1, M-2 |
| DOE | 1990 | UPZ-4 and -5. |
| Howe Sound | 1956 | HS-Series |
| Inspiration | 1964-1970 | AOF-Series, I-6 |
| Kennecott | 1991 | MS-1 |
| Kerr-McGee | 1964 | OF-1A, DC-1 |
| Magma | 1957-1997* | MB-Series, Reentered various other |
| Quintana | 1976 | QDC-Series |
| SOPCO-Miami | 1964-1965 | DCA-Series |
| Unknown | 1930's | C-Series, U-Series |

*Note: BHP Ltd purchase Magma Copper Co and continued the exploration of the MB-Series.

Through the end of 1976, a total of 23 holes had been started on the Apache Leap Tuff. Only 9 of these holes, including Magma's No. 6 shaft, had penetrated into the underlying pre-mineral rock units. Seven of the mine were near the northeast corner of the volcanic sheet, adjacent to the Eden property now controlled by Cambior.

During ASARCO's period of exploration drilling, they drilled 20 holes to a pre-mineral intercept, totally 79,000 feet of rotary and core footage. Of these intercepts, ASARCO reentered 3 previous holes and continued them down, and re-entered another to confirm the intercept to the pre-mineral intercept.

The ASARCO drilling discovered four styles of mineral zones, two of which had not been known previously. Hole A-1 was drilled to test the extension of the oxide copper in the Cactus breccia. A slide block of Cactus breccia 15.4 feet thick had 0.14% copper in the upper 50 feet. Hole A-4 discovered the Magma-style limestone replacement mineralization. The porphyry target around discovery hole A-8, was the intended target for the project, however, this drilling was the first to intercept such a target under the volcanic plateau. The native copper in conglomerate, was indicated in holes A-4 and A-7, and is a new type discovery for this area.

This report covers the porphyry and native copper targets.

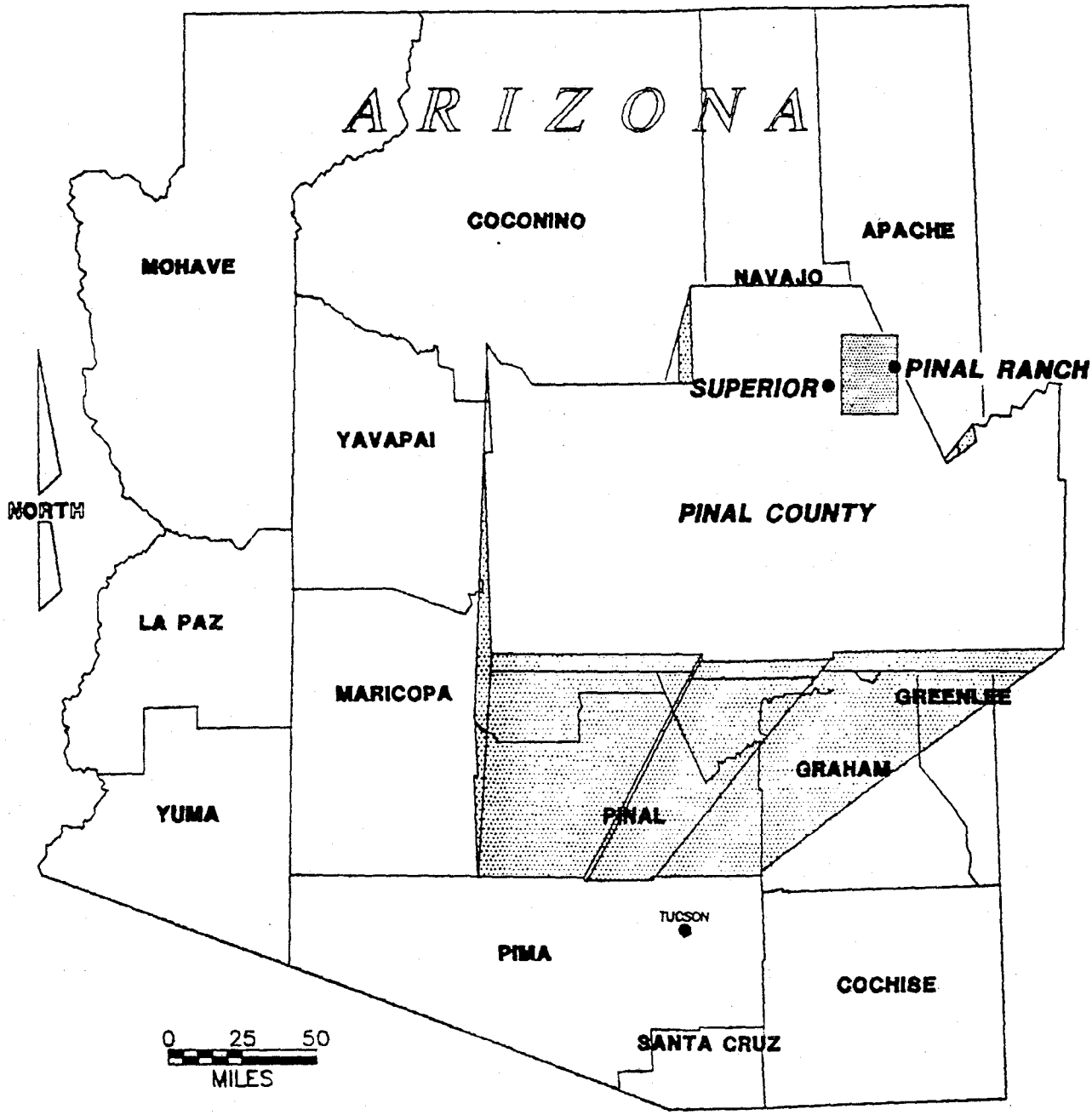



Figure I-1. Location of Superior East Project, eastern Pinal County, Arizona.

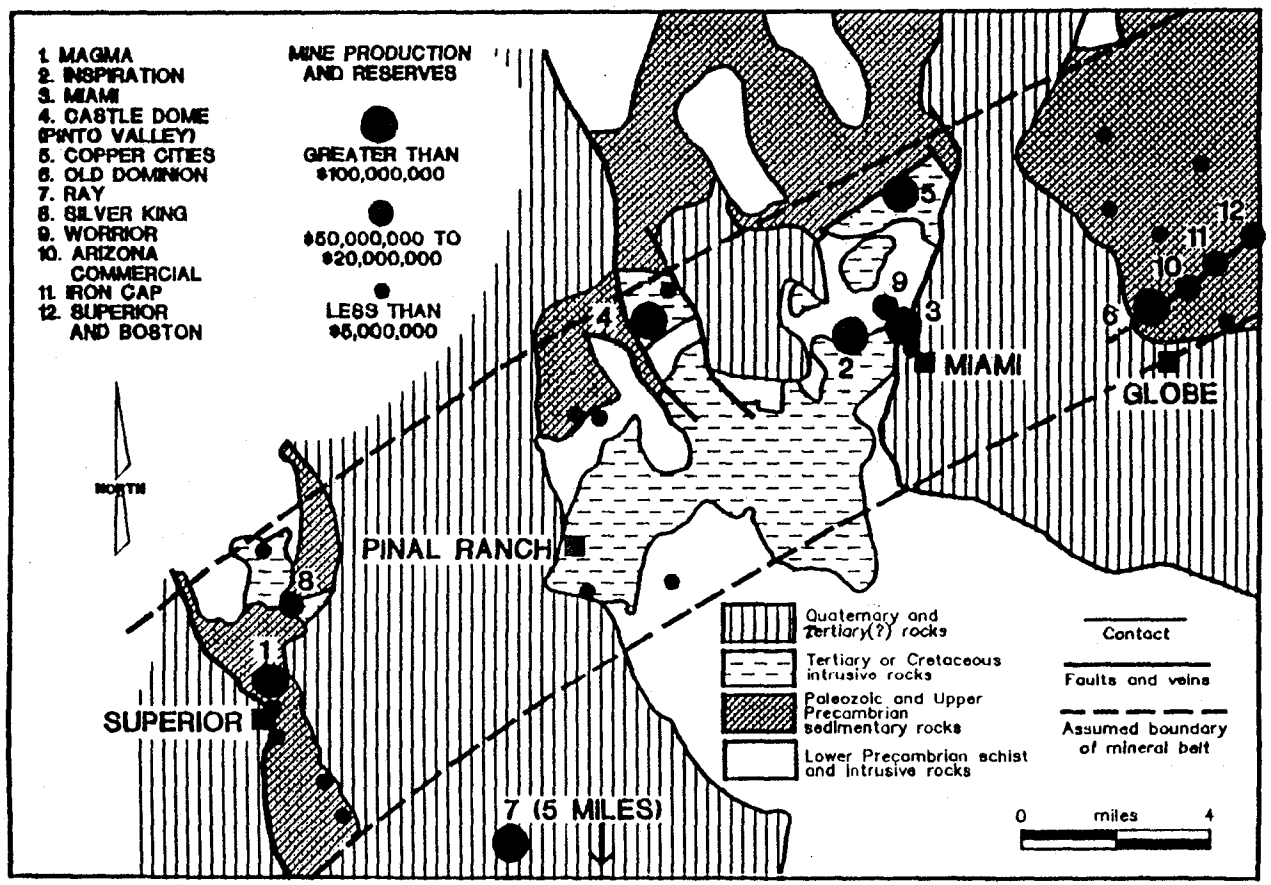



Figure 1-2. Index map of Pioneer (Superior) and Miami-Globe districts with indicated limit of mineral belt and location of productive deposits (modified from N.P. Peterson, 1962).

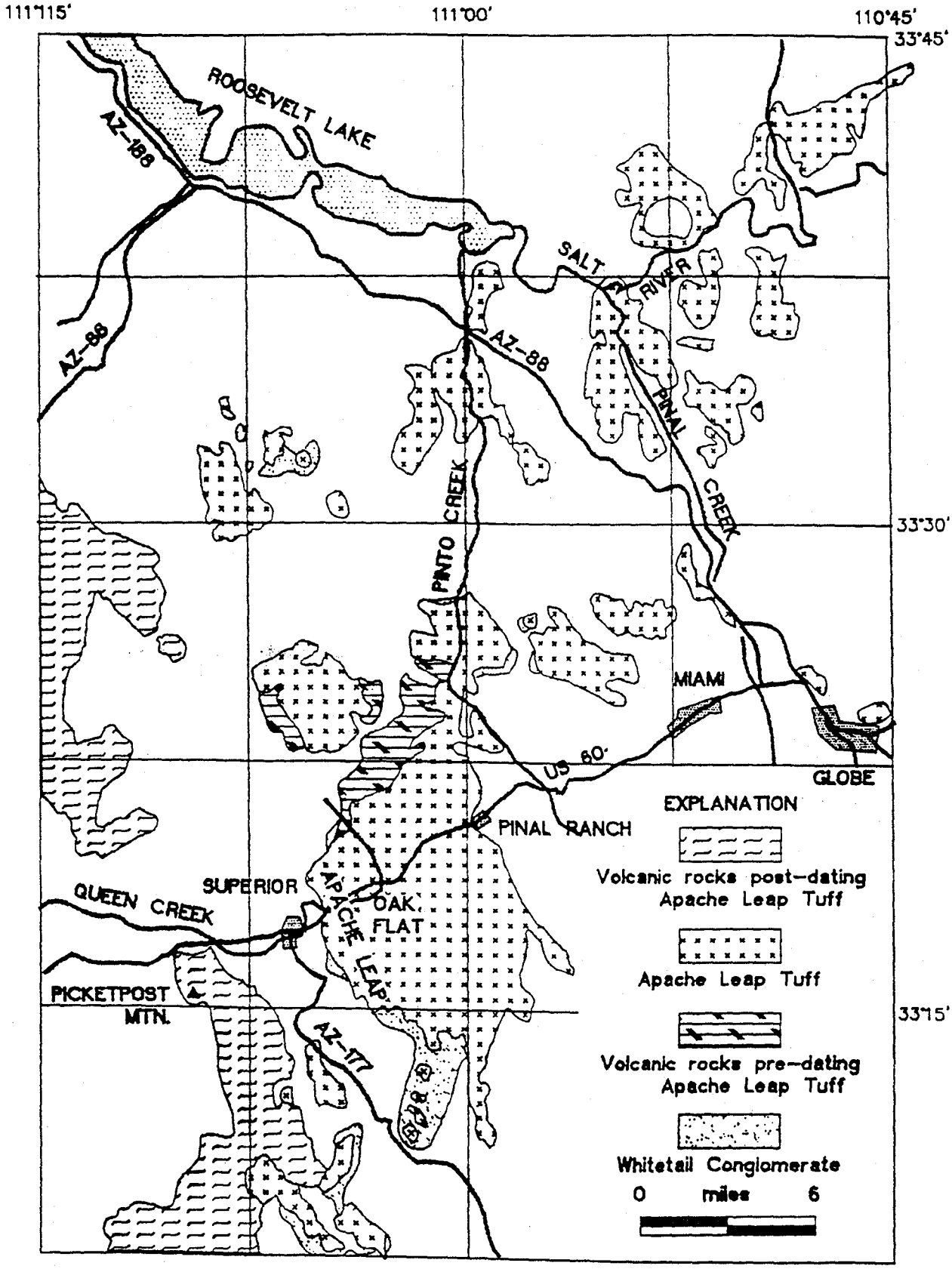



Figure 1-3. Map showing approximate outcrop distribution of the Apache Leap Tuff, volcanic rocks that post-date and pre-date the Apache Leap Tuff, and the Whitetail Conglomerate.

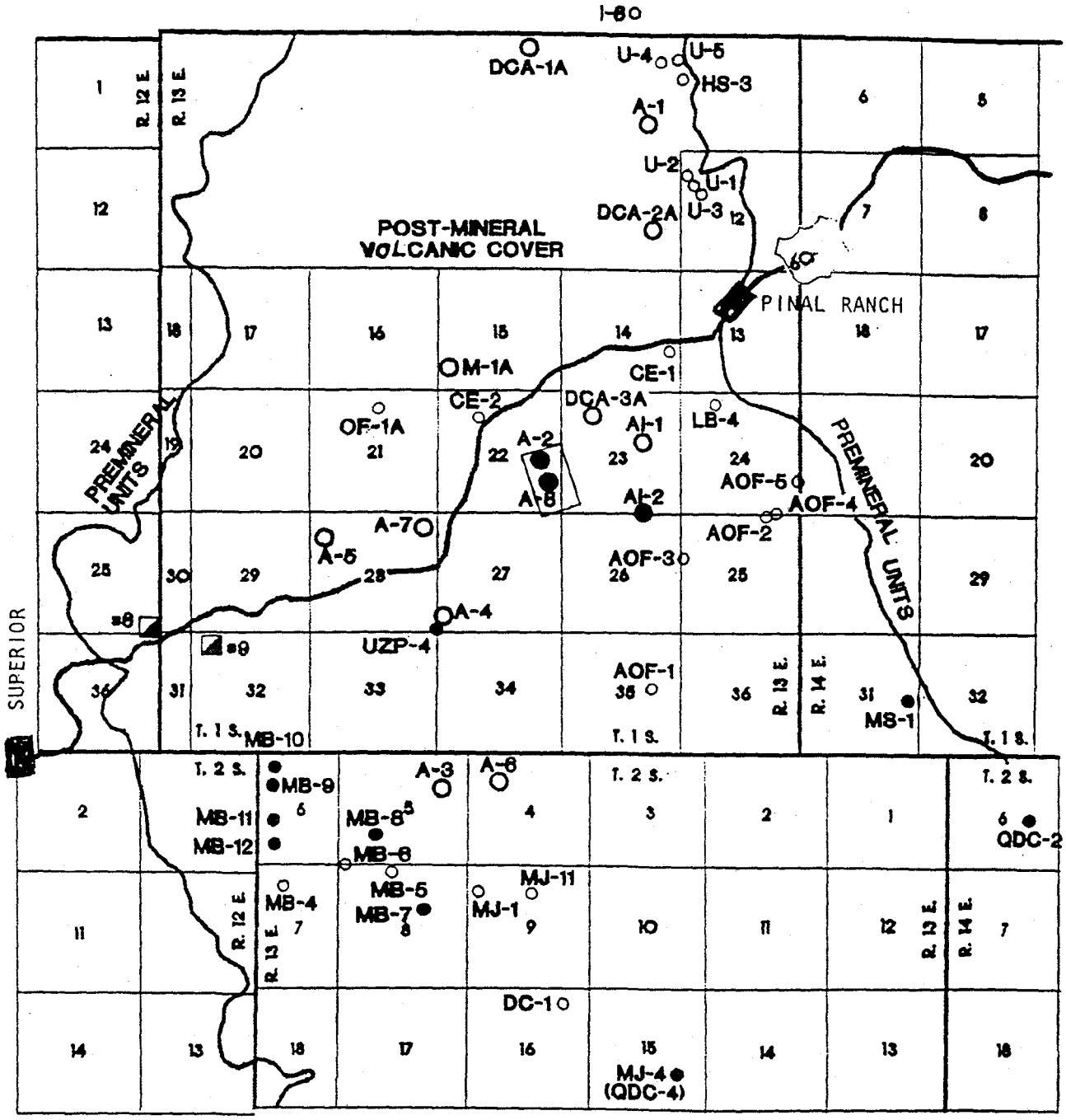



Figure 1-4. All holes drilled to date (1993).

# IV. Target Definition & Exploration

Two exploration targets have been indicated within ASARCO held lands of their Superior East Project. One target is the porphyry copper target, the other is the native copper in conglomerate target. The native copper target extends under ASARCO claims, BHP claims, and the Oak Flat Recreation area of the U.S. Forest Service withdrawal. A third exploration target of limestone replacement mineralization lies mainly under the Oak Flat Recreation area.

1). The eastern porphyry copper target contains disseminated values, veins, shear zone, & specialty mineralization of primary chalcocite-bornite mixture and chalcopyrite. The present drilling is within Sections 22 and 23, T1S, R13E.

The porphyry target has eleven intercepts of copper, ranging from 0.29% to 1.57% copper over thicknesses of 173 feet to 824 feet. Within this block a modified geologic resource of approximately 160 million tons of 0.90% copper is indicated, using a 0.5% copper cut-off.

The mineralization is considered open in all directions around the block. Three outer holes — in excess of 2500 feet distance — contain 0.12 to 0.14% copper mineralization.

This indicates a very large system and adds exploration possibilities for additional copper resources to be found.

Table 4-1 lists the eleven holes and the three outer holes, their thickness of copper values, the copper values, and depth to the top of the mineral interest.

Table 4-1. Drill Hole, Interval, % Copper, & Depth

| Hole No. | Interval, Feet | Percent Copper | Feet to Top of Interval, below surface |
|---|---|---|---|
| A-2 | 623 | 0.30 | 4317 |
| A-8 | 446 | 1.57 | 3879 |
| A-9 | 624 | 0.81 | 4044 |
| A-10 | 296 | 0.29 | 3953 |
| A-11 | 824 | 0.87 | 4262 |
| A-12 | 577 | 0.77 | 4171 |
| A-13 | 530 | 0.58 | 3499 |
| A-14 | 173 | 0.47 | 4096 |
| A-15 | 547 | 0.71 | 3670 |
| A-16 | 460 | 0.30 | 3860 |
| AI-2 | 310 | 0.37 | 2850 |
| A-4 | 83 | 0.16 | 6581 |
| AI-1 | 729 | 0.12 | 3238 |
| DCA-3A | 116 | 0.13 | 4490 |

The first ten holes are within a block 2300 feet E-W by 1700 feet N-S. Hole AI-2

is located 2000 feet east and indicates additional resources eastward.

Hole A-4 is located 6000 feet to the southwest and its mineralized value also indicates additional resources in that direction. Holes AI-1 and DCA-3A are 3000 feet northeast and 2500 to the north northeast and extend the outside limits for a resource in that direction.

2. The western target of native copper in Whitetail Conglomerate is located in Sections 28 and 33, T1S, R13E.

The target was intercepted in two holes 4000 feet apart, with the top of the intercept 4700 feet to 5000 feet below the surface. Over 400 cummulative feet of intercept averaged in excess of 0.75% copper. Based on basin parameters, with a minimum thickness of 250 feet, a geologic resource of 400 million tons averaging plus 0.8% copper, could be suggested.

Only about a fourth of this tonnage is under ASARCO held claims, with the remainder under BHP and Forest Service withdrawal. As the copper was derived from an eroded porphyry copper system, such as Superior East, it brings up the point that either much of the system has been eroded, i.e., about half of the drilled

porphyry copper sulfide resource has been removed to erosion and slide block mechanics or it suggests that much more sulfide resource is yet to be discovered.

3. The third target is the limestone replacement mineralization within the Paleozoic units mined at the Magma Mine to the west. The drill hole A-4 encountered a slide block of well mineralized limestone, within the Whitetail Conglomerate, and also cut through a piece of Escabrosa limestone at a depth of 6450 feet, which also had good values, before being cut-off by a fault.

The majority of the target is under the U.S. Forest Service with drawal of Oak Flat.

All the target areas are within the Tonto National Forest and a plan of operation and drilling permits are part of a continued exploration project.

Expansion of the porphyry copper resource area can be initiated along the road system presently constructed in most directions from the present resource.

Drilling costs are substantial to complete drill holes a mile below the surface in the porphyry copper target area, and plus 1000 feet in the

conglomerate target area. The previous drilling costs were around $40 per foot in the 1970's when the bulk of the drilling was completed. Now it would probable exceed $50 per foot.

When exploration drilling was beginning, a study of previous drilling methods indicated a problem existed when drilling through the basal tuff of the upper volcanics, the weathered lower volcanics, and the upper part of the upper Whitetail Conglomerate, when underpowered machines were used.

With the depths involved it was decided to use a modified small oil rig with several air packages attached to rapidly remove the cutting and advance the hole. This proved successful and the rotary hole was cased for the diamond drill coring to follow. However, the cost of this rotary drilling and the casing was considerable. Later, coring from the surface using a heavy duty rig was found to be successful and cost effective.

Perched water pockets in the upper volcanics caused some problems, as did water loss in the porous beds in the lower volcanics. Faulting and sheared zones within various units also caused a solution loss and especially within the well altered, brecciated, sheared mineralized zones at depth.

ASARCO has invested in excess of $3,500,000 to date in the total project area.

Two cross-sections exhibit much of the sequence of rock units and a bare suggestion of the faults involved. Cross section Line 1, Figure 4-1, starts on the west at the concentrator fault and moves eastward to the Magma No. 6 shaft, then on to ASARCO drill hole A-4, and continues east of Devils Canyon. Cross-section Line 2, Figure 4-2, trends N20°E, starting on the west side of Devils Canyon, then crossing Devils Canyon, crosses Line 1, and on northeast through drill hole A-8, DCA-3A, DCA-2A, V-2, and off the plateau onto the Eder Group of claims with the copper oxide zones of Cambrian. These sections show the native copper zone and the porphyry copper zone and the expansion possibilities toward the outlying holes which had favorable alteration with low copper values.

Figure 4-1

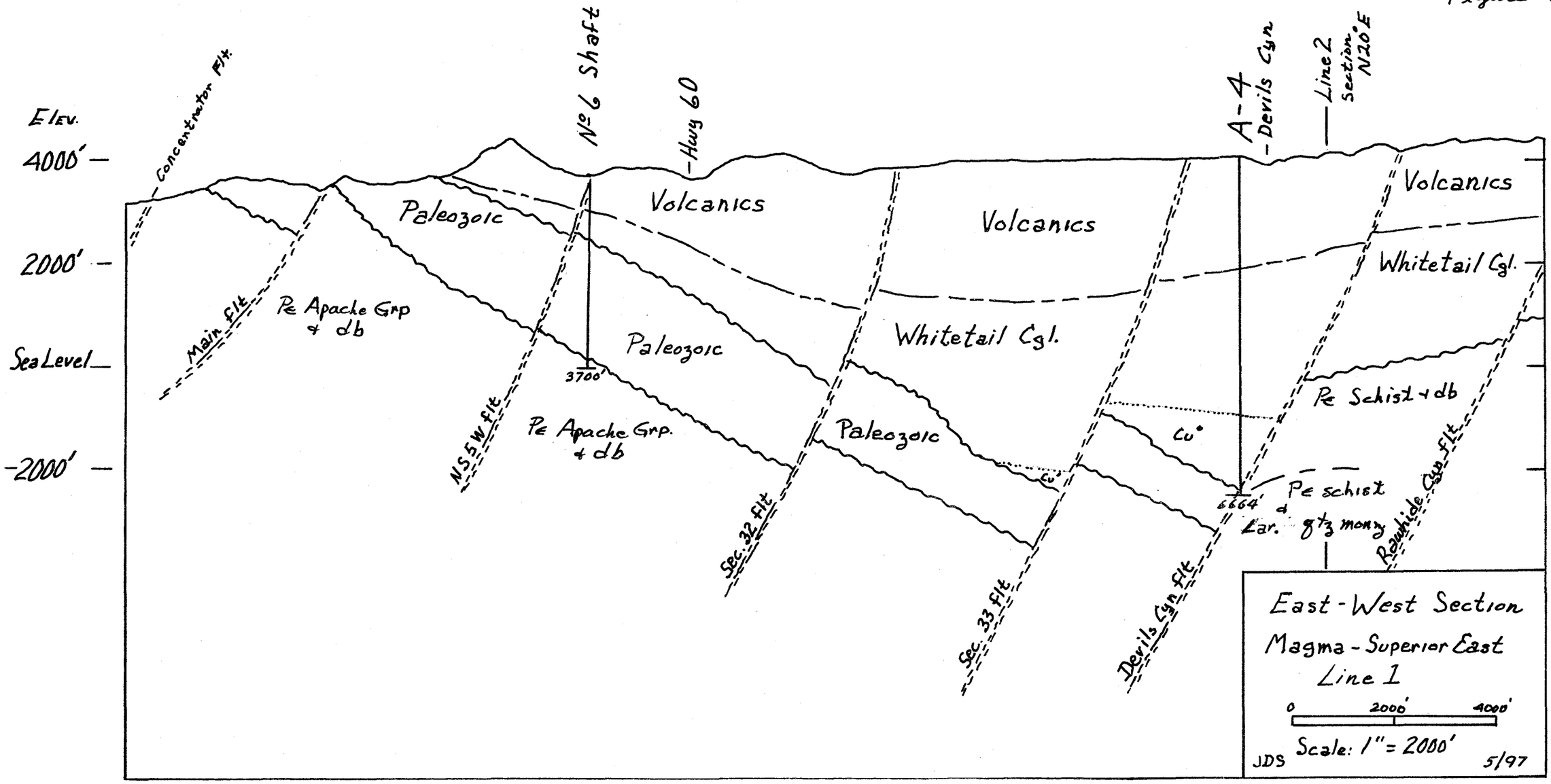
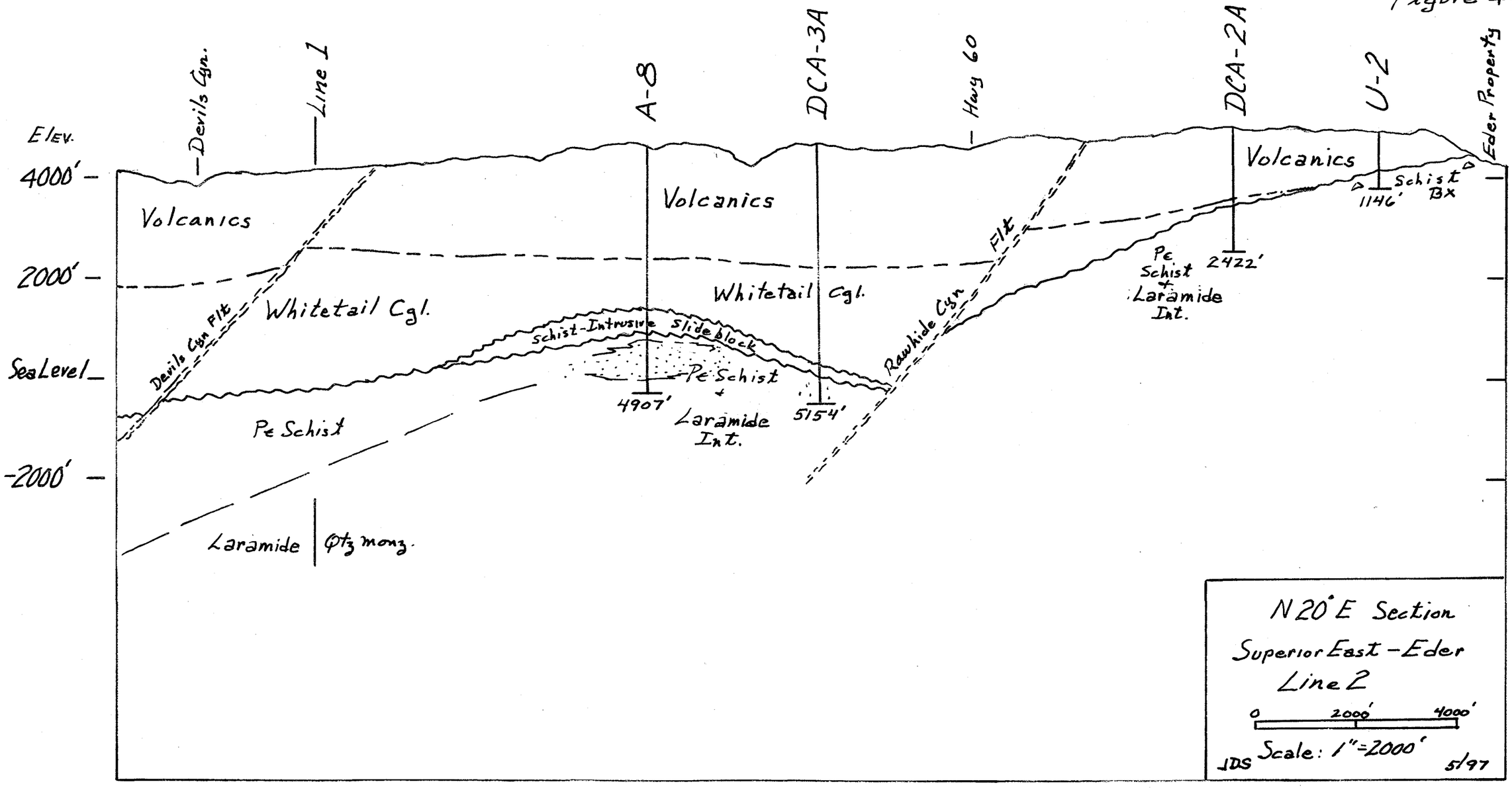

Elev.
4000'
2000'
Sea Level
-2000'
Concentrator flt.
Main flt.
Pe Apache Grp + db
Paleozoic
Nº 6 Shaft
Hwy 60
Volcanics
3700'
Pe Apache Grp. + db
N55W flt.
Sec. 32 flt.
Paleozoic
Volcanics
Whitetail Cgl.
Sec. 33 flt.
Paleozoic
Cu°
Devils Cyn flt.
A-4
Devils Cyn
6664'
Line 2
Section N20°E
Volcanics
Whitetail Cgl.
Pe Schist + db
Pe schist & Lar. g+3 monz
Rawhide Cyn flt.
East-West Section
Magma - Superior East
Line 1
0
2000'
4000'
Scale: 1" = 2000'
JDS
5/97

Figure 4-2


Elev.
4000'
2000'
Sea Level
-2000'
Devils Cyn.
Line 1
A-8
DCA-3A
Hwy 60
DCA-2A
U-2
Eder Property
Volcanics
Volcanics
Volcanics
Whitetail Cgl.
Whitetail Cgl.
Devils Cyn Flt
Schist-Intrusive Slideblock
Pe Schist + Laramide Int.
4907'
5154'
Rawhide Cyn Flt
Pe Schist + Laramide Int.
2422'
Schist BX
1146'
Pe Schist
Laramide
Qtz monz.
N 20° E Section
Superior East - Eder
Line 2
0
2000'
4000'
Scale: 1" = 2000'
JDS
5/97

# V. Description of Porphyry Target

The porphyry target has eleven drill hole intercepts (Figure V-1), with the holes A-# being the central part of the geologic mineral resource.

The hole AI-2 is located plus 2000 feet to the east and has 310 feet of 0.37% copper, indicating an excellent expansion possibility to the east and southeast. Drill hole AI-1 is over 3000 feet away to the northeast, and exhibits moderate alteration and pyrite with low copper values. To the north northwest is hole DCA-3A with similar characteristics as hole AI-1. Hole DCA-3A has a 212 foot intercept of 0.33% copper, however, the intercept is within a cataclastically deformed slide block, while the in-place underlying block has only 0.1% copper.

As noted in Figure V-2, three faults striking northwesterly has dropped the modeled mineral zone outline down to the northwest. Also, Hole A-16 was drilled after the model was constructed and was disappointing in that the hole did not confirm the grade anticipated. However, the wide spacing of the holes opens up other exploration models, one of which will be discussed later. Hole A-17, in the near northeast, was started and taken to 820 feet

*Figure 5-1*

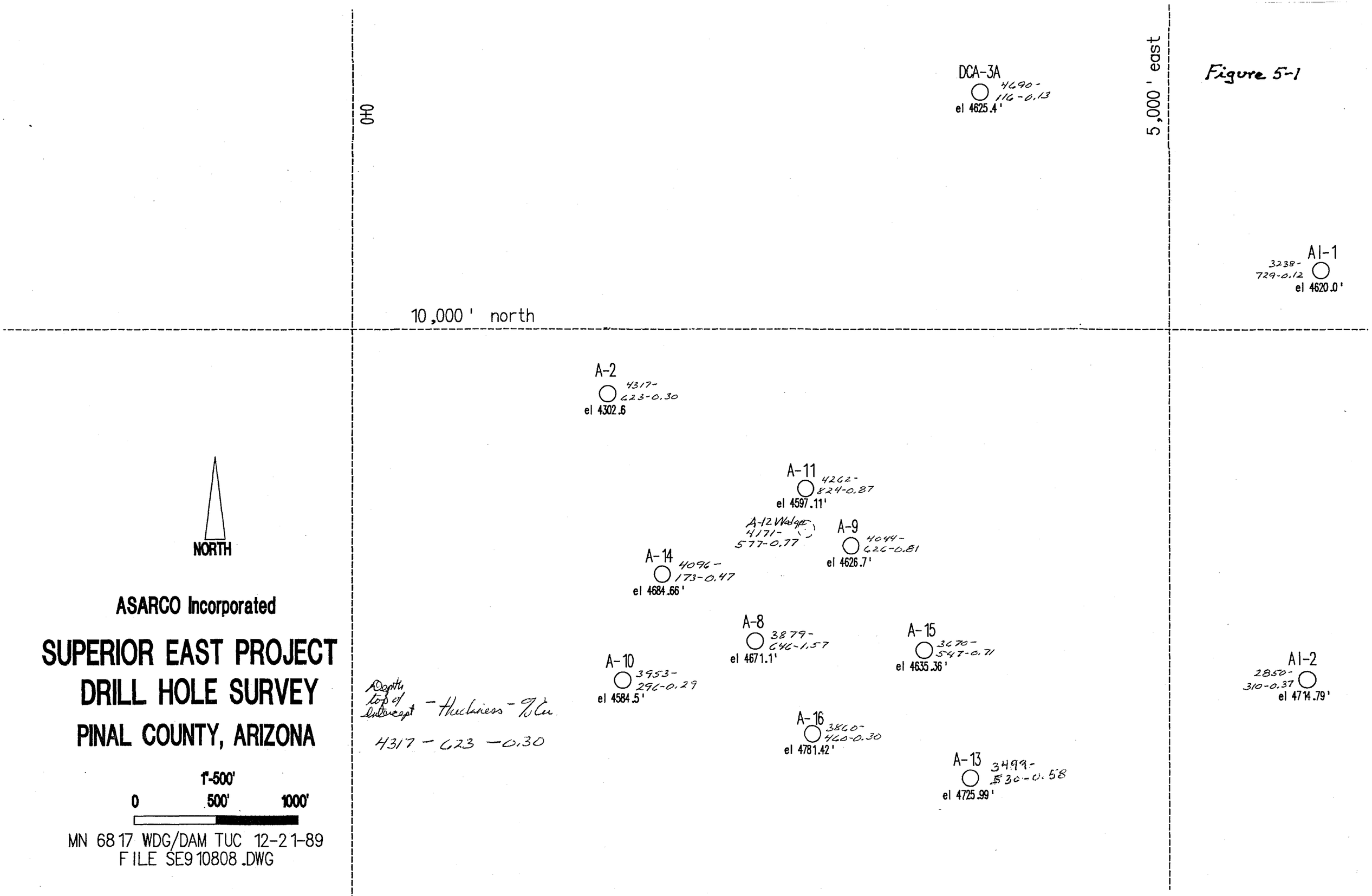
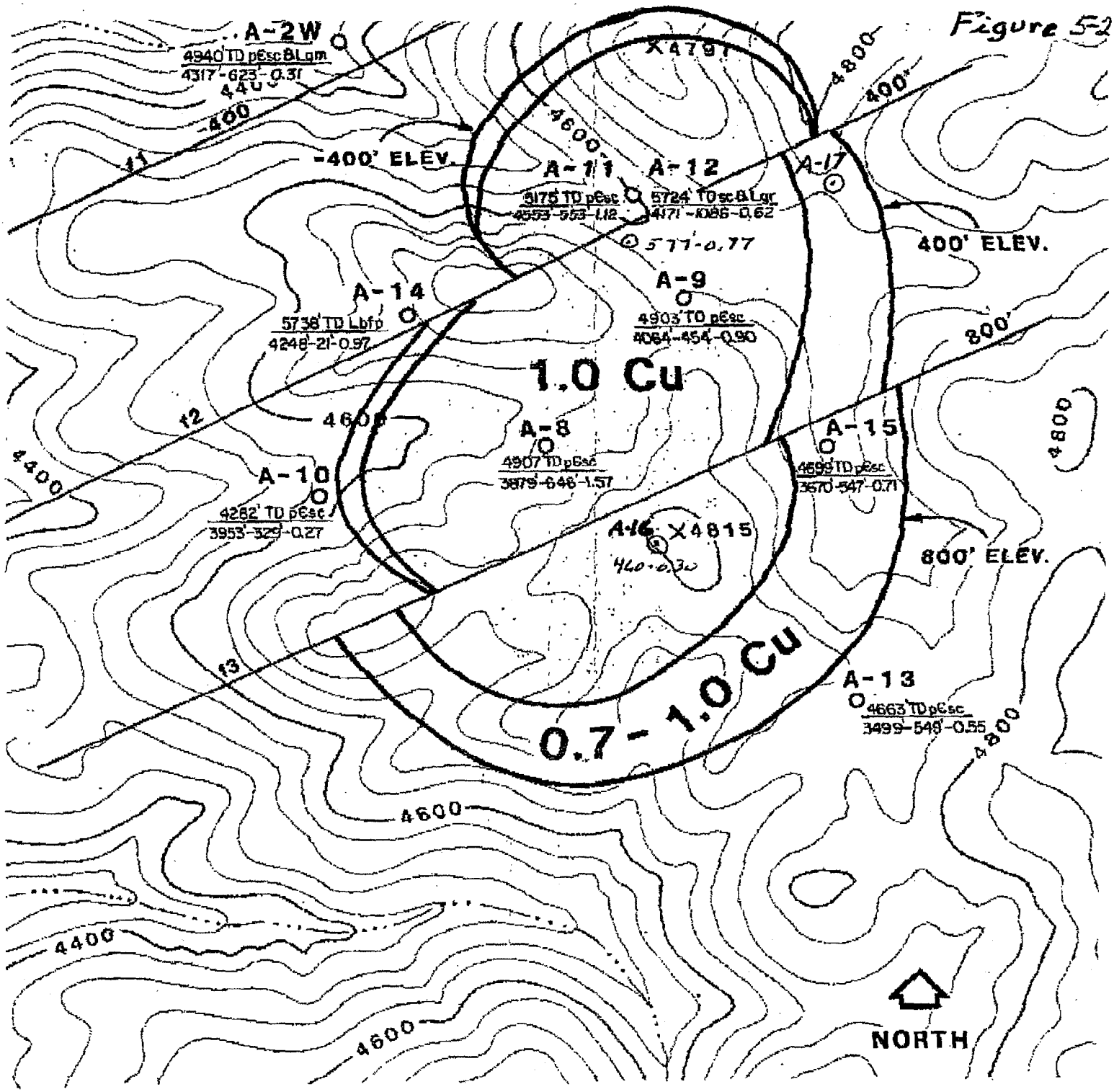

0,0
5,000' east
10,000' north
DCA-3A
4690-
116-0.13
el 4625.4'
AI-1
3238-
729-0.12
el 4620.0'
A-2
4317-
623-0.30
el 4302.6
A-11
4262-
824-0.87
el 4597.11'
A-12 Wedge
4171-
577-0.77
A-9
4044-
626-0.81
el 4626.7'
A-14
4096-
173-0.47
el 4684.66'
A-8
3879-
646-1.57
el 4671.1'
A-15
3670-
547-0.71
el 4635.36'
A-10
3953-
296-0.29
el 4584.5'
AI-2
2850-
310-0.37
el 4714.79'
A-16
3860-
460-0.30
el 4781.42'
A-13
3499-
530-0.58
el 4725.99'
Depth top of intercept - thickness - % Cu
4317 - 623 - 0.30
NORTH
ASARCO Incorporated
SUPERIOR EAST PROJECT
DRILL HOLE SURVEY
PINAL COUNTY, ARIZONA
1"-500'
0
500'
1000'
MN 6817 WDG/DAM TUC 12-21-89
FILE SE910808.DWG

Figure 5-2




A-8 ASARCO hole & designation

4907' TD pЄcs — *total depth rock type*

3879'-646'-1.57 — depth-length-%copper

**PRE-MINERAL ROCK TYPE**

- *Lbfp* *Laramide biotite feldspar porphyry*
- Lqm Quartz monzonite
- Lgr Granite
- pЄsc Schist

T. 1 S., R. 13 E.

# MODELED MINERAL ZONE OUTLINE

## SUPERIOR EAST PROJECT
## PINAL COUNTY, ARIZONA

1" = 500'

JDS DEC 1985

6340 12/85

in the volcanic unit, where it was abandoned. Re-entry in A-17 is probable, with the surface casing capped and heavy drilling mud left in the hole.

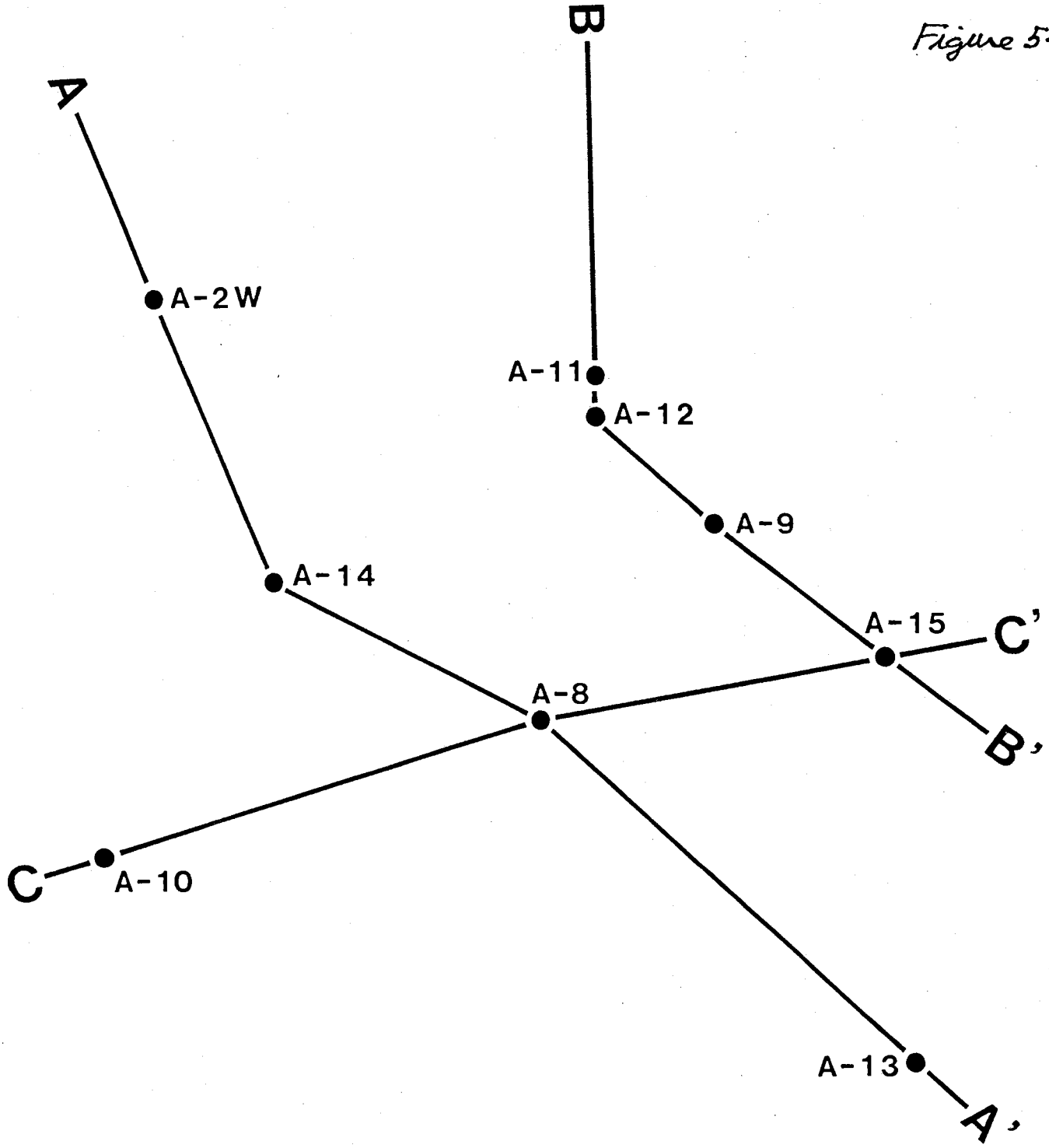
Figure V-3 plots the three section lines through the porphyry target. Figures V-4 and V-5 are cross-section lines A-A' and B-B' along the apparent strike of the modeled mineral zone. Figure V-6, section C-C', trends northeast across the trend of the other two sections.

This model suggests an egg-shaped mineral body with the central high-grade core area surrounded by lesser values, along with a general sharp cut-off at the base. In this model, approximately half of the mineral zone has been leached of its copper values, and this copper is suggested to have contributed to the values in the native-copper bearing conglomerate to the west.

The leached capping interval includes both the oxidized and leach capping in the slide block (5B) above the basal fault, as well as the oxidized zone below the fault.

Table V-1 lists the footage of leached capping in various slide blocks, and the footage below the basal fault, and above the oxide/sulfide line. This band is also shown on Figures V-4, V-5, and V-6.

Figure 5-3

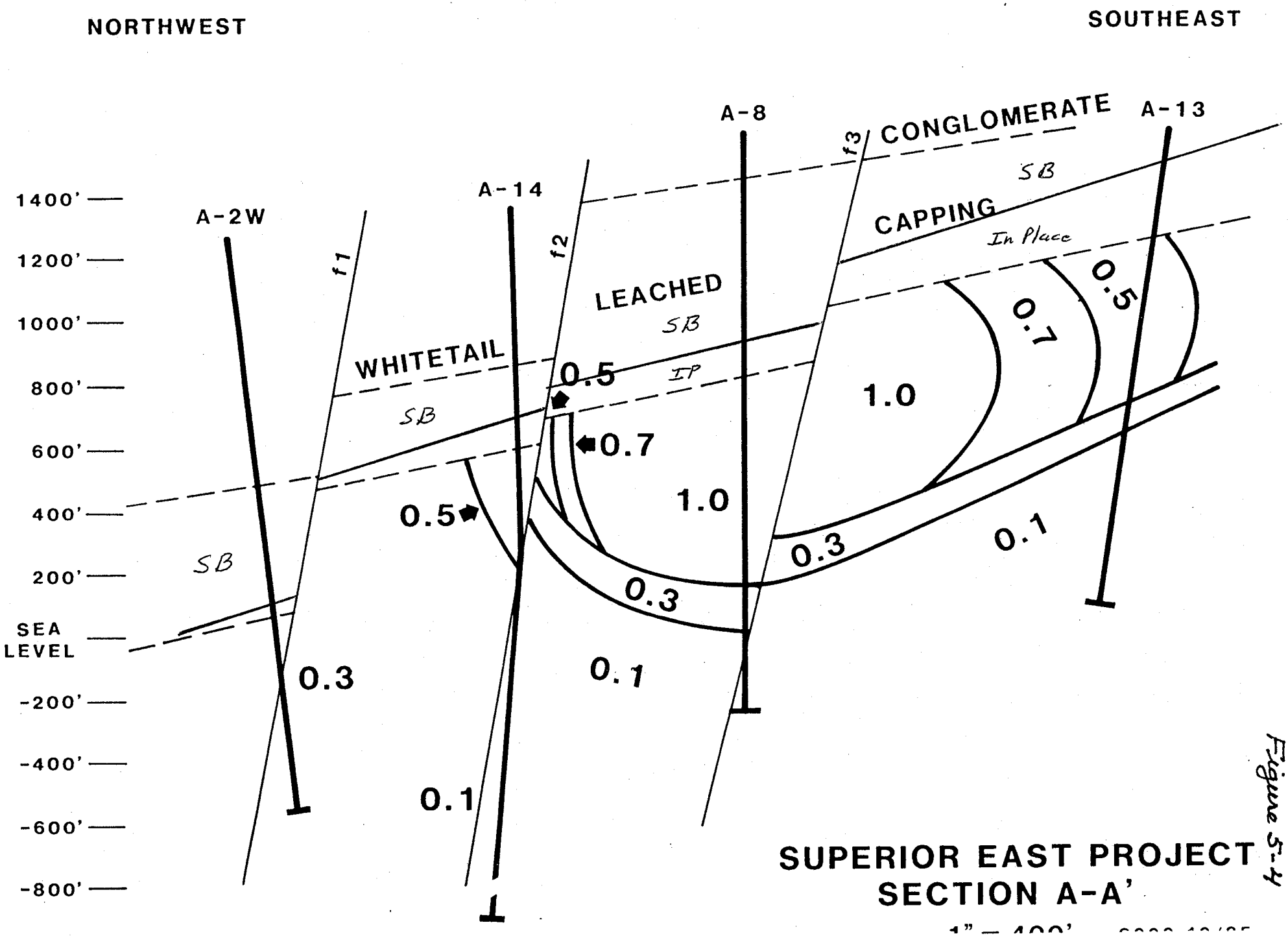



SECTION LINES

1" = 400'

SUPERIOR EAST PROJECT
PINAL COUNTY, ARIZONA

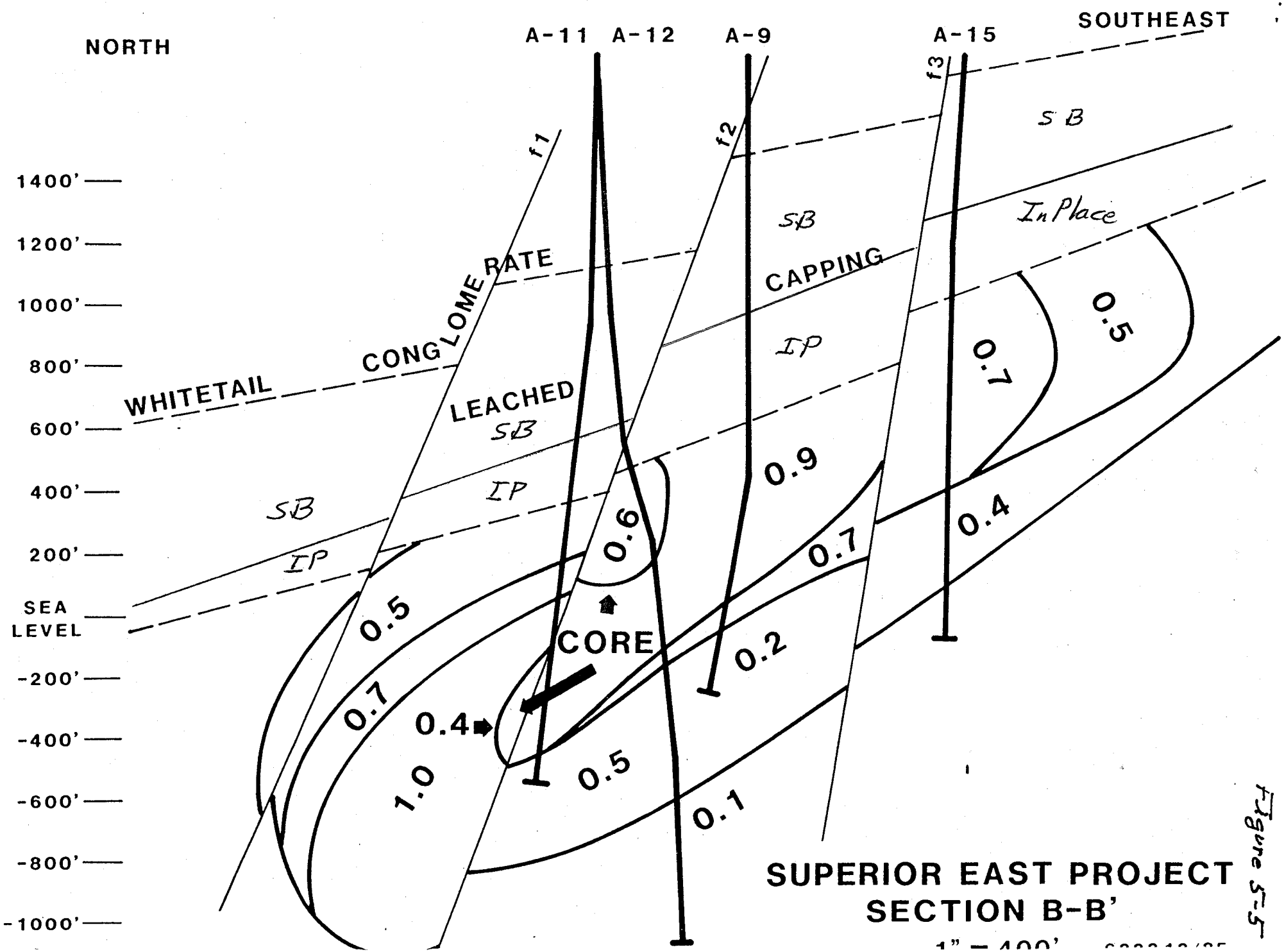
6321 12/85




SUPERIOR EAST PROJECT
SECTION A-A'

1" = 400'

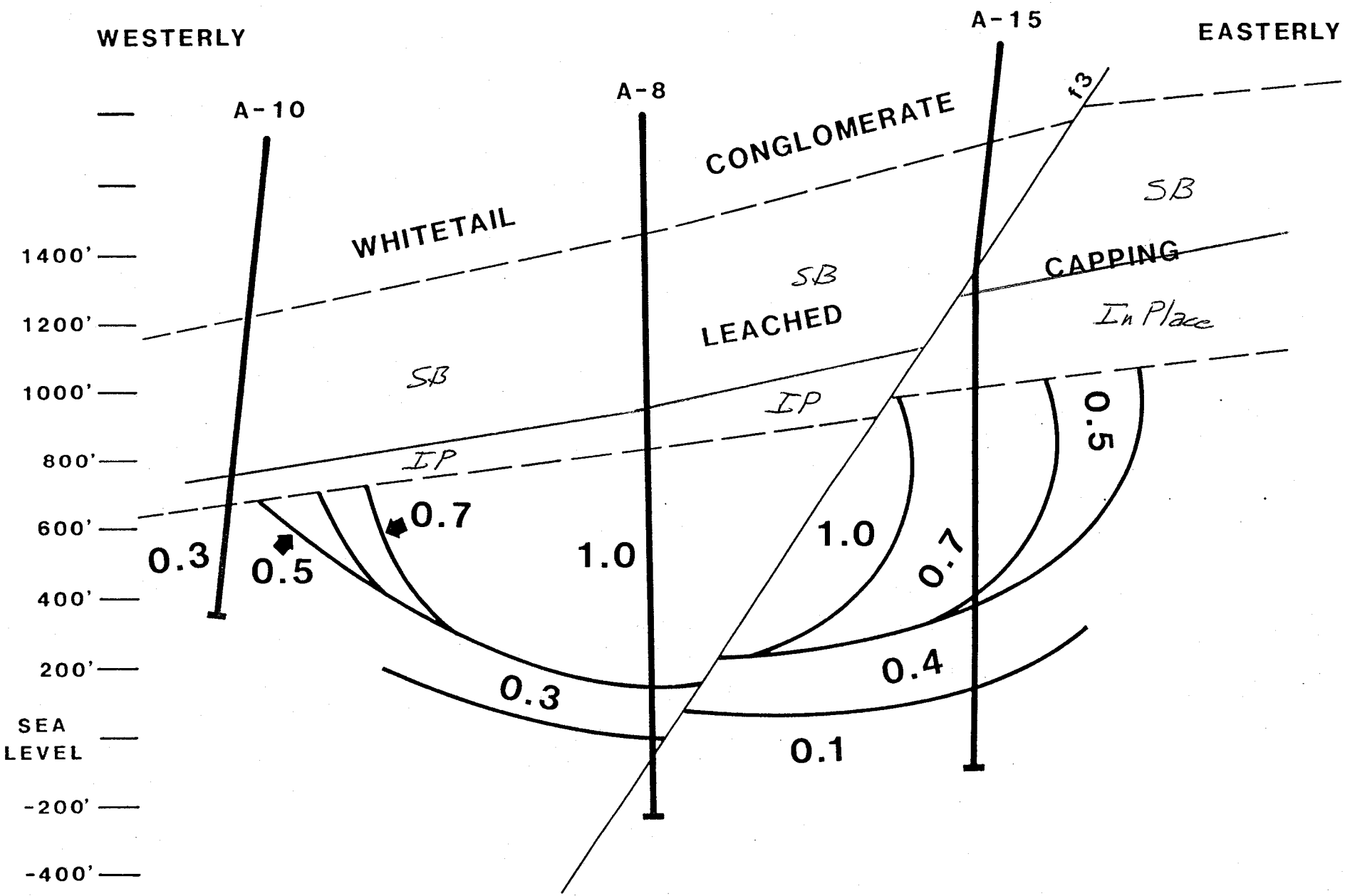
Figure 5-4




SUPERIOR EAST PROJECT
SECTION B-B'

1" = 400'

Figure 5-5




**SUPERIOR EAST PROJECT**
**SECTION C-C'**

1" = 400'

Figure 5-6

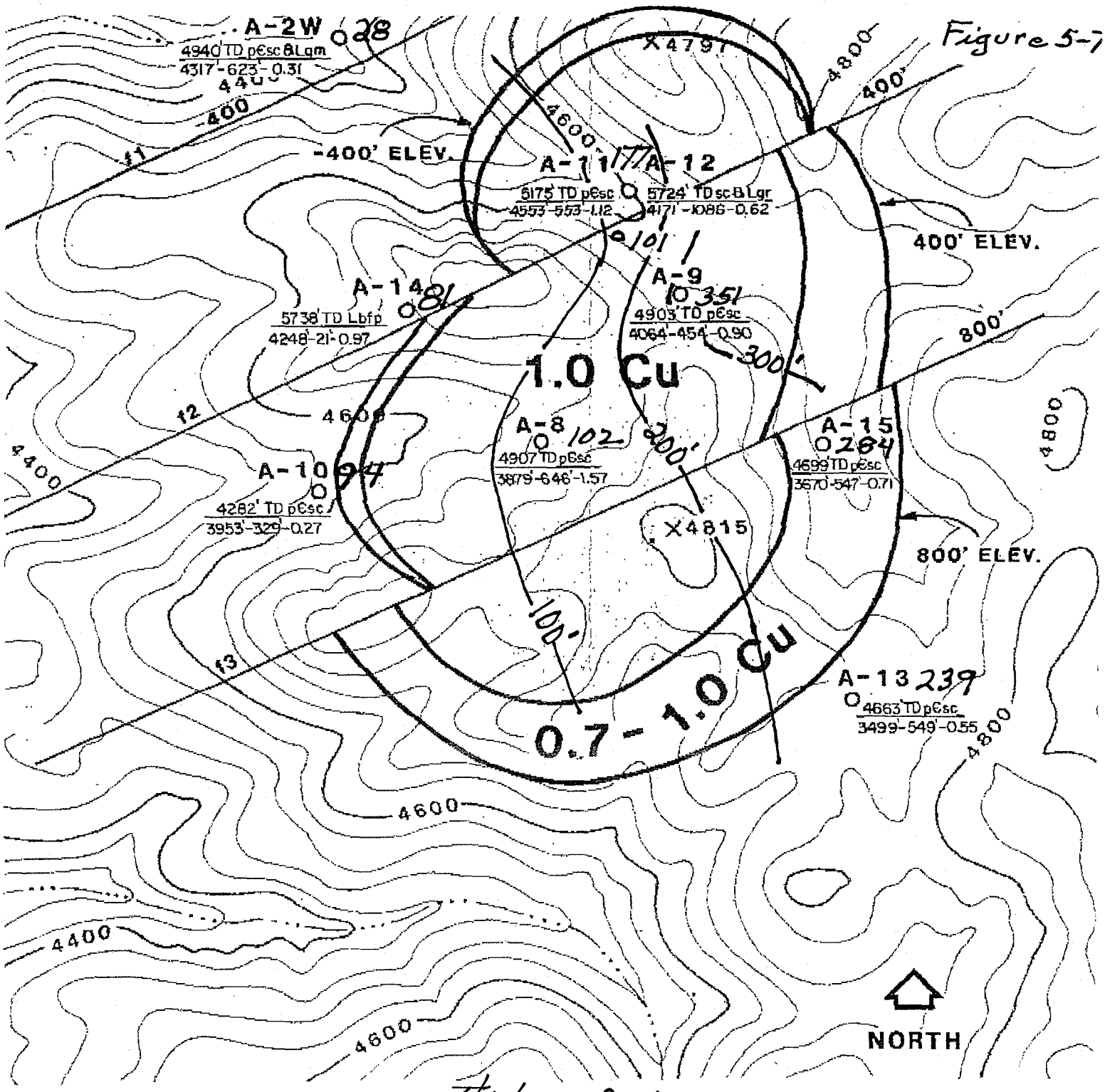
Table V-1. Footage of Leached Capping in Drill Holes.

| Drill Hole No. | Slide Block Footage | In-Place Leached Footage |
|---|---|---|
| A-240 | 369 | 28 |
| A-8 | 551 | 102 |
| A-9 | 418 | 351 |
| A-10 | 484 | 94 |
| A-11 | 593 | 177 |
| A-12 | 570 | 101 |
| A-13 | 189 | 239 |
| A-14 | 174 | 81 |
| A-15 | 433 | 284 |
| A-16 | 627 | 225 |
| AI-2 | 178 | 124 |
| AI-1 | 588 | 0 |
| DCA-3A | 216 | 0 |

Figure V-7 contours the in-place leached footage and indicates a thinning to the west. This indicates that the overriding oxide slide block was truncating the oxidized zone to the west, as it moved toward the basin.

Petrographic studies indicated only a very minor amount of secondary chalcocite was deposited in the upper footage of the sulfide zone. The bulk is found a primary chalcocite with bornite, as found in the

Figure 5-7




Thickness, feet of In-Place Leached Capping

A-8 ASARCO hole & designation

4907' TD pЄcs — *total depth rock type*

3879'-646'-1.57 — depth-length-%copper

**PRE-MINERAL ROCK TYPE**

| | |
|---|---|
| *Lbfp* | *Laramide biotite feldspar porphyry* |
| Lqm | Quartz monzonite |
| Lgr | Granite |
| pЄsc | Schist |

T. 1 S., R. 13 E.

# MODELED MINERAL ZONE OUTLINE

## SUPERIOR EAST PROJECT
## PINAL COUNTY, ARIZONA

1" = 500'

JDS DEC 1985

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veins at Magma and Butte, Montana.

Mineral percentages was noted in some of the core logging. Much of the bornite-chalcocite is found along quartz veins and in stringy quartz-sericite veins and shears.

Table 2 lists the mineral percentage for Holes A-8 and A-11, and includes the variation and style of mineralization.

Table V-2. Mineral Percentages

| Hole No | Footage | Percent Chalcocite | Bornite | Chalcopyrite | Pyrite | Qtz Vns |
|---|---|---|---|---|---|---|
| A-8 | 3886-3957 | 0.1-1.0 | — | — | 0.1-0.2 | 5-10 |
| | 3957-4348 | 0.1-0.2 | 0.1-5.0 | — | 0.1-3.0 | 1-5 |
| | 4348-4578 | tr-0.2 | 0.2-5.0 | trace | trace | 1-3 |
| | 4578-4731 | trace | tr-0.2 | — | tr-1.0 | 2-5 |
| | 4731-4907 T.D. | — | trace | trace | tr-0.5 | tr-1 |
| A-11 | 4264-4299 | tr | 0.5-3.0 | tr-1.0 | 1-4 | — |
| | 4299-4498 | tr | 0.5-1.0 | — | 1-2 | — |
| | 4498-5086 | — | 0.2-1.5 | — | tr-1 | 0.5-1 |
| | 5086-5175 T.D. | — | tr | — | trace | trace |

Remnant chalcocite (secondary) is found in the slide block units, however, the bulk of the copper was removed and transported elsewhere, such as to the native copper beds.

The model when presented contained a geologic resource of 204 million tons of 0.90% copper, with a 0.5% copper cutoff.

However, the drill hole A-16, having only 460 feet of 0.30% copper in the upper part of the sulfide zone, effectively cut-out 20% to 30% of the tonnage and grade, dropping the geologic resource to 160 million tons of 0.90% copper.

Hole A-16 also had a thinner interval of Whitetail Conglomerate, an unaltered slide block compared to the adjacent holes A-8 and A-13 which had altered slide block. The hole also had a much thicker zone between the named basal fault and the oxide-sulfide contact. The oxide-sulfide contact is at +919 feet, and in Figure V-4, this elevation would place it several hundred feet lower into the projected sulfide zone.

It is unresolved at this time to project fault structures which might account for the apparent graben zone in the A-16 area.

A strong sub-horizontal shear was noted along the oxide-sulfide contact, and at the time, it was not deemed necessary to call this structure the basal fault. There a number of unresolved problems remain with the interpretation of drill hole A-16.

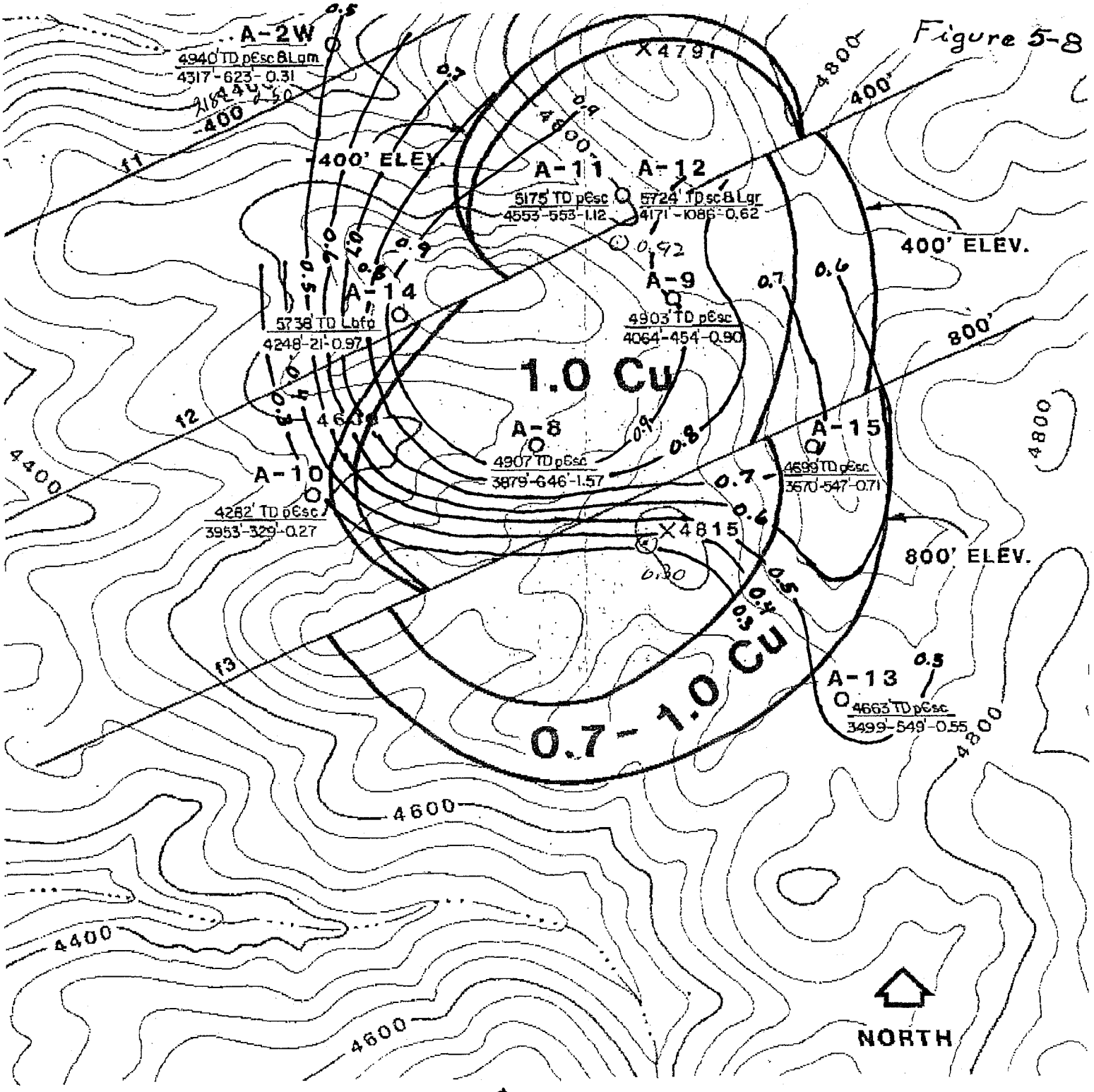
Figure V-8 contours the grade found in the drill holes. The two holes A-8 with 646 feet of 1.57% copper, and hole A-11 with 553 feet of 1.12% copper dominate the pattern. However, it does indicate a northeast trend through holes A-8, A-9, A-12 and A-11.

A breakdown of the various assay grades within the drill holes is listed in Table V-3. The table lists the drill hole number, their intervals of percent copper, and the rock unit of the interval.

All units are sheared, brecciated, and injected by quartz veins; all with varable quartz-sericite alteration patterns. The best mineralization follows the veins, shears, and brecciation.

Graphic Log and Assay Results for the drill holes in the porphyry copper target are placed in the Addendum following the Published Reference Section.

The graphic log indicates the various rock units and their added descriptions, while the assay results are generalized into bulk zones.




—0.7— Copper Grade Contour

T. 1 S., R. 13 E.

A-8 ASARCO hole & designation
4907' TD pЄcs total depth rock type
3879'-646'-1.57 depth-length-%copper

PRE-MINERAL ROCK TYPE

- Lbfp Laramide biotite feldspar porphyry
- Lqm Quartz monzonite
- Lgr Granite
- pЄsc Schist

# MODELED MINERAL ZONE OUTLINE

## SUPERIOR EAST PROJECT
## PINAL COUNTY, ARIZONA
## 1" = 500'

JDS DEC 1985

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Table V-3. Drill hole, top of intercept, footage, grade & rock type

| Hole No | Top of Intercept | Footage | Percent Copper in +1.0 | +0.9 | +0.8 | +0.7 | +0.6 |
|---|---|---|---|---|---|---|---|
| A-2 | 4295 | 218 | | | | | |
| A-2W | 4317 | 296 | | | | | |
| | 4830 | 110 | | | | | |
| A-4 | 6571 | 10 | | | | | |
| A-8 | 3879 | 26 | | | | | |
| | 3905 | 17 | | | | | |
| | 3922 | 57 | 1.31 | | | | |
| | 3979 | 156 | | | | | |
| | 4135 | 55 | 1.32 | | | | |
| | 4190 | 36 | | | | 0.72 | |
| | 4226 | 42 | 9.92 | | | | |
| | 4268 | 70 | | | | | |
| | 4338 | 187 | 1.65 | | | | |
| | 4403 | 12 | 1.18 | | | | |
| | 4415 | 45 | | | | | |
| A-9 | 4044 | 20 | | | | | |
| | 4064 | 75 | 1.23 | | | | |
| | 4139 | 37 | | | | | |
| | 4176 | 92 | | | | | 0.62 |
| | 4268 | 177 | | | | 0.70 | |
| | 4445 | 73 | 1.69 | | | | |
| | 4518 | 90 | | | | | |

| Interval +0.5 | Interval +0.4 | Interval +0.3 | Interval +0.2 | Interval Rock Unit |
|---|---|---|---|---|
| 1.50 T.D | | | | Penal Schist w/ dikes gm p. A-2 |
| | | 0.35 | | Penal Schist w/ dikes of porphyry |
| | 0.42 T.D. | | | " " " " " " |
| | | 0.38 | | Penal Schist entended by porphyry |
| 1.55 | | | | Penal Schist w/ dikes of porphyry |
| | | | 0.23 | Penal Schist |
| | | | | Penal Schist |
| | 0.49 | | | Penal Schist to 40'8"; Laramide b. feld. porphyry below. |
| | | | | Laramide biotite feldspar porphyry. |
| | | | | Penal Schist |
| | | | | Penal Schist |
| | | | 0.25 | Penal Schist. |
| | | | | Penal Schist |
| | | | | Penal Schist |
| | | 0.32 | | Laramide biotite feldspar porphyry |
| | 0.46 | | | Penal Schist |
| | | | | Penal Schist cut by qtz mony. dike |
| | | 0.37 | | Penal Schist cut by porphyry dike |
| | | | | Penal Schist cut by porphyry dike |
| | | | | biotite feldspar porphyry. |
| | | | | Penal Schist cut by bio. feld. porphyry |
| | | 0.35 | | Penal Schist with minor bio feld. porp. |

| Hole No. | Top of Intercept | Footage | Percent copper in +1.0 | +0.9 | +0.8 | +0.7 | +0.6 |
|---|---|---|---|---|---|---|---|
| Continued | | | | | | | |
| A-9 | 4408 | 7 | 5.43 | | | | |
| | 4415 | 55 | | | | | |
| | 4470 | 197 | | | | | |
| A-10 | 3953 | 18 | | | | | |
| | 3971 | 263 | | | | | |
| | 4234 | 15 | | | 0.82 | | |
| A-11 | 4262 | 62 | | | | | |
| | 4324 | 174 | | | | | |
| | 4498 | 55 | | | | | |
| | 4553 | 84 | | | 0.85 | | |
| | 4637 | 181 | 2.39 | | | | |
| | 4818 | 72 | | | | | |
| | 4890 | 53 | 1.35 | | | | |
| | 4943 | 55 | | | | | |
| | 4998 | 19.5 | 4.63 | | | | |
| | 5017.5 | 134.5 | | | | | |
| A-12 | 4171 | 317 | | | | | 0.64 |
| | 4488 | 66 | 1.61 | | | | |
| | 4554 | 108.5 | | | | | |
| | 4662.5 | 85.5 | 1.03 | | | | |
| | 4748 | 63 | | | | | |
| | 4811 | 40 | | | | 0.79 | |
| | 4851 | 108 | | | | | |

Table V-3 2of4R

| Interval | | | | Interval Rock Unit |
|---|---|---|---|---|
| +0.5 | +0.4 | +0.3 | +0.2 | |
| | | | | Penal Schist A-9 |
| | | 0.37 | | Penal Schist |
| | | | 0.24 | Penal Schist cut by biotite porp. dikes |
| 53 | | | | Penal Schist cut by porphyry |
| | | 0.33 | | Penal Schist cut by blk porp + bio feld porp |
| | | | | Penal Schist cut by bio-feld porp. |
| | | 0.39 | | Penal Schist |
| | 0.44 | | | biotite feld. porphyry w/ schist bands |
| | | | 0.29 | Penal Schist |
| | | | | Penal Schist |
| | | | | Penal Schist cut by bio. feld-porp. |
| | 0.45 | | | Penal Schist cut by bio-feld-porp. |
| | | | | biotite feldspar porphyry. |
| | | | 0.33 | Penal Schist cut by bio feld-porp. |
| | | | | Penal Schist |
| | 0.45 | | | Penal Schist cut by bio-feld. porp. |
| | | | | Penal Schist cut by bio. feld-porp. |
| | | | | Penal Schist |
| | 0.41 | | | Penal Schist cut by bio-feld. porp. |
| | | | | Penal Schist |
| | | 0.31 | | Penal Schist |
| | | | | Penal Schist cut by porphyry. |
| | | 0.34 | | Penal Schist |

Table V-3 3d4R

| Interval +0.5 | +0.4 | +0.3 | +0.2 | Interval Rock Unit |
|---|---|---|---|---|
| | | | | Penal Schist and porphyry. A-12 |
| | | | 0.20 | Penal Schist |
| 0.54 | | | | Penal Schist cut by porphyry & aplite |
| | | 0.32 | | Penal Schist |
| | | 0.32 | | Penal Schist 3499-3549; Monzonite 3549-3637. |
| | | | | Monzonite |
| | | | 0.29 | Monzonite |
| | | | | Monzonite |
| | | 0.34 | | Monzonite |
| 0.53 | | | | Penal Schist cut by Laramide granite |
| | | | 0.28 | Penal Schist cut by qtz feldspar porp. |
| | | | | Porphyry, qtz feldspar. |
| | | | | Penal Schist |
| | | | | Penal Schist |
| | 0.46 | | | Penal Schist w/ minor blk porphyry. |
| | | | 0.27 | Penal Schist w/ minor porphyry. |
| | | | | Penal Schist w/ minor porphyry. |
| | | 0.33 | | Penal Schist and qtz feld. porp. |
| | | 0.36 | | Penal Schist |
| | | | 0.24 | Penal Schist |
| | 0.44 | | | qtz feld. porphyry |
| | | 0.39 | | qtz feld. porphyry. |

| Hole No | Top of Intercept | Footage | Percent Copper in Interval +1.0 | +0.9 | +0.8 | +0.7 | +0.6 | +0.5 | +0.4 | +0.3 | +0.2 | Interval Rock Unit | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Continued | | | | | | | | | | | | | |
| A-14 | 4850 | 40 | | | | | | | | | 0.28 | qtz feld. porphyry | A-16 |
| | 5057 | 21 | | | | | | | | | 0.21 | qtz feldspar porphyry | |
| AI-2 | 2850 | 70 | | | | | | | | | 0.22 | Pencil Schist | |
| | 2920 | 110 | | | | | | | | 0.30 | | Pencil Schist | |
| | 3030 | 130 | | | | | | | 0.47 | | | Pencil Schist | |
| AI-1 | 3441 | 26 | | | | | | | | | 0.21 | Pencil Schist | |
| | 3443 | 24 | | | | | | | | | 0.20 | Pencil Schist cut by aplite & qtz mus. porphy. | |
| | 3812 | 9 | | | | | | | | | 0.21 | Pencil Schist | |
| DCA-3. | 4454 | 212 | | | | | | | | | 0.33 (in slide block) | Cataclastic altered qm & granite | |

# VI Description of the Whitetail Conglomerate Target

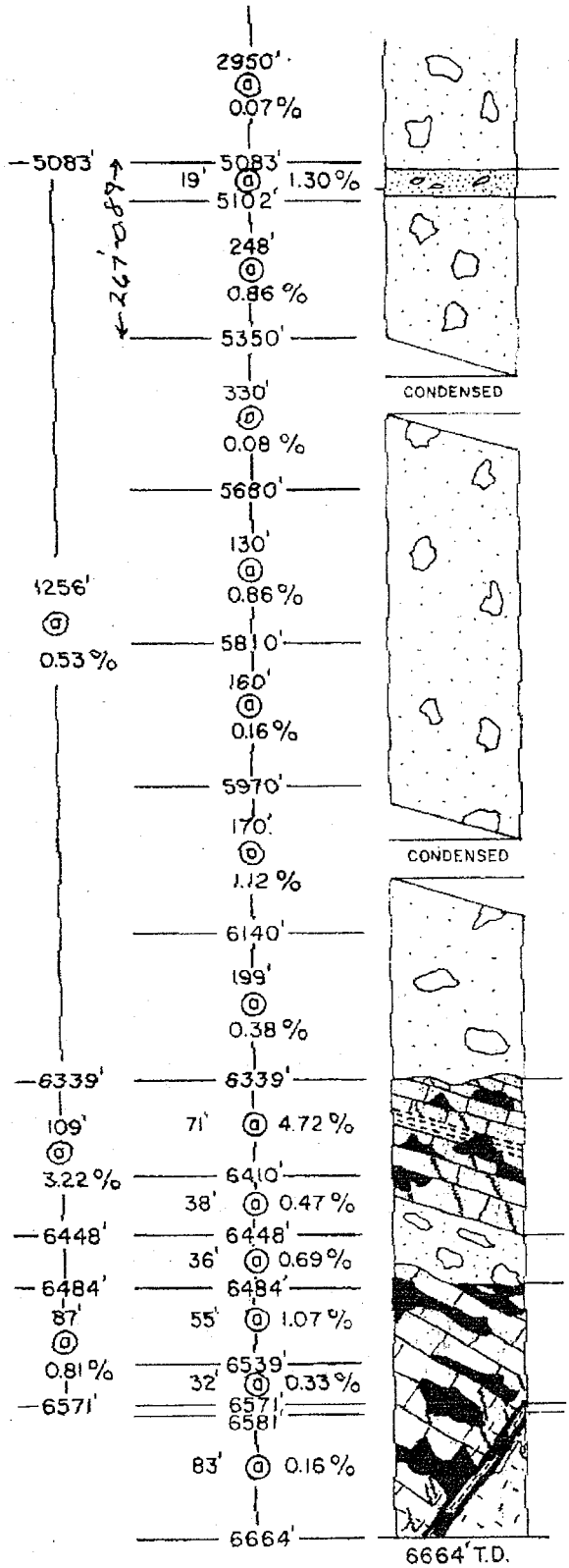
The Whitetail Conglomerate target is located mainly west of the Devils Canyon fault. The Devils Canyon fault has down dropped the west basin in excess of 7,000 feet based on stratigraphic restoration.

After the initiation of the western basin by down dropping along the Devils Canyon fault, the Paleozoic cover rocks east of the fault were eroded and transported into the western basin. As erosion continued, the porphyry system and its mineralization was exposed and also eroded into the basin. The leached copper values were precipitated in the apparent closed basin as native copper surrounding various clasts of the prominent units and in the mud matrix of the conglomerate.

Figure VI-1 is a short version of the Graphic Log and Assay Results showing the mineralization found in the lower part of drill hole A-4.

The top of the native copper intercept was at 5083 feet where a lithic tuff marker bed is evident. In hole A-4, intervals of notable native copper was intercepted: 267 feet of 0.89%, 130 feet of 0.86%, 170 feet of 1.12%, and 199 feet of 0.38% copper, ending at 6339 foot depth, in the Tertiary Whitetail Conglomerate units.

Figure 6-1




Whitetail Conglomerate

5083
5102 *Lithic tuff marker*

Whitetail Conglomerate

Typically mixed clast (schist, diabase, sediments, and porphyry) conglomerate (60%) interbedded with nearly homogeneous schist conglomerate (40%).

The mixed conglomerate is poorly sorted, relatively unpacked, with subrounded clasts set in fine to medium-grained matrix of brownish-red color. Clast/matrix ratio 60/40. Clast composition: schist 20-45%; diabase 30-50%; sediments 15-20%; porphyry 10%.

The schist conglomerate is well sorted, well packed, with clasts tabular in upper portions but becoming subrounded in lower section. Clasts set in fine-grained matrix of general dark red-brown color. Clast/matrix ratio 80/20. Clast composition: schist 90%; diabase 10%; rare sediments; porphyry up to 5%.

Copper occurs throughout as sheets along clast boundaries and as specks and sheets in clast and matrix; best in mixed conglomerate. Matrix contains gray greenish clay in lower portions in both mixed and schist conglomerate.

6339

Allochthon Limestone Block. Brecciated; moved from west; replacement zone totally oxidized; secondary oxidized copper along breccia openings

6448

Whitetail Conglomerate. Mixed conglomerate.

6484

Autochthon Limestone Block. Massive replacement textures with hematite, specularite, silica, and sulfides (now oxidized).

6571-6581 Fault Zone (1.44% Cu).

Tertiary quartz monzonite with Precambrian schist inclusions; both weakly altered and weakly mineralized.

TO ACCOMPANY *Report*
DATED *Aug. 31, 1972*
BY *J. D. Sell*

Graphic Log and Assay Groups
of Mineralized Units
in Drill Hole A-4

SCALE: 1" = 150'

J.D.Sell August 22, 1972

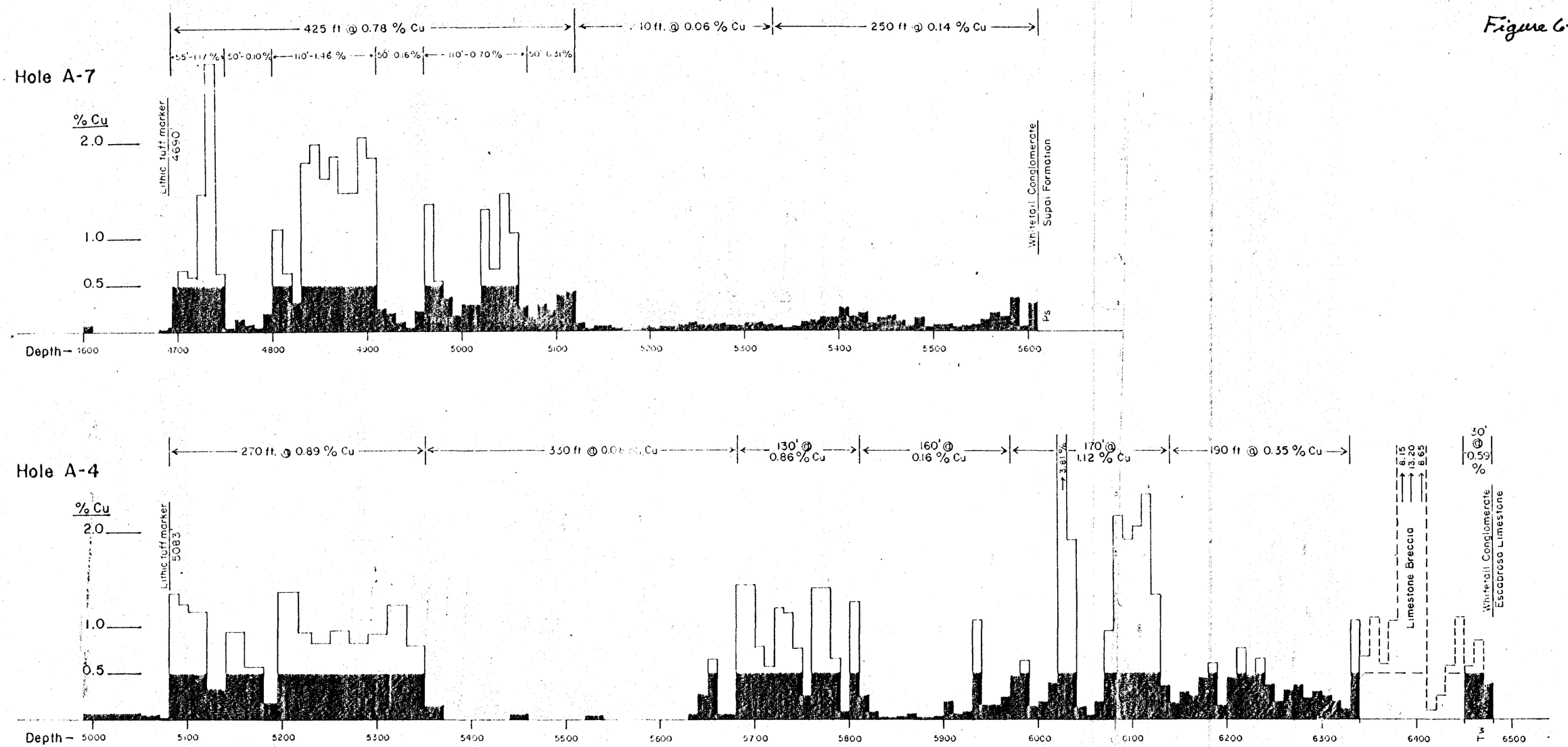
North of hole A-4, a strip of BHP Ltd controlled claims, 3300 feet wide, separate the two ASARCO controlled claim blocks. Drill hole A-7 was placed near the north side of the BHP Ltd block boundary. At the depth of 4690 feet the lithic tuff marker bed was intercepted and native copper intervals of 55 feet of 1.17%, 110 feet of 1.46%, 110 feet of 0.70%, and 50 feet of 0.31% copper was found, ending at the depth of 5115 feet.

Figure VI-2 compares the individual assays of the copper values between drill holes A-4 and A-7, with the base line of 0.5% copper values blocked off in black.

In order to calculate a geologic reserve it was assumed that a basic inclined syncline was developed with an east-west axis, and terminating against the continuing downdrop along the north-south Devils Canyon fault. Thus the central, and the area adjacent to the Devils Canyon fault was downdropped more rapidly than the far western part of the basin. Contouring in Figures VI-3 and VI-4 show a half-moon shaped basin thinning to the west along individual beds of conglomerate.

The mode and type of the copper occurrence and its apparent lateral distribution, and its

Figure 6-2.




*Comparison Of Individual Assays*

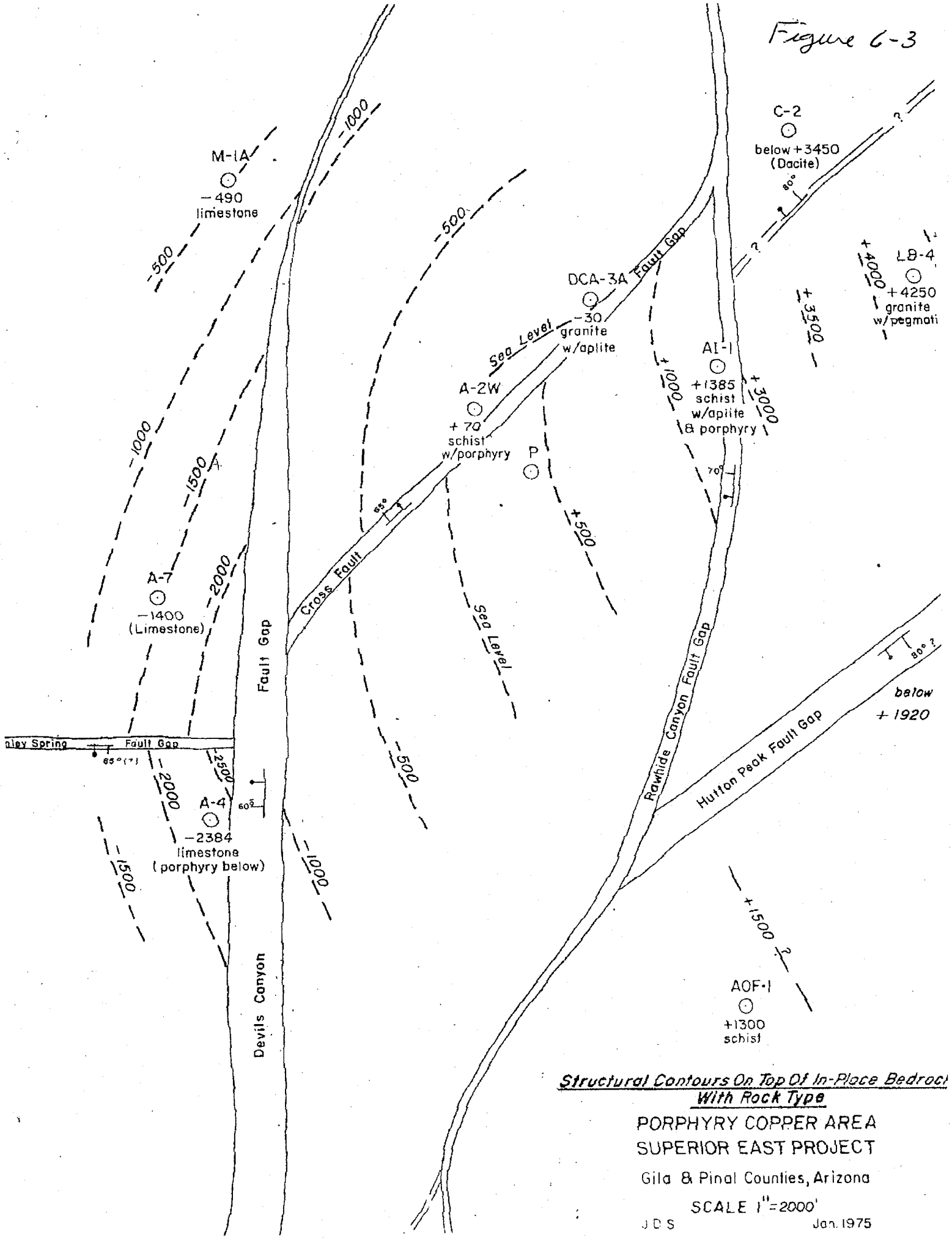
HOLES A-4 & A-7
IN WHITETAIL CONGLOMERATE
SUPERIOR EAST PROJECT

Gila & Pinal Counties, Arizona

J.D.S. Jan. 1975

MVK 2824

Figure 6-3




**Structural Contours On Top Of In-Place Bedrock With Rock Type**

PORPHYRY COPPER AREA
SUPERIOR EAST PROJECT
Gila & Pinal Counties, Arizona
SCALE 1"=2000'
J D S Jan. 1975

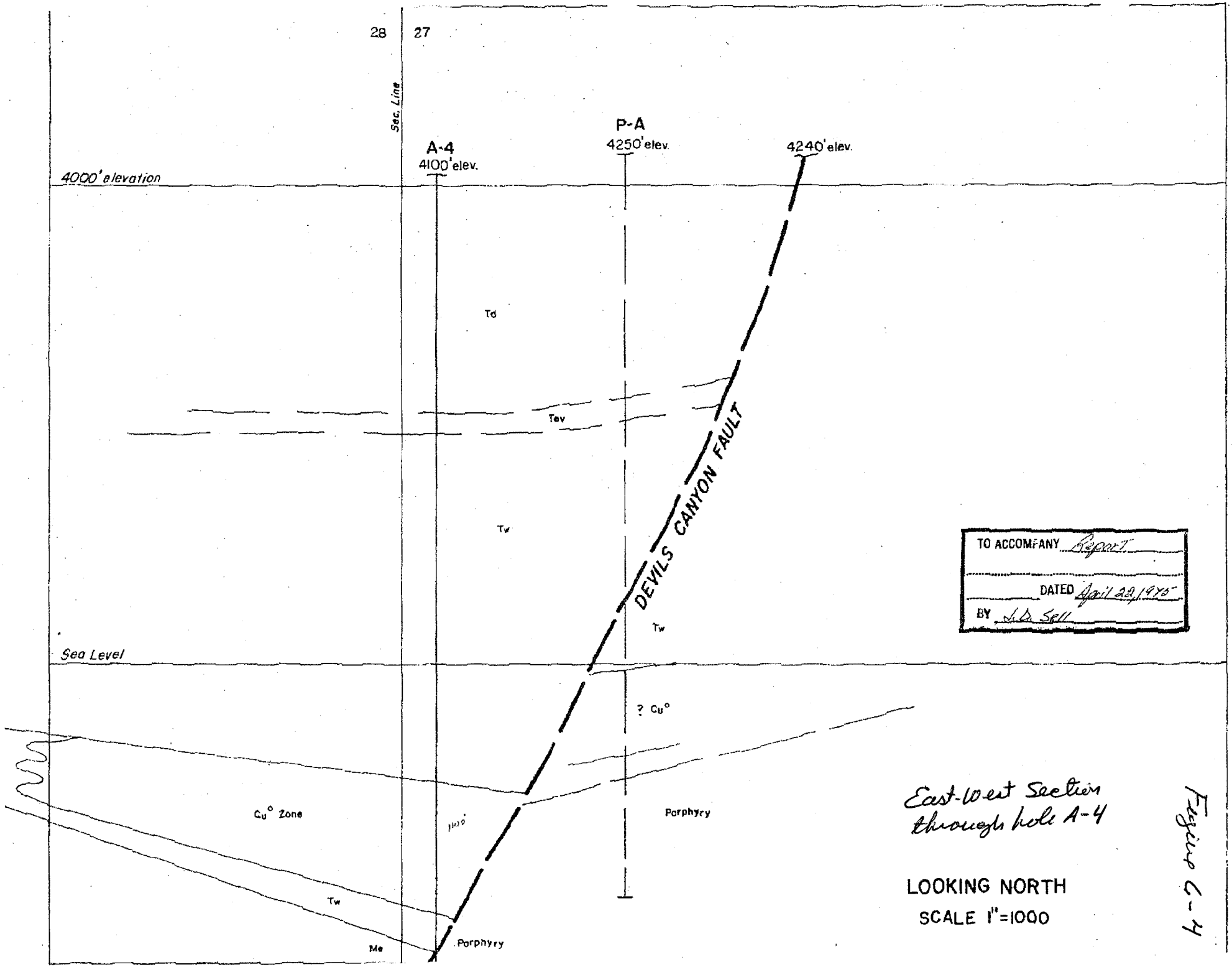

28
27
Sec. Line
A-4
4100' elev.
P-A
4250' elev.
4240' elev.
4000' elevation
Td
Tev
Tw
DEVILS CANYON FAULT
Tw
Sea Level
? Cu°
Cu° Zone
Porphyry
Tw
Me
Porphyry
TO ACCOMPANY Report
DATED April 22, 1975
BY J. D. Sell
East-West Section through hole A-4
LOOKING NORTH
SCALE 1"=1000

Figure 6-4

control by sedimentary parameters, would imply a large geologic resource within the basin. Using a minimum thickness of 250 feet of native copper interval, as the horizon thins by wedging out of individual units, an inferred resource block could be modeled.

It is suggested that the basin contained 430 million tons of copper-bearing conglomerate, with a grade of 0.8% copper. Only 137 million tons of this resource might be under the ASARCO held mining claims.

Using wider parameters and possible extensions on the east side of the Devils Canyon fault, it would be inferred that three times this tonnage at the same grade, might be available in the basin.

Of course, using only the two holes, the resource projections are implied only.

The other two-thirds of the tonnage-grade is under the lands held by BHP Ltd (formerly Magma Copper Co.) and the Oak Flat Recreation area (US Forest Service withdrawal).

ASARCO did not drill any further holes in the conglomerate basin target other than hole A-3 located 8,500 feet south of hole A-4 on a State Lease section. This 6008 foot hole did not penetrate the lithic tuff marker bed near the base of the conglomerate. Based on available

data it is believed that the hole was terminated 500 feet above the base of the conglomerate as known to hole A-4. Although no copper of note was found in the cored interval, and it is unknown if substantial values are in the lower portion of the Whitetail. Completion of hole A-3 to a prominent bedrock would have added the parameters to suggest the relative size of the copper-bearing half-moon wedge.

Non-the-less, the two holes of A-4 and A-7 suggest a large resource.

## VII. DESCRIPTION OF MINERALOGY

### 1. SULFIDE ZONE

Within the sulfide zone, the main copper minerals are primary chalcocite and bornite, with or without pyrite and quartz, as veins and disseminations.

Chalcopyrite is minor and apprears in the middle and lower portion of the mineral intercept and generally presists at depth.

Pyrite, with minor chalcopyrite, also increases with depth and in the outer holes.

Table 7-1. Depth Variation of Mineral Components within the drill holes, indicates the general distribution of chalcocite (cc), bornite (bn), chalcopyrite (cp), pyrite (py ), and hematite-specularite (hem). The notation of pyrite and hematite generally suggests the hole completely penetrated the copper-bearing mineral zonation at depth.

TABLE 7-1. Depth Variation of Mineral Components, with quartz and pyrite generally associated.

| Hole No. | Upper Zone | Middle Zone | Lower Zone |
|---|---|---|---|
| A-8 | cc | cc-bn | cp, tr hem |
| A-9 | cc-bn | bn-cc-cp | cp |
| A-10 | cc | cc-bn | hem-bn-cc |
| A-11 | cc-bn | bn-cp | cp-tr bn-hem |
| A-12-12A | cc-bn | bn-cc-cp | cp-hem |
| A-13 | cc | cc-cp | py |
| A-14 | cc | cc-cp | py-hem |
| A-15 | cc | cc-bn | cp |
| A-16 | cc-bn | bn-cc-cp | cp |
| | | | |
| A-2 | cc | | py-hem |
| A-4 | -- | -- | cp-tr hem-moly |
| DCA-3A | tr cp | -- | tr moly |
| AI-1 | cp | cp | cp |
| AI-2 | cp-tr cc | cp | cp-hem |

In Table 7-1, the abundance of cc and cc-bn generally indicates intervals of plus 1% copper, while cc-bn-cp intervals are below 1%, and cp indicates intervals below 0.5% copper.

This general trend can be noted in the drill hole assay intervals of the holes located in the Addendum portion of the report.

Figures 7-1 through 7-4 are photographs of the relationship of py-cp-bn-cc-digenite from higher grade samples. Other photographs show bornite-chalcocite textures similar to that found deep at the Magma Mine, west of the Superior East deposit, as shown in Figure 7-5 (Plate XXI).

## 2. NATIVE COPPER ZONE

Native copper was found in a few holes in the oxidized upper portions, either in the slide blocks or the oxidized tops above the sulfide in the in-place blocks.

The abundant native copper is the primary mineralization in the Whitetail Conglomerate basin to the west of the in-place sulfide body.

In a report of the electron microprobe analysis of the native copper, it was found that the average copper concentration of the samples tested was 99% copper and no sulfur was noted.

At the very top of the main native copper zone is a short interval of cuprite. Study of this mineral and the native copper suggested both were emplaced as their respective mineral. No sulfides are present or involved in the cuprite-native copper distribtion in the Whitetail Conglomerate.

Addendum 7.1 is a File Memorandum covering testing of the Native Copper ore. The conclusions were that with removal of metallics from the flotation tailing by screening increased recovery to 90% in combined rougher flotation concentrate and screen oversize. Also when using an acid-ferric sulfate leach, the recovery was 92 % of the copper.

Addendum 7-1

April 30, 1975

File Memorandum: Misc. 2F

Subject: Further Testing of Native Copper Ore (Proj. 2036)

Two flotation tests were run on this ore to check previous flotation tests by Hazen Research. Data sheets for these tests (Test Nos. NC-3 and NC-4) are attached.

The ore was ground to 55% passing 200-mesh and floated for 15 minutes. Test NC-3 used Aeropromoter 208 collector and a combination of pine oil, DF 250, and cresylic acid frothers. Test NC-4 used AP 208 and the same frothers with addition of sodium hydrosulfide and Z-6 to attempt to get a stronger float condition for the coarse metallic copper.

Both tests yielded about 50% recovery of the copper in rougher concentrates assaying 6.7-7.0% Cu.

As in previous flotation tests the low copper recovery was due to failure to float the coarse (+65 mesh) metallic copper even with long flotation times and large collector dosages. In both tests only about 25% of the copper in the +65 mesh size floated.

The rougher tailings and concentrates were screened and the fractions assayed separately. Table 1 in the attached supporting data gives total copper assays of the screen fractions and distributions of copper in the products.

The +48 and +65 mesh fractions of the rougher tailings were added into the rougher concentrates by calculation for Tests 3 and 4 respectively. These results are summarized in Table 2. Addition of the coarse metallic copper in these fractions to the rougher concentrate yields copper recoveries of 88-92% in combined concentrates assaying 7.0-9.5% Cu.

Further test work on this ore should investigate the feasibility of coarse grinding followed by separation of metallics either by screening through 48 mesh or tabling. The screen undersize or table tailings would then be ground finer and floated. Cleaner flotation concentrate combined with +48 mesh metallics would be the final copper concentrate.

Two leach tests were run on minus 10-mesh ore to determine the amenability of the native copper to leaching by ammoniacal ammonium carbonate and $H_2SO_4$ - ferric sulfate solutions.

Test NC-1 used a 20 gpl. ammonium carbonate - 50 gpl. $NH_3$ solution. Test NC-2 used 50 gpl. sulfuric acid and 15 gpl. ferric iron (added as ferric sulfate).

Both leaches were agitated on bottle rolls at 33% solids for approximately four days. The leach pulps were filtered and washed on the filter with 5%

ammonia or acid solution and fresh water.

Leach residues and combined leach and wash solutions were assayed for copper, and the heads calculated. Recoveries were figured on calculated heads.

The ammonia leach gave only 53% recovery. An assay size analysis of the leach tailings (see supporting data) showed 39% of the copper in the tails was present in the minus 200-mesh fraction (23 weight percent) indicating possible adsorption of some of the dissolved copper by slimes. However, the coarser sizes, 65 thru 200 mesh, also contained 0.35-0.38% Cu, which showed generally poor leach recoveries at all sizes.

The acid-ferric sulfate leach resulted in 92.3% copper recovery. Washing of the leach residue was minimal because the slimy nature of the residue made filtration very slow. Titration of the acid solution at the end of the leach showed an acid consumption of 37 lbs. $H_2SO_4$ per ton of ore.

Conclusions:

1. Flotation without removal of coarse metallics from the tails gave copper recovery of about 50%.

2. Removal of metallics from flotation tailing by screening increased recovery to 90% in combined rougher flotation concentrate and screen oversize.

3. Ammoniacal leaching (4 days at 10-mesh) yielded 53% recovery.

   Acid-ferric sulfate leaching under the same conditions gave 92% copper recovery.

Recommendations:

1. Further investigation should be done of flotation with separation of metallics between stages of grinding.

2. Leaching with lower concentrations of sulfuric acid with ferric sulfate might be feasible and should be tried.

*TABLE 1*

Assay Size Analyses of Rougher Flotation Concentrates and Tails

Test NC-3

Rougher Tails

| Size | Wt. % | Assay % Cu | Distribution % |
|---|---|---|---|
| + 35 | 1.2 | 29.5 | 65.9 |
| + 48 | 1.0 | 5.55 | 10.4 |
| + 65 | 4.0 | .49 | 3.7 |
| +100 | 10.7 | .19 | 3.7 |
| +150 | 14.4 | .11 | 3.0 |
| +200 | 14.1 | .11 | 3.0 |
| -200 | 54.6 | .10 | 10.3 |
| | 100.0 | .537 | 100.0 |

Rougher Concentrate

| Size | Wt. % | Assay % Cu | Distribution % |
|---|---|---|---|
| + 65 | 3.1 | 63.6 | 29.3 |
| +100 | 1.8 | 36.4 | 9.7 |
| -100 | 95.1 | 4.32 | 61.0 |
| | 100.0 | 6.74 | 100.0 |

Test NC-4

Rougher Tails

| Size | Wt. % | Assay % Cu | Distribution % |
|---|---|---|---|
| + 65 | 5.5 | 7.45 | 82.8 |
| - 65 | 94.5 | .09 | 17.2 |
| | 100.0 | .495 | 100.0 |

Rougher Concentrate

| Size | Wt. % | Assay % Cu | Distribution % |
|---|---|---|---|
| + 65 | 3.2 | 55.2 | 25.1 |
| - 65 | 96.8 | 5.44 | 74.9 |
| | 100.0 | 7.03 | 100.0 |

TABLE 2

Recoveries With and Without Adding Metallics from Tails

Test NC-3

| Treatment | Product | Wt. % | Assay % Cu | Copper Recovery |
|---|---|---|---|---|
| Flotation Only | R. Conc. | 6.96 | 6.74 | 48.4 |
| | Tails | 93.04 | .54 | 51.6 |
| | | 100.00 | .969 | 100.0 |
| Flotation + Screening Tails | R. Conc. | 6.96 | 6.74 | 48.4 |
| | +48 Tails | 2.04 | 18.72 | 39.4 |
| | Combined | 9.00 | 9.46 | 87.8 |
| | -48 Tails | 91.00 | .130 | 12.2 |
| | | | | 100.0 |

Test NC-4

| Treatment | Product | Wt. % | Assay % Cu | Copper Recovery |
|---|---|---|---|---|
| Flotation Only | R. Conc. | 6.80 | 7.03 | 50.9 |
| | Tails | 93.20 | .495 | 49.1 |
| | | 100.00 | .939 | 100.0 |
| Flotation + Screening Tails | R. Conc. | 6.80 | 7.03 | 50.9 |
| | +65 Tails | 5.13 | 7.45 | 40.7 |
| | Combined | 11.93 | 7.21 | 91.6 |
| | -65 Tails | 88.07 | .09 | 8.4 |
| | | 100.00 | .939 | 100.0 |

TABLE 3

Assay Size Analyses of Leach Tailings

Test NC-1 (Ammoniacal Ammonium Carbonate Leach)

| Size | Wt. % | Assay % Cu | Distribution % |
|---|---|---|---|
| + 65 | 67.3 | .35 | 52.3 |
| +100 | 4.1 | .38 | 3.5 |
| +150 | 3.4 | .37 | 2.9 |
| +200 | 2.5 | .36 | 2.0 |
| -200 | 22.7 | .79 | 39.3 |
| | | .45 | 100.0 |

Test NC-2 ($H_2SO_4$- Ferric Sulfate Leach)

| Size | Wt. % | Assay % Cu | Distribution % |
|---|---|---|---|
| + 65 | 51.9 | .055 | 37.2 |
| -65 | 48.1 | .100 | 62.8 |
| | 100.0 | .077 | 100.0 |

## VIII POTENTIAL FOR FUTURE DEVELOPMENT

The potential for future development includes a number of factors. These include: 1) confirmation of the mineral resource, 2) expansion of the mineral resource, 3) potential mining methods, 4) inherent water and temperature factors, 5) environmental considerations, and 5) costs. The under-lying land agreements with Contintal Copper Company (and their agreement with Kirby Coryell), and ASARCO, should be clarified and made acceptable for long-term holding of the property.

Figure 8-1, addresses points 1 and 2, in the sulfide zone. Shown are the drill hole locations (open circles) of the present drill holes, along with their rated thickness-assay grade, and shown as filled triangles are sites to further confirm the values within the mineral resource and to expand the resource.

Eleven additional drill holes are along the present road system established for the previous and proposed, at the time, drill holes. Road construction would need to be completed to the remaining seven sites, often from the present road system.

Note that the open-triangle superimposed over the open circle at hole A-17 signifies the hole has been started and needs to be completed to the mineralized zone.

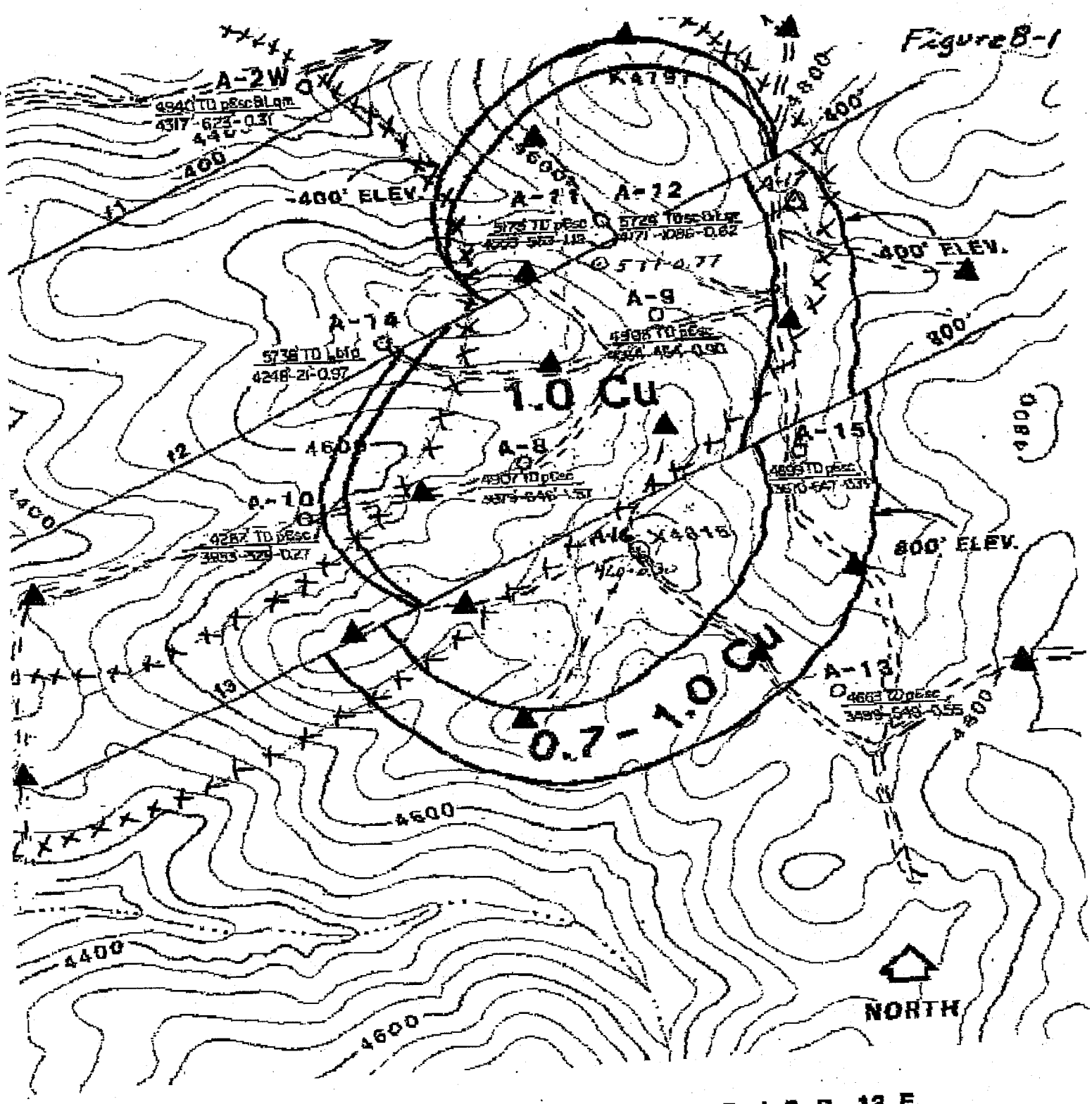
The curvi-linear plots of xxxxxxxx suggest what may be the main mineralized zone based on a central core of lower grade mineralization surrounding the higher grade of plus 1% copper in the main zone.

Drill holes A-13 and A-15 show that substantial thickness of 0.55% and 0.71% copper mineralization is found outside the curvi-linear plot as outlined. Indicating that further expansion is available not only within the bracketed zone but also further outside.

Confirmation and expansion of the available native copper in conglomerate resource will be partially tested by the western-most holes shown on Figure 8-1. These two holes would indicate further mineralization in the footwall (east) side of the Devils Canyon Fault in the Whitetail Conglomerate as well as the deeper sulfide mineralization in the bedrock units. Review Figure 6-3 for a general plan showing the holes A-4 and A-7, which have the thick sections of native copper west of the Devils Canyon Fault. Additional holes north and west of hole A-7 are recommended for testing the native copper resource and extension.

Potential mining methods include block caving, vertical crater retreat, cemented cut and fill (to utilize most of the waste mill product), and possible *in situ*. *In situ* is probably not applicable in the sulfide zone, but may be in the native copper resource.

Figure 8-1




T. 1 S., R. 13 E.

A-8 ASARCO hole & designation

4907' TD pSsc — total depth rock type

3875'-646'-1.57 — depth-length-%copper

PRE-MINERAL ROCK TYPE

- Lbtp Laramide biotite feldspar porphyry
- Lqm Quartz monzonite
- Lgr Granite
- pSsc Schist

# MODELED MINERAL ZONE OUTLINE

SUPERIOR EAST PROJECT
PINAL COUNTY, ARIZONA
1" = 500'

DEC 1985

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Thus mining conditions must take the apparent steep dip of the schistosity into consideration as the schist contains abundant mica, and the mass is very moveable along the schistosity layers.

Use of a tunnel-boring machine to ramp down to the 3500-foot level from the Carlota area would establish a network of subparallel tunnels for confirmation and expansion in ring-drilling the deposit with 1000 foot holes. This would also provide needed data for geo-mechanical studies on the various angle-intercepts of the schistosity for determining the most probable mining method and sequenceing of mining blocks.

Water is probably not a problem in the mineral zones, as most of the drill holes suggested a fluid loss in such zones. However, within the overlying dacite unit, water-bearing intervals were noted and these may extend some distance along the porous zones and/or vertically along fracture-fault structures.

At the Magma Mine to the west, they noted an increase of water flow into the mine, especially the limestone replacement mining area, after heavy winter/summer rains over the dacite plateau. Along Queen Creek, near the highway tunnel on State Highway 60, the water was noted to funnel down into large rubble zones along faults and along bedding zones within the limestone beds. Therefore, if mining supplied fractures reach into the main drainage areas within the dacite, these would provide additional water acess into the mining zone following abundant water flow in the drainages.

The Arizona Water Company at Superior picked up water at three points in Queen Creek east of the town of Superior, for distribution to the town of Superior. From 1962 thru 1970, they collected 25-30 million gallons of water per year. The water flowed from springs and rain runoff. After Magma completed their haulage tunnel in 1971 from #6 shaft to the new #9 shaft, crossing under the Queen Creek drainage, the springs dried up and no water now runs in Queen Creek except during excessive runoff periods. In 1971, the Water Company collected only 12.7 million gallons of water, and only "minor" water during 1972, even though winter and summer rains continued over the plateau. As stated above, investigations indicated that the water flow has now been transfered to the underground workings along fault structure extensions and along bedding zones within the limestone units which crop-out in Queen Creek.

Magma closed the mine at Superior in 1982 and allowed the water to fill all the workings from the 5000 Level on up, from west to east. Magma then decided to reopen the limestone replacement division, serviced by the #9 shaft on the plateau, in 1989. They found the water level had risen to above the 3000 Level in their #3 shaft, where they installed pumps for dewatering the workings. By 1990, they were pumping 2500 gallons per minute and had dewatered the East Division down to the 3400 Level. BHP has since purchased Magma Copper, and recently closed the operations at Superior. The present East Replacement Division workings will again be filling with water. The intra-connected vein workings to the west will also be filled with water as before.

The temperatures found in various drill holes and at the Magma Mine are listed in Table VIII-1.

The gradients have been established for the intervals listed and then used to calculate the estimated temperature (* F) at the various depths.

Table VIII-1. Temperature (* F) in Drill Holes and at Magma Copper Company.

| Hole No. | *F Readings | Calculated gradient / 100 ' | @ 4000' | @ 5000' | @ 6000' |
|---|---|---|---|---|---|
| A-2 | 115* @ 3000'; 126* @ 4060' | 1.04* | 125* | 136* | 146* |
| A-3 | 118* @ 3000'; 156* @ 5500' | 1.48* | 133* | 148* | 162* |
| A-4 | 164* @ 4500'; 184* @ 6650' | 0.93* | 159* | 168* | 178* |
| A-7 | 128* @ 3000'; 174* @ 6000' | 1.53* | 143* | 159* | 174* |
| A-8 | 112* @ 3000'; 131* @ 4440' | 1.32* | 125* | 138* | 152* |
| A-9 | 112* @ 3000'; 136* @ 4830' | 1.31* | 125* | 138* | 151* |
| A-10 | 114* @ 3000'; 126* @ 3930' | 1.29* | 127* | 140* | 153* |
| A-11 | 112* @ 3000'; 137* @ 4750' | 1.43* | 126* | 141* | 155* |
| A-12 | 112* @ 3000'; 147* @ 5690' | 1.30* | 125* | 138* | 151* |
| A-13 | 111* @ 3000'; 131* @ 4500' | 1.33* | 124* | 138* | 151* |
| A-14 | 110* @ 3000'; 142* @ 5450' | 1.31* | 123* | 136* | 149* |
| A-15 | 110* @ 3000'; 122* @ 3725' | 1.66* | 127* | 143* | 160* |
| DCA-1A | 121* @ 5173'; 151* @ 5600' | 7.03*! | NA | NA | NA |
| DCA-3A | 114* @ 3000'; 138* @ 4975' | 1.22* | 126* | 138* | 150* |
| Average | 112* @ 3000' | 1.32* | 125* | 139* | 152* |
| Magma | 109* @ 2000L; 152* @ 4800L | 1.54* | 124* | 155* | 171* |

! High gradient, not applicable.

Exempting the holes A-3, A-4, and A-7, located west of the Devils Canyon Fault, and DCA-1A located north of the State Highway 60, the average gradient in the sulfide zone is 1.32* per 100 feet below the 3000 foot depth. Thus, at the 3000 foot level, near the top of the sulfide intercept, the temperatures expected range between 110* and 115*, with an average of 112*F, while at the 5000 foot level, the average is 139*F. Working in such temperatures would necessitate the use of refrigeration cooling, such as used at Magma, where the average temperature exceeds those found at the Superior East sulfide zone.

# IX. Recommendations For Further Exploration

1. Porphyry Copper Target Area.

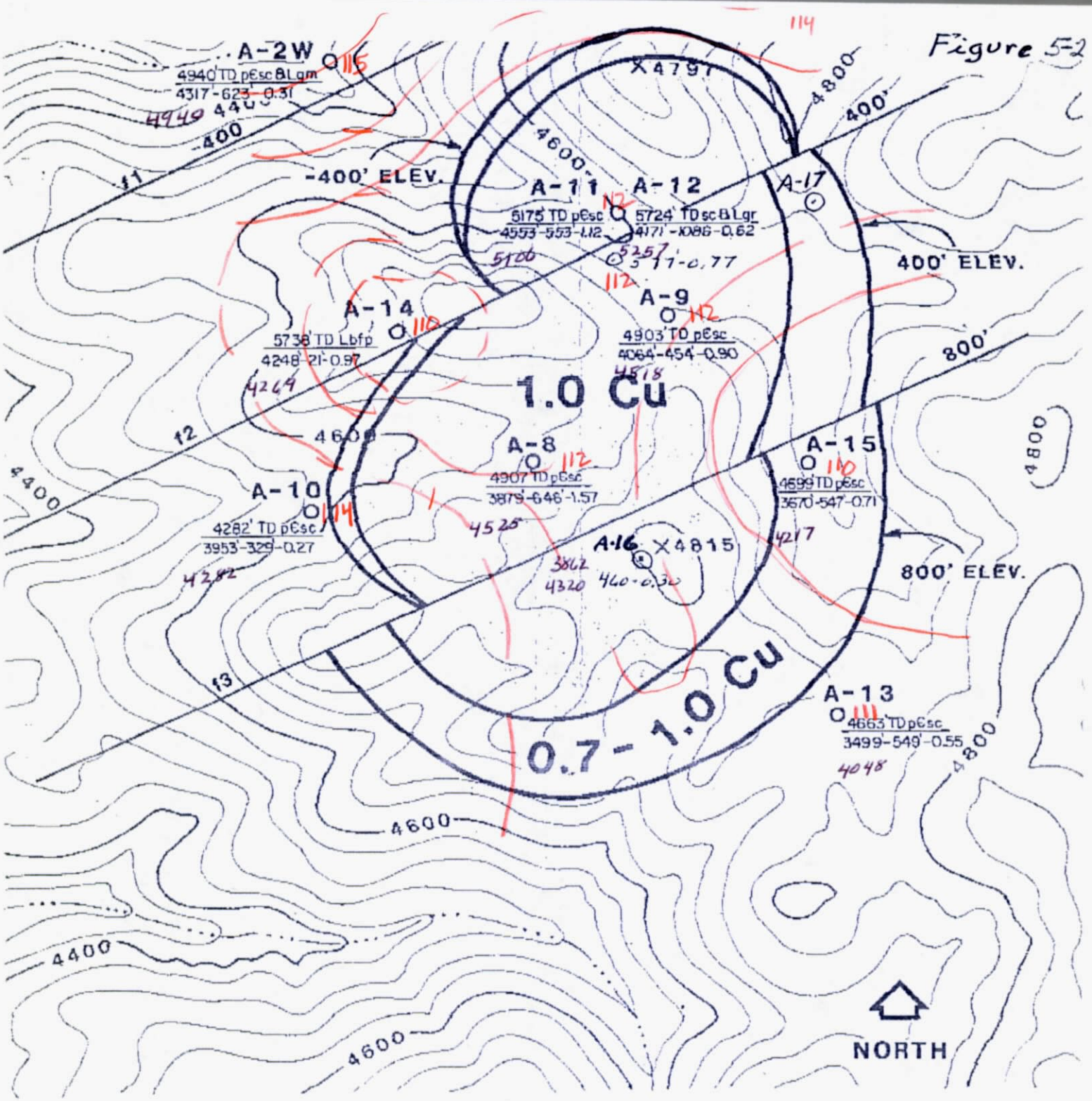
The porphyry copper target area was discussed in Section V, and only indicates the known potential of the target area.

Figure IX-1 plots the present road system (double dashed lines) in the target area, and the proposed roads (single dashed lines) to expand the drilling area, and the proposed drill holes (black triangles).

A rough cat-trail was established west from hole A-10 and turning south sub-parallel to the Devils Canyon drainage.

With the low-grade values in holes A-10 and A-14, which show alteration suggesting a barren core zone, it can be suggested that the Superior East target is similar to the ore zone at Ray, Arizona. Ray has a large mineralized ore ring zone surrounding a barren core.

Should an ore ring zone exist at Superior East, the erosion of a portion of it might explain the amount of native copper implied to the west. The outline ring (x pattern lines on Figure IX-1) could be tested easily by use of the present road system. As the Figure V-8 indicated, the higher-grade mineralizations, at




A-8 ASARCO hole & designation

4907' TD pЄcs — *total depth rock type*

3879-646-1.57 — depth-length-%copper

PRE-MINERAL ROCK TYPE

- *Lbfp* *Laramide biotite feldspar porphyry*
- Lqm Quartz monzonite
- Lgr Granite
- pЄsc Schist

T. 1 S., R. 13 E.

# MODELED MINERAL ZONE OUTLINE

SUPERIOR EAST PROJECT
PINAL COUNTY, ARIZONA
1" = 500'

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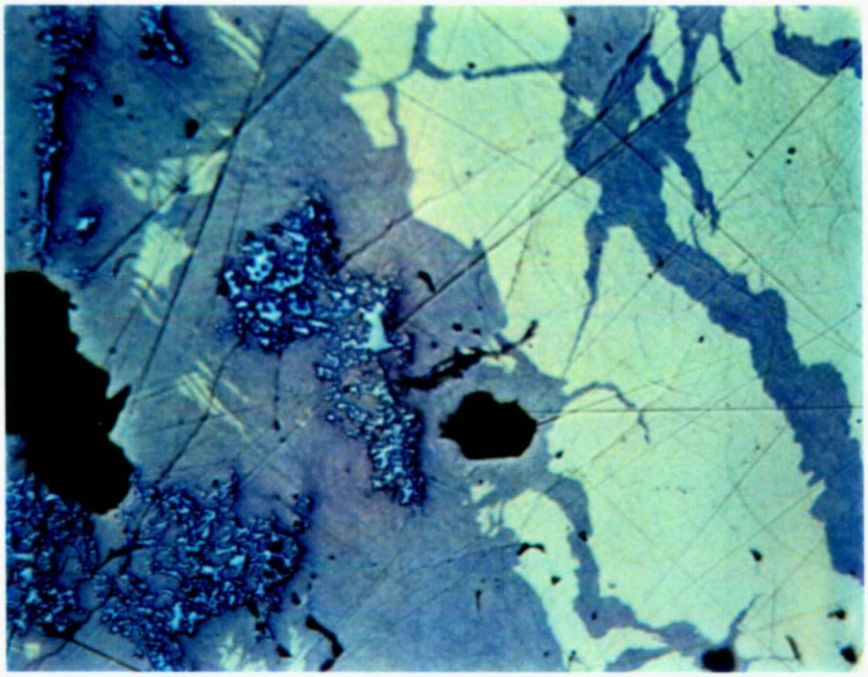


Figure 7-1 A-8-3978: bornite - lavender blue, chalcopyrite - light yellow, unknown - light blue. Width of image ≈ 665 μm

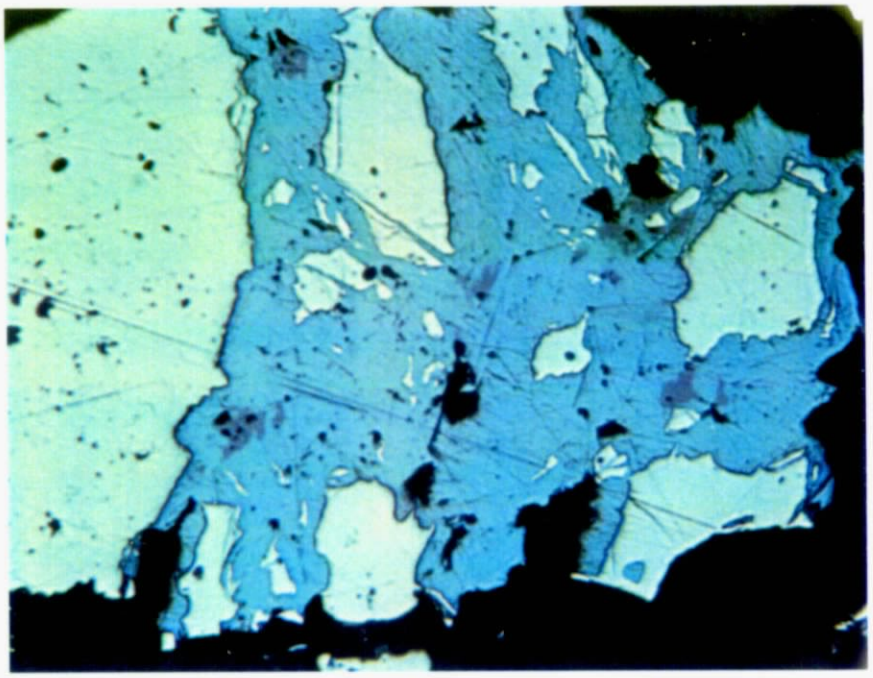


Figure 7-2 A-8-4202: pyrite - light yellow, chalcocite - blue, bornite - lavender. Width of image ≈ 665 μm

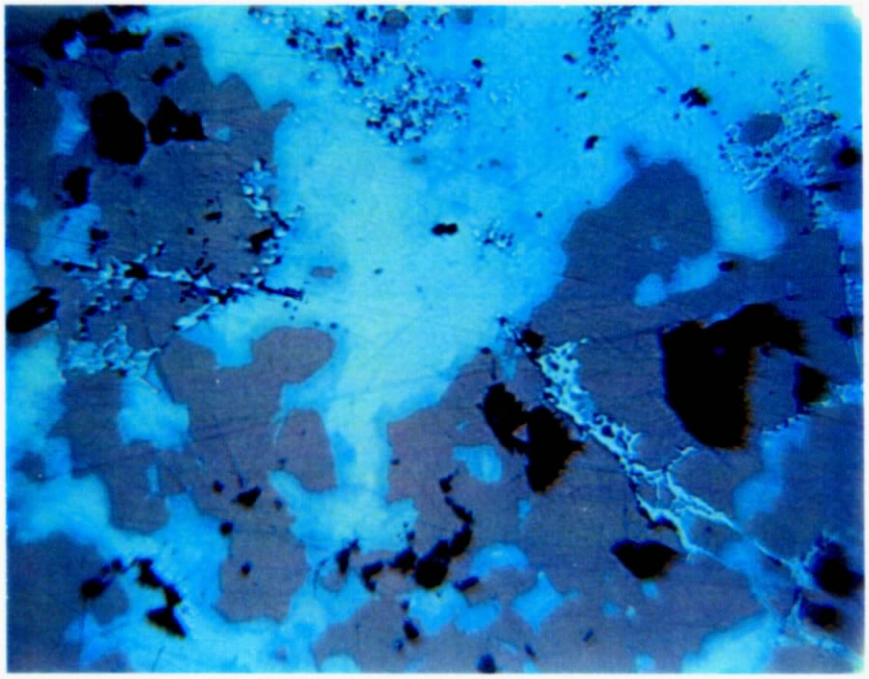


Figure 7-3 A-8-4253: bornite - lavender, chalcocite - blue, digenite - dark blue, unknown - light blue. Width of image ≈ 315 μm

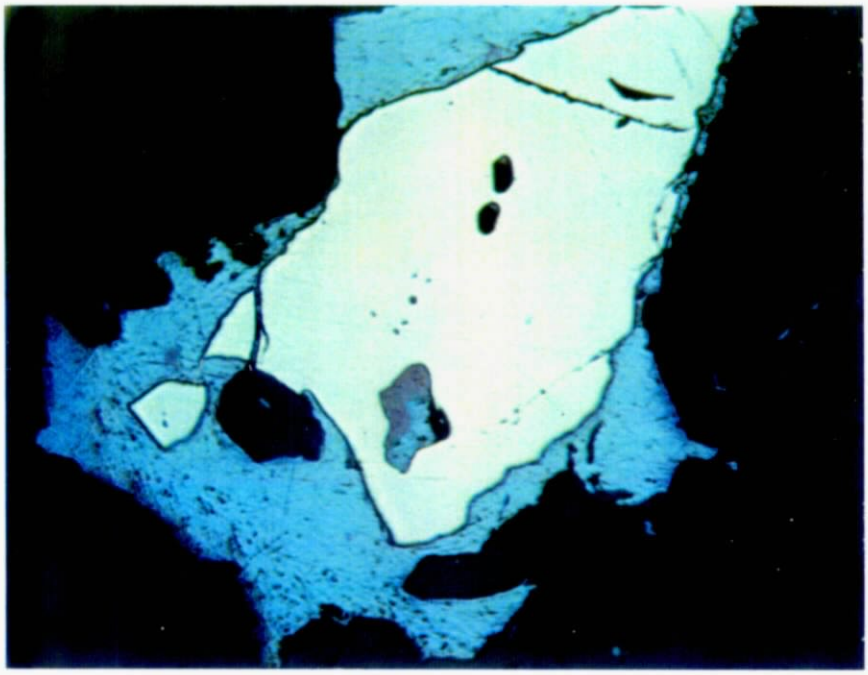


Figure 7-4 A-9-4449: pyrite - light yellow, chalcocite - blue, bornite - lavender. Width of image ≈ 665 μm

PLATE XXI

A.—Deep-level chalcocite (light) and bornite (dark). Cigar-shaped bornite areas show pronounced parallelism. Between bornite "cigars" is a subgraphic intergrowth of chalcocite and bornite. It is believed cigars are skeletal crystals of bornite which were first to form. With a decrease in iron content, remaining materials in solution separated out as simultaneous deposition of chalcocite and bornite. 2,000-foot level, 15 x-cut. (x 160)

B.—From same section as A. Some of larger bornite areas are crossed by irregular veinlets of chalcocite. With further decrease in iron content, conditions were such that only chalcocite deposited. Solutions depositing chalcocite had some replacing action on bornite which took form of veinlets. These veinlets lack continuity and regularity of supergene chalcocite veinlets and do not follow cracks and gangue boundaries. All the chalcocite is believed to be hypogene. (x 330)

-75-



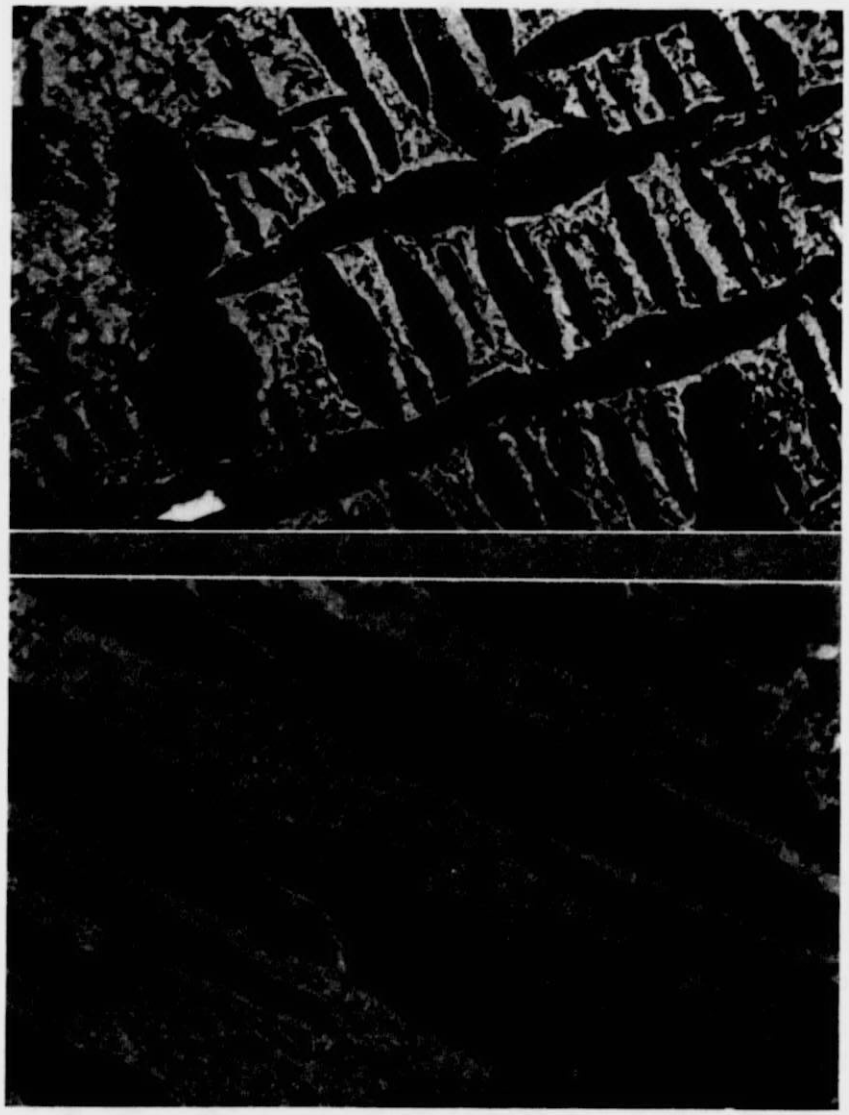
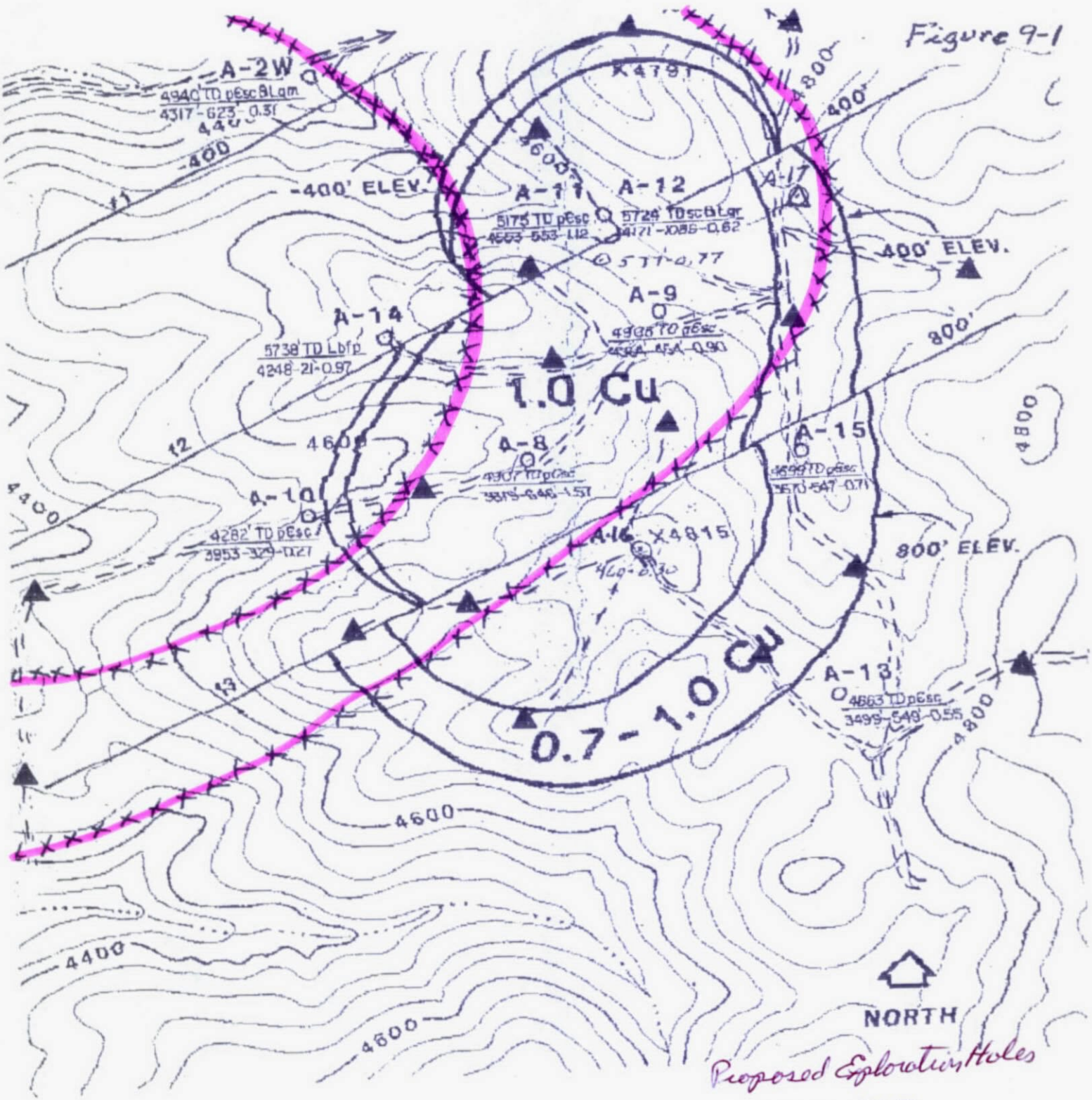


Plate XXI.—Photomicrographs of Magma ore.

Figure 75

Figure 9-1




Proposed Exploration Holes

T. 1 S., R. 13 E.

A-8 ASARCO hole & designation
O
4907' TD pEsc total depth rock type
3879-646 1.57 depth-length-%copper

PRE-MINERAL ROCK TYPE

Lbfp Laramide biotite feldspar porphyry
Lgm Quartz monzonite
Lgr Granite
pEsc Schist

# MODELED MINERAL ZONE OUTLINE

SUPERIOR EAST PROJECT
PINAL COUNTY, ARIZONA
1" = 500'

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the present known values, have a northeast trend. Hole A-17 was placed to test this extension and might be the first test in an expanding exploration program.

2. Native Copper in Whitetail Conglomerate Target Area.

The trail westward & turning south from hole A-10, Figure IX-1, was intended to test the area east of hole A-4. This hole is shown on Figure VI-4 as the "P-A" hole. Not only would the hole test the extension of native copper east of the Devils Canyon fault, but it would also test the ore ring extension concept. As sketched, the top of the native copper intercept might be around sea level, with the total intercept through the underlying sulfide zone would increase the depth of the drill hole several thousand feet deeper.

## X. SUMMARY AND CONCLUSIONS

The Superior East sulfide zone has several positive attributes: 1) An above average grade of mineralization in a form for bulk-mining methods, 2) a relatively clean bornite-chalcocite mineralogy with chalcopyrite in the lower levels, and 3) an open-ended configuration for expansion possibilities of the tonnage and grade.

The negative factors include the depth to the zone, the higher temperatures, and the amount of schist which is unstable in most workings. The under-lying agreement terms are onerous.

The native copper zone to the west is also attractive for its simple metallurgy and the probable extent of the mineralization. The negative factors is primarily the depth, potential water problems, and the land situation.

In conclusion, the property is one that holds promise in the future, as the large open-pit mines become depleated in the first quarter of the 21st century. Having the tonnage-grade now sugested and the extention probabilities, these two deposits may provide the flagship for a substantial enterprise.

PREPARED BY Joe
DATE 10/3

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| PREPARED BY | 7135 |
| --- | --- |
| PR | 3 of 3 |

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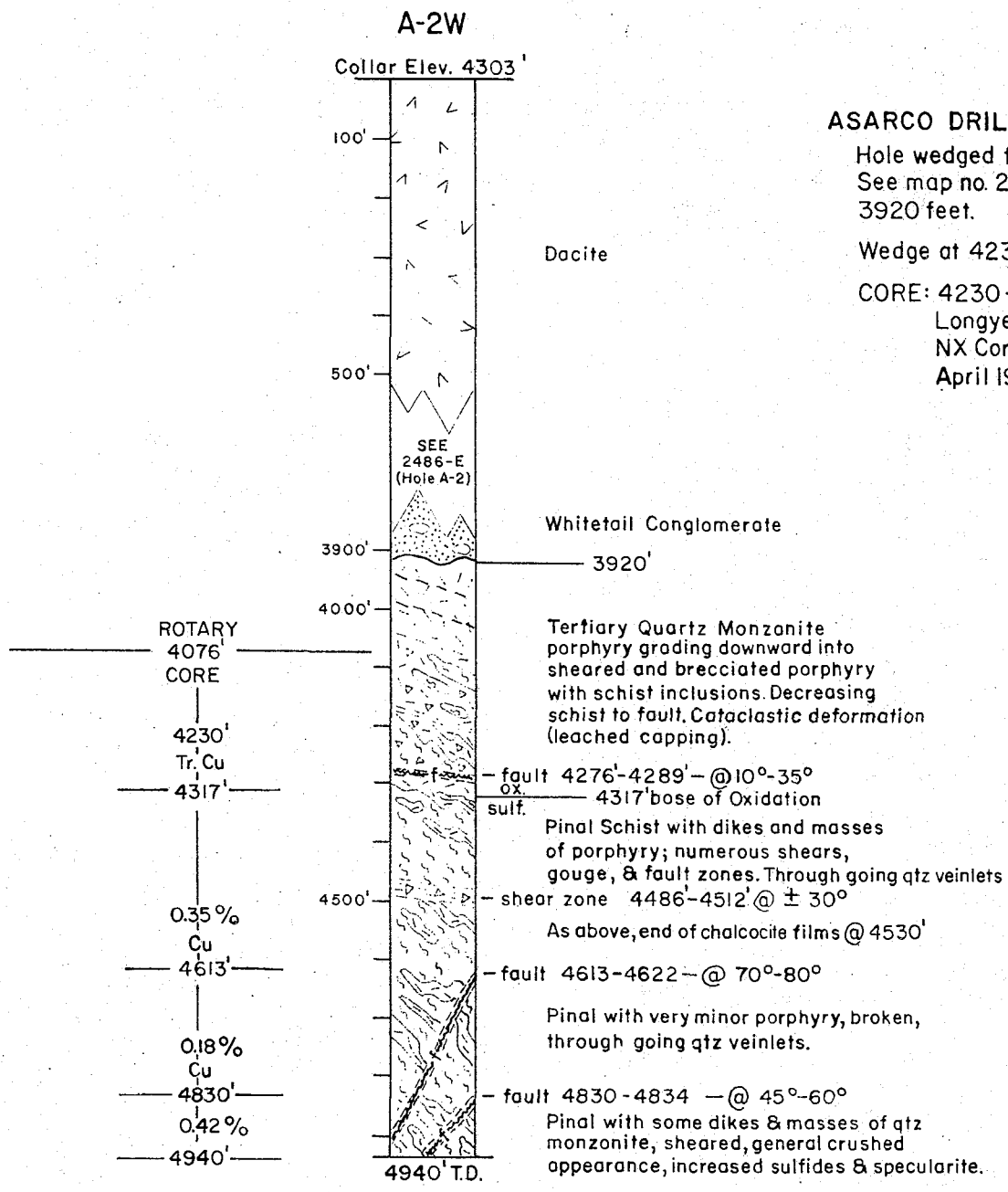
# Addendum

Graphic Log and Assay Results of:

Drill Hole A-2
Drill Hole A-2W
Drill Hole A-8
Drill Hole A-9
Drill Hole A-10
Drill Hole A-11
Drill Holes A-12 and A-12A
Drill Hole A-13
Drill Hole A-14
Drill Hole A-15
Drill Hole A-16
Drill Hole AI-2
Drill Hole AI-1
Drill Hole DCA-3A.




## ASARCO DRILL HOLE A-2W (Wedge)

Hole wedged from previous Hole A-2.
See map no. 2486-E for units above 3920 feet.

Wedge at 4230 feet.

CORE: 4230-4940 feet
Longyear TRK-44
NX Coring
April 19-May 17, 1972

NOTE: Individual assays for the hole is found in Assay Report, dated May 26, 1972.

T 1 S, R 13 E.
NW ¼ NE ¼ SE ¼ of Sec. 22

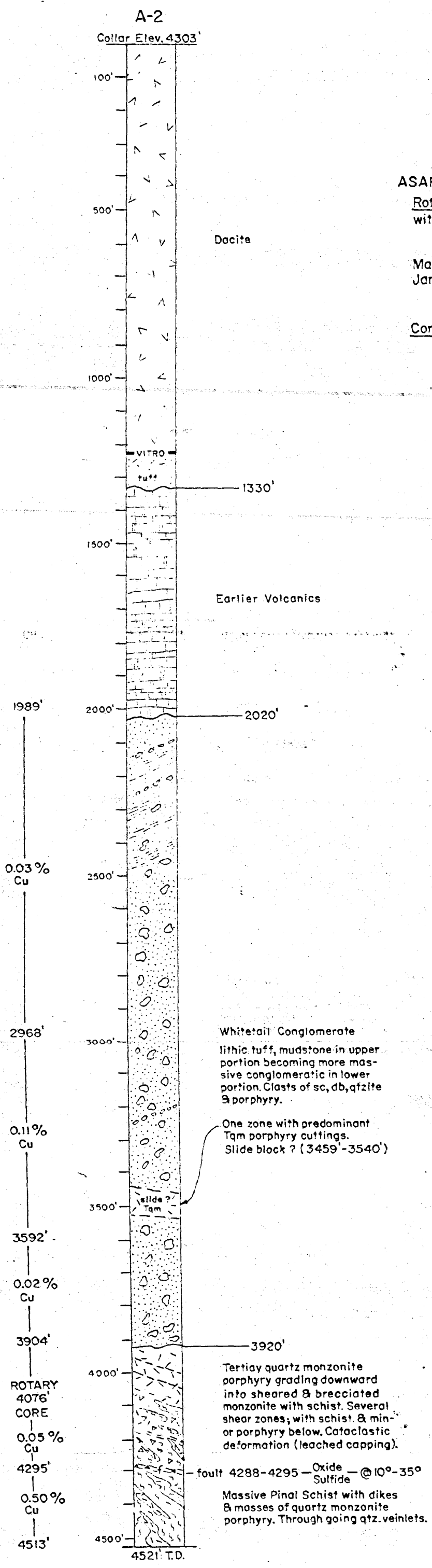
GRAPHIC LOG & ASSAY RESULTS
of
DRILL HOLE A-2W

SUPERIOR EAST PROJECT

GILA & PINAL COUNTIES, ARIZONA

SCALE 1" = 300'

J.D.S. July 8, 1972




## ASARCO DRILL HOLE A-2

Rotary: Surface-4076 feet
with spot cores at 2559-2574
3540-3550
4075-4076
Mayhew 3000, air drilled
January 13-February 7, 1972
8¾"-6¼" hole.

Core: 4076-4521 feet
Longyear TRK-44
NX Coring
March 4-18, 1972

NOTE: Hole lost w/corebarrel & rods in bottom. See Hole A-2W (map # 2486-F) for wedged hole.

Individual assays for the hole are found in Assay Report, dated March 24, 1972.

T 1 S, R 13 E.
NW ¼ NE ¼ SE ¼ of Sec. 22

GRAPHIC LOG & ASSAY RESULTS
of
DRILL HOLE A-2

SUPERIOR EAST PROJECT

GILA & PINAL COUNTIES, ARIZONA

SCALE 1" = 300'

J.D.S. July 8, 1972

2486-E

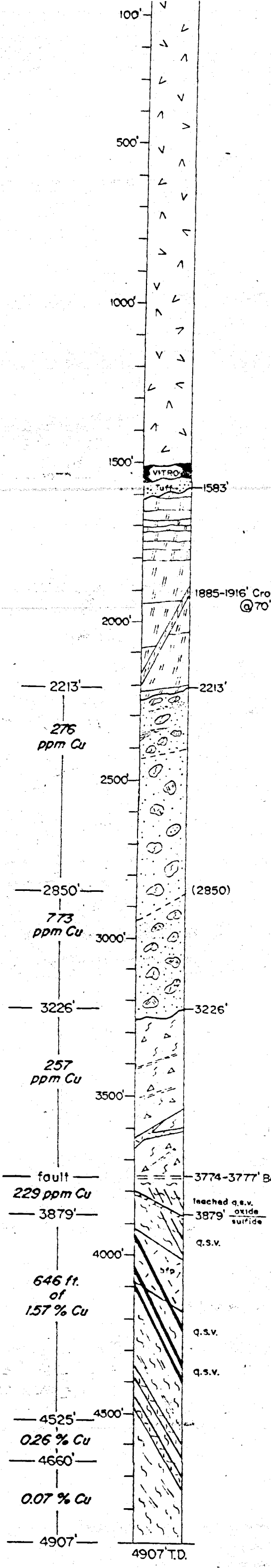
# ASARCO DRILL HOLE A-8

CORE: Surface-1971' NC
1971'-3197' NX
3197'-4907' BX

Joy Manufacturing Co.
Joy-22
Surface-1971'
Aug. 8-Sept. 15, 1976

Joy-22 Heavy Duty
1971'-4907' T.D.
Sept. 16-Dec. 29, 1976

*NOTE: Casing left in hole.*
*11 ft. of 4" surface (0-11')*
*523 ft. of NX (1448-1971')*
*697 ft. of BX (2500-3197')*




DACITE

EARLIER VOLCANICS

Andesite-basalt flows of 15-50' thickness with rubble and/or oxidized tops.

1885-1916' Cross fault zone @ 70'

WHITETAIL CONGLOMERATE

Sandy to gritty lenses and matrix with tuffaceous lenses, with clasts of pre-Whitetail units. Minor Cu°.

2213-2400' Muddy light brown to light green matrix 42 %.
Clasts: 95 % sc, 5 % p€ qtzite.

2400-2850' Medium green to green-brown matrix 30 %.
Clasts: 77 % sc, 21 % db, 2 % p€ qtzite.

2850-3226' Medium brown to red-brown at base, matrix 25 %.
Clasts: 66 % sc, 20 % db, 13 % Schultze and porphyry, 1 % p€ qtzite, tr Tbx. (numerous alt. clasts)

SLIDE BLOCK of Pinal Schist intruded by Laramide granitic aplite.

Altered and hematite replaced schist breccia, with minor gouge and "matrix" zones. Oxidized with tr. Cu° (Leached Capping).

3774-3777' Basal fault and gouge zone, oxidized, slickensides. @ 15°-20°

PINAL SCHIST, cut by Laramide biotite feldspar porphyry (Lbfp)

Top portion oxidized with FeOx and containing remnant chalcocite in quartz-sericite alteration.

Lbfp at 3879-3885' is a 30° dipping structure with gouge at top and bottom.

Sulfide zone is variably altered with quartz-sericite bands following schistosity at 10°-20° and cut across at 30°-60°. Bands also cut Lbfp.

Mineralization, disseminated and thin veins, follow schistosity and cut across at 60°. Most quartz-sulfide veins (q.s.v.) cut at 60°. Chalcocite is main copper sulfide to 3958' where bornite appears and becomes dominant below with continued chalcocite.

Schist contains numerous crushed-gouge zones with chalcocite-bornite.

Minor pyrite throughout with trace of chalcopyrite appearing at bottom of hole.

*NOTE: Individual assays are found in Assay Report dated Feb. 10, 1977.*

T. 1 S., R. 13 E.
NW 1/4 SW 1/4 SW 1/4 of Sec. 23

## GRAPHIC LOG & ASSAY RESULTS of

# DRILL HOLE A-8

## SUPERIOR EAST PROJECT

PINAL COUNTY, ARIZONA
SCALE 1" = 300'

J.D.S.

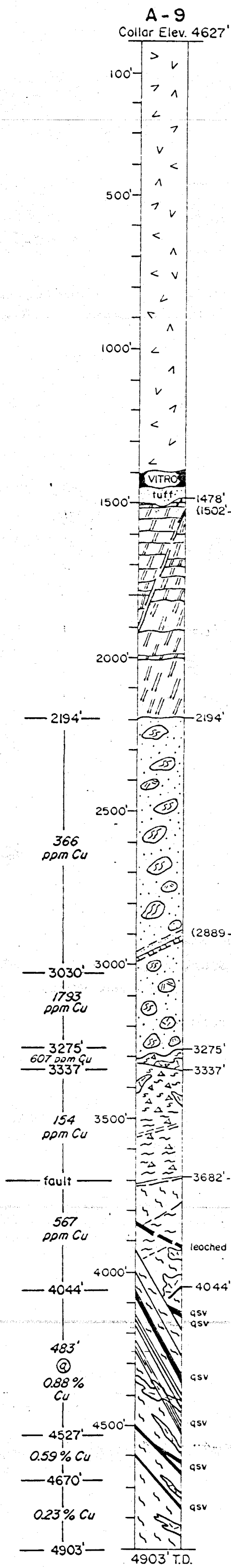
Feb. 1977
MVK 2486-K

# ASARCO DRILL HOLE A-9

CORE: Surface - 2357' NC
2357' - 3624' NX
3624' - 4903' BX
T.D.

Joy Manufacturing Co.
Joy-22, Heavy Duty Rig
Jan. 7 - May 4, 1977

*NOTE: Casing left in hole: 10' of 4"; Surface-10' 464' of NX; 1893'-2357' 586' of Bx; 3038'-3624'*




DACITE

EARLIER VOLCANICS

Andesitic - basalt flows, 5' - 45' thick, with few 100' - 200' thick units, separated by rubble and/or oxidized tops.

Cross - fault probably has around 100' feet of vertical offset, with dominant horizontal component (- 20° slickensides).

WHITETAIL CONGLOMERATE

Clasts, few qmp & blk qm, set in sandy, gritty, granular, tuffaceous matrix. Minor Cu°.

2194' - 2600' M: 19 % brown to tan and green brown.
ACP: 97 1/2 % sc, 2 1/2 % db

2600' - 2889' M: 23 %, brown to green brown to green.
ACP: 65 % sc, 25 % db, 10 % pЄ qtz & Pioneer.

(2889 - 2917 sandy-grit of db & gr debris; w/ fresh water lms unit)

2917' - 3000' M: 17 1/2 %, chocolate to dark brown
ACP: 54 % sc, 45 1/2 % Schultze gr, 1/2 % db.

3000' - 3275' M: 17 % dark brown w/ reddish cast
ACP: 65 % sc, 21 % db, 11 % Schultze, 3 % Єqtzite minor leached clasts.

SLIDE BLOCK of M-1A Type. Lqm w/ chilled borders intruding pЄ schist. Both cut by qtz veins. Totally oxidized. Broken w/ 10-40 % red-brown "adobe" matrix. Rests on 45 % slip surface.

SLIDE BLOCK of A-2 Type. Broken, sheared, gougy, brecciated pЄ schist w/ few brecciated Lqmp dikes. "Leached Capping" w/ tr to 2 % limonite, minor cuprite & black hematite above fault at 3521' - 3539'. 10 % - 40 % hematite below fault. Quartz-sericite & qtz veining throughout.

PINAL SCHIST w/ minor granite aplite dikes. Minor hematite, 1 % - 5 %, mainly along schistosity. Cut by inclined breccia zones & quartz-sericite bands w/ remnant chalcocite (3900) also qtz veining at 60°. Schistosity changes across minor faults.

PINAL SCHIST w/ minor porphyry & biotite feldspar porphyry dikes.

qsv, quartz sulfide veins, w/ weakly developed quartz masses, often brecciated w/ crushed bornite - chalcocite & pyrite.

Intense quartz-sericite banding subparallel to the 45° - 60° qsv zones & subparallel to schistosity at 5° - 30°.

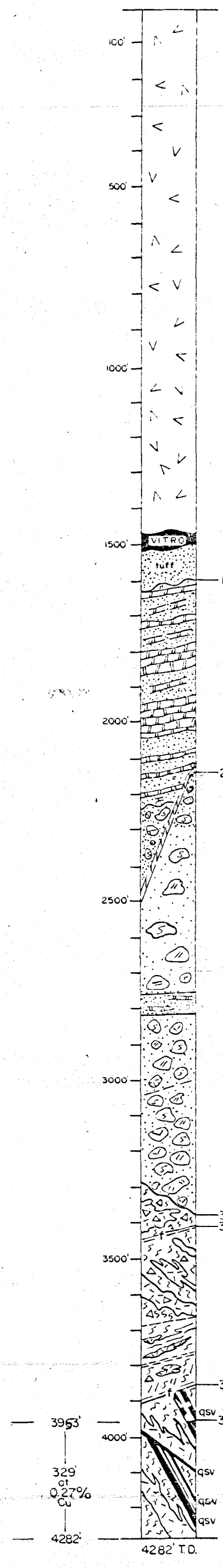
Breccia & gouge zones throughout in similar orientation.

*NOTE: Individual assays are found in Assay Report dated May 24, 1977.*

T. 1 S. R. 13 E.
SW 1/4 NW 1/4 SW 1/4 of Sec. 23

## GRAPHIC LOG & ASSAY RESULTS of DRILL HOLE A-9

A-10
Collar Elev. 4585'




## ASARCO DRILL HOLE A-10

Joy Drilling Company
Joy Heavy Duty HD-22
May 5 - August 3, 1977
November 15 - December 28, 1977

5" rock bit surface - 11'
NC core 11' - 2437'
NX core 2437' - 3417'
BX core 3417' - 3968'
AX core 3968' - 4282' T.D.

*NOTE: Casing left in hole*
*11' of 4.5" surface-11'*
*141' of NX 2296'-2437'*
*222' of BX 3195'-3417'*
*also BX rods from 3380'-3968'*

DACITE. Medium chocolate brown to dense orange brown to olive brown.

Fragmental content increases

Vitrophyre unit 1468'-1492'

Crystal tuff, brown at top grading to grey at base

1599'

EARLIER VOLCANICS. Dense green black andesitic-basalt flows with oxidized tops, vesicular, with increasing red and red-black cinder ash towards base of total unit. Flows dip up to 25°. Individual units of cinders and flows vary from 70-150' in thickness.

2114'-2117', Steep angular shearing cross fault

2138'

WHITETAIL CONGLOMERATE

2138'-2230' M: 26.5% dark brown to grey green, sandy grit
ACP: 51.5% sch, 39.5% pЄsed, 5% pЄgr, 2.5% db, 1% Paleozoic, dipping 5-10°

2230'-2390' M: 82% green to green grey brown with tuff lenses 10°
ACP: 89% sch, 9% pЄsed, 2% db, trace of pЄgr and Paleozoic

2390'-2752' M: 20.5% brown to green brown, sandy grit
ACP: 71% sch, 24% db, 4% pЄsed, and 1% boisa with fresh-water lime

(2752'-2814') Mixture of limey siltstone-mudstone and fresh-water lime with 52.5% green brown matrix and grit of 21.5% sch, 26% Schultze border, 11.5% db, and 1% pЄsed at 5°-10°

2814'-3375' M: 19% dark to reddish brown, sandy grit
ACP: 76.5% sch, 15% db, 6.5% Schultze and dik porphyry, 2% pЄsed with minor Cu°, dipping 20°-[illegible]

3375'
3406'

M-1A TYPE S.B. 83% border Schultze and 23% schist in 23% matrix of brick-red sandy grit. Rests on 15°-20° fault surface. Totally oxidized.

A-2 TYPE S.B. Broken and crushed units of Pinal schist cut by Laramide biotite feldspar and Laramide black porphyry. Qtz-sericite and biotitizations of units with remnant cuprite and chalcocite. Totally oxidized. Cut by flat faults.

3859' (basal fault zone at 20°)

PINAL SCHIST Cut by a number of Laramide quartz feldspar porphyry and black porphyry dikes and sills. Units cut by quartz-sericite bands with disseminated and vein mineralization at 30°-60°.

3953' oxidized / sulfide

*NOTE: Individual assays are found in ASSAY REPORT dated January 13, 1978*

T. 1 S. R. 13 E.
NW 1/4 SE 1/4 SE 1/4 of Sec. 22

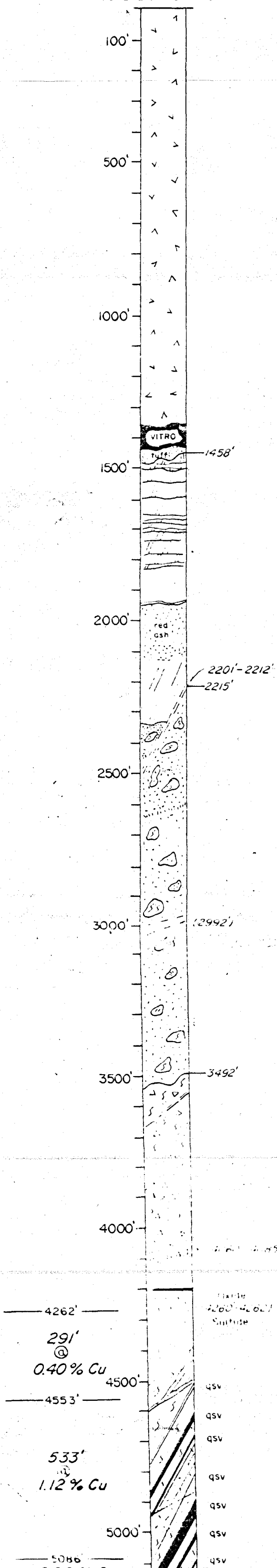
## GRAPHIC LOG & ASSAY RESULTS
of
# DRILL HOLE A-10
# SUPERIOR EAST PROJECT
## PINAL COUNTY, ARIZONA
SCALE 1" = 300'

J.D.S. Jan., 1978

mn 2486-0 dam

A-11

*Collar Elevation 4608'*




## ASARCO DRILL HOLE A-11

CORE: Surface - 2580' NC
2580' - 3772' NX
3772' - 4857' BX
4857' - 5175' AX

Joy Manufacturing Co.
Joy-22, HD
Surface - 5175'
8/2/78 - 6/20/79

*NOTE: Casing left in hole*
*137' of 4"; Surface (0-137')*
*2550' of NX Casing (30'-2580')*
*840' of BX Casing (2932'-3772')*
*1102' of AX Casing, ie BX Rods, (3755-4857')*
*(including barrel & bit)*

DACITE

EARLIER VOLCANICS

Andesitic basalt flows of 6-283' in thickness with rubble or oxidized tops. Lower flow has 187' of red ash underlain by 96' of blue black basalt of "Olberg ash & Blue Basalt" type.

WHITETAIL CONGLOMERATE

Sandy to gritty matrix lenses, with lenses of tuffaceous material, containing clasts of pre-Whitetail units. Minor Cu°.

2215 - 2601' red, muddy brown w/greenish matrix 35 %
Clasts: 98 ½ sc, 1 db, ½ Schultze
2601 - 2607' tuff bed
2607 - 2960' dark brown to dirty green matrix 24 %
Clasts: 77 sc, 18 db, 5 Apache
2960 - 2992' sandy grit w/schist & diabase debris
2992 - 3060' mud red brown matrix 32 %
Clasts: 49 Schultze, 41 sc, 7 db, 3 Apache
3060 - 3492' dark red to orange red matrix 19 %
Clasts: 73 sc, 20 db, 7 Schultze, tr Apache

SLIDE BLOCK of Pinal Schist intruded by Laramide biotite feldspar porphyry & diorite porphyry dikes. Altered & hematite replaced gouge-ox zones with minor Cu°. Oxidized, leached capping.

PINAL SCHIST cut by Laramide biotite feldspar porphyry dikes.
Top portion oxidized, leached capping, w/oxidized qsv zones, tr native copper remaining, probably a moved block in part. 15° fault zone @ 4260 - 4262' is oxide-sulfide contact.

Sulfide zone contains disseminated py-cc-bn & quartz-sulfide veins (py-bn) in quartz-sericite altered wallrock, bands, & breccia zones, generally at + 60° inclination.

*NOTE: Individual assays are found in Assay Report dated July 13, 1979*

T. 1 S. R. 13 E.
NW ¼ NW ¼ SW ¼ of Sec. 23

GRAPHIC LOG & ASSAY RESULTS
of

# DRILL HOLE A-11
# SUPERIOR EAST PROJECT
PINAL COUNTY, ARIZONA
SCALE 1" = 300'

C.D.S. Aug. 1979

# ASARCO DRILL HOLES
## A-12 and A-12-A

A-12 Dyna-drill, Thompson & Associates
Jan. 14, 1980 – March 5, 1980
NX 2750' – 2879' (terminated)

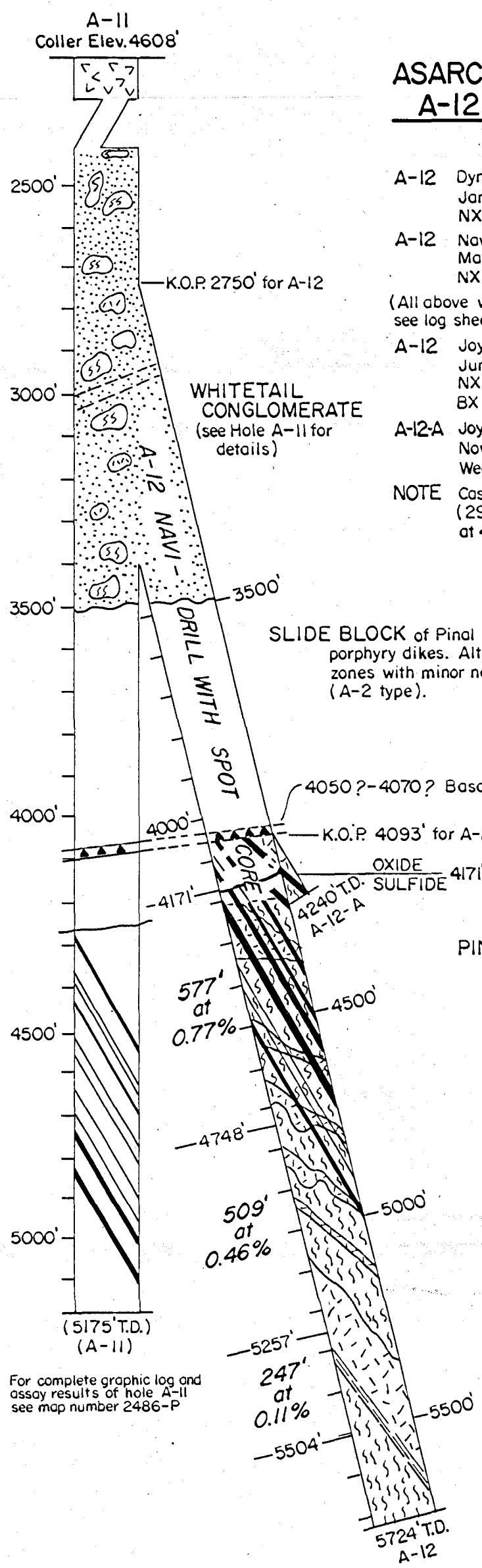
A-12 Navi-drill, Christensen (Boyles)
March 12, 1981 – June 1, 1981
NX 2879' – 4217'

(All above with Joy Manufacturing Company drillers; see log sheet for spot cores)

A-12 Joy Manufacturing Company
June 2, 1981 – November 10, 1981
NX 4217' – 5085'
BX 5085' – 5724' T.D.

A-12-A Joy Manufacturing Company
November 11, 1981 – December 19, 1981
Wedge hole, BX 4093' – 4240' T.D.

NOTE Casing left in Hole A-12, 2185' of BX casing (2900'-5085'), and wedge of A-12-A set at 4095' (base)




For complete graphic log and assay results of hole A-11 see map number 2486-P

SLIDE BLOCK of Pinal Schist intruded by Laramide biotite feldspar porphyry dikes. Altered and hematite replaced gouge-breccia zones with minor native copper. Oxidized, leached capping (A-2 type).

4050?-4070? Basal fault, breccia, gouge

PINAL SCHIST cut by Laramide feldspar porphyry dikes at 45°-60°.

Top portion, 4070'?-4171', oxidized with some brecciation and faults, some oxidized remnant chalcocite and native copper.

Sulfide zone contains disseminated py-cc-bn and qtz-cc-bn veins, changing below 4750' to qtz-py-cp-bn veins and below 5050' to qtz-py-cp veins decreasing with depth. All in variable quartz-sericite alteration veins and halos with some K-spar type below 5300'. Numerous breccia and shear zones throughout.

NOTE: Individual assay for hole A-12 and A-12-A may be found in assay report dated January 15, 1982.

T. 1 S., R. 13 E.
NW¼ NW¼ SW¼ of Sec. 23

## GRAPHIC LOG & ASSAY RESULTS
OF
# DRILL HOLES
# A-12 and A-12-A
## SUPERIOR EAST PROJECT
PINAL COUNTY, ARIZONA

SCALE 1" = 300'

J.D. Sell Jan. 1982

A-13

Collar Elev. 4728'

# ASARCO DRILL HOLE A-13

Surface — 10' — (6¼ RB)

CORE: 10' – 2363' NC

2363'–4663' NX

*Joy Manufacturing Co.*

Joy-36, TM.

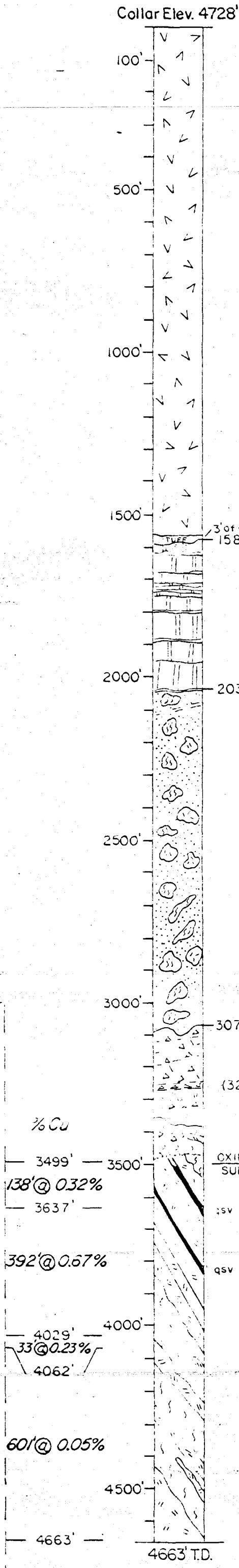
Surface –4663'

March 8, 1980 – Sept. 8, 1980

*NOTE: Casing left in hole*

4": Surface –10' (w/cap)

NX: 1723'–2363' (640')




DACITE

3'of vitrophyre 1580'

EARLIER VOLCANICS

Andesitic basalt flows with oxidized tops, autobrecciation. All portions generally fractured.

2036'

WHITE TAIL CONGLOMERATE

1"–4" subangular clasts set in gritty-sandy matrix. Minor Cu° below 2250'; tuff lense @ 10°–15° (2090')

| | |
|---|---|
| 2036'-2070' | M: 35%, med. dark brown, reddish cast. ACP: 65%; 100 sc |
| 2070'-2285' | M: 21%, green grey to green brown. ACP: 79%; 88 sc, 12 db |
| 2285'-2600' | M: 15%, med. brown to green brown. ACP: 85%; 70 sc, 28 db, 2 pC sed. |
| 2600'–3071' | M: 20%, red brown. ACP: 80%; 95 sc, 5 db |

3071'

A-2 TYPE SLIDE BLOCK of Pinal Schist cut by high angle qtz-seri bands w/1-2% hematite limonite w/numerous flattish breccia & gouge zones throughout.

(3242'-3260') Flattish breccia-gouge, possibly basal fault zone

PINAL SCHIST & MONZONITE, broken brecciated & gougy to 3471; but all cut by variable quartz-sericite-sulfide (or oxidized) bands in overall strong quartz-sericite alteration. Bands & breccia zones generally at steep, + 60° angle to core axis.

Quartz-sulfide veins & breccias

*NOTE:* Individual assays are found in Assay Report dated Aug. 5, 1981.

T. 1 S. R. 13 E.

SW ¼ SW ¼ SE ¼ SW ¼ of Sec. 23

## GRAPHIC LOG & ASSAY RESULTS of DRILL HOLE A-13

## SUPERIOR EAST PROJECT

PINAL COUNTY, ARIZONA

SCALE 1" = 300'

J.D. Sell

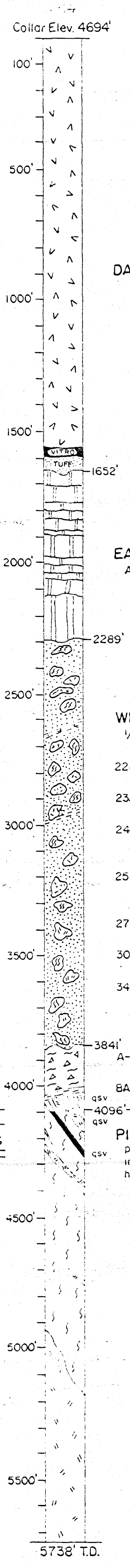
Aug. 1981

# ARCO DRILL HOLE A-14

**ROTARY:**
Surface - 1534'
8": Surface - 20'
6": 20'-1534'
CMX DRILLING CO.
June 20, 1980 - July 2, 1980

**CORE:**
1534'-2891' NC
2891'-5493' NX
5493'-5738' T.D. BX
JOY MANUFACTURING Co.
Sept. 19, 1980 - March 9, 1981

*NOTE: Casing left in hole:*
7": Surface - 20'
4 1/2": Surface - 1534'
NX: Surface - 2891'
BX: 3750'-5493 w/shoe
*Six sack Portland cement plug set at 3000'.*




DACITE

EARLIER VOLCANICS
Andesitic basalt flows of 5' to 162' overlain by oxidized rubble-breccia tops of 6' to 60' for total thickness of flow units of 17'-168'

WHITETAIL CONGLOMERATE
1/2"-4" clasts set in gritty-sand matrix.
Minor Cu° below 2700 feet.

| | |
|---|---|
| 2289'-2325' | M: 53%; dirty to tan brown. ACP: 47%; 90 sc, 8 p€ sed, 2 p€ gr. |
| 2325'-2493' | M: 60%; green tan to green grey. ACP: 40%, 60 sc, 30 p€ sed, 10 p€ gr. |
| 2493'-2577' | M: 58%; org-red-tan greenish with pumice zone at base. ACP: 42%; 97 sc, 2 db, 1 p€ sed. |
| 2577'-2728' | M: 10%; dark brown w/ lense of fresh limestone @ 2630' ACP: 90%; 85 sc, 15 db, tr p€ sed. |
| 2728'-3000' | M: 20%; dark to green brown. ACP: 80%; 56 sc, 39 db, 5 p€ sed. |
| 3000'-3487' | M: 15%; med. dark brown. ACP: 85%; 70 sc, 17 db, 8 p€ gr, 5 Lr. gr. |
| 3487'-3841' | M: 20%; brick red brown ACP: 80%, 92 sc, 8 Lr gr, tr p€ gr. |

A-2 TYPE SLIDE BLOCK of Pinal Schist w/ altered bands & some aplite & qfp w/ alteration-mineral. ALL OXIDIZED.

BASAL FAULT ZONE @ 10°-15° (4006'-4015'), gouge-bx

PINAL SCHIST cut by aplitic porphyry & quartz-feldspar porphyry, all cut by steep dipping quartz-sericite bands containing variable amounts of chalcocite, chalcopyrite, & pyrite, Some hematite bands, pyrite increasing with depth.
1/8" - 1/4" vns & narrow bx zones w/ cc end 4144'

Below 5150', secondary K-feldspar & green sericite became noticeable component in schist & bfp, porphyry; quartz-sericite banding with minor mineral became scattered.

*% Cu*
4096'
*53 @ 0.53%*
4149'
*99 @ 0.28%*
4248'
*21 @ 1.20%*
4269'

*Scattered assays range from 0.02-0.08 % Cu w/ 0.2 - 0.4 % in qsv zones.*

*NOTE*: Individual assays are found in Assay Report dated Aug. 10, 1981.

T. 1 S. R. 13 E.
N LINE of NW1/4 NE1/4 SE1/4 SE1/4 of Sec. 22

## GRAPHIC LOG & ASSAY RESULTS
of
# DRILL HOLE A-14
## SUPERIOR EAST PROJECT
PINAL COUNTY, ARIZONA
SCALE 1" = 300'

J.D. Sell  Aug. 1981  MVK-2486-2

A-15

Collar Elev. 4628'

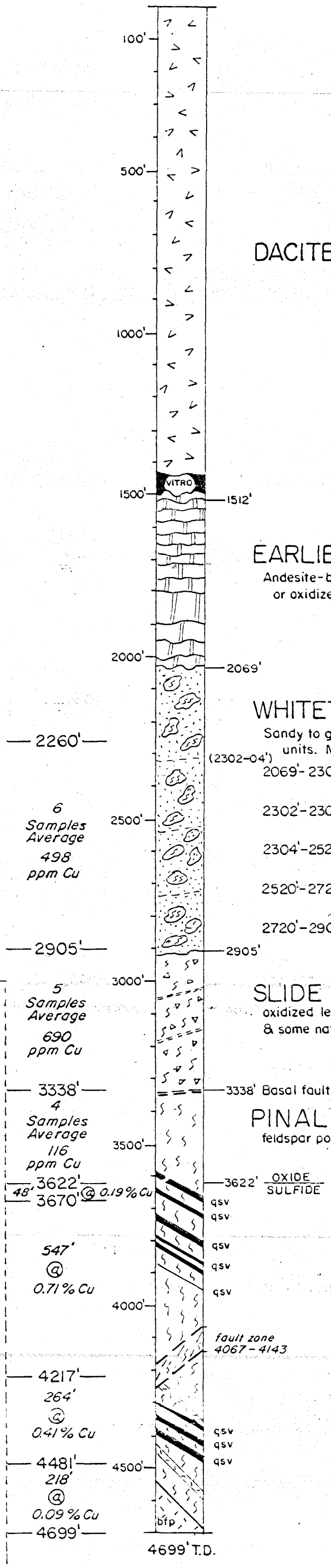
# ASARCO DRILL HOLE-15

Surface-11' Rock Bit 6'4"

CORE: 11-1101 NC
1101-2029 NX
2029-4699 BX

JOY MANUFACTORING CO.
JOY-22, Heavy Duty
Surface – 2029'
Feb. 16 – April 6, 1983
2029 – 4699 T.D.
April 2 – July 6, 1984

NOTE: Casing left in hole.
11' of 4" Surface (0-11')
650' of NX (441'-1101')
529' of BX (1500'-2029')




DACITE

EARLIER VOLCANICS

Andesite-basalt flows of 12'-98' thickness with rubble or oxidized tops.

WHITETAIL CONGLOMERATE

Sandy to gritty to muddy matrix with clasts of pre-Whitetail units. Minor Cu°

| | |
|---|---|
| 2069'-2302' | green tan grit matrix 25%, Clasts: 99+% sch, tr. qtzite, tr. db. |
| 2302'-2304' | marker bed, fresh water lms w/ash grit matrix. |
| 2304'-2520' | green brown to brown matrix 27%, Clasts: 63% sch, 27% db, 8% qtzite, 2% p€ sh-lms |
| 2520'-2720' | reddish muddy brown matrix 21%, Clasts: 76% sch, 22% db, 2% qtzite |
| 2720'-2905' | reddish adobe to dark brown matrix 26%, Clasts: 65% sch, 18% db, 16% Lr gr porp, 1% p€ lms |

SLIDE BLOCK of A-2 type. Pinal schist, altered, oxidized leached capping type, with hematite, specularite, & some native copper. gouge-breccia zones throughout.

PINAL SCHIST cut by minor Laramide biotite feldspar porphyry, (Lbfp), dikes.

Top portion oxidized of very poor leached capping characteristics which continues to 3670' where the first 45° dipping structures with cc-bornite is encountered.

Sulfide zones of bx-gouge bordering qtz-sericite and qtz veins with variable mineral content of cc-bornite, (qtz-sulf veins qsv) grading downward into cp below 4200' minor pyrite throughout. Zones dipping generally 30° or less.

NOTE: Individual assays are found in Assay Report dated Aug. 24, 1984

T. 1 S., R. 13 E.
NE 1/4, SW 1/4, SW 1/4 of Sec. 23

## GRAPHIC LOG & ASSAY RESULTS

## DRILL HOLE A-15
## SUPERIOR EAST PROJECT
## Pinal County, Arizona

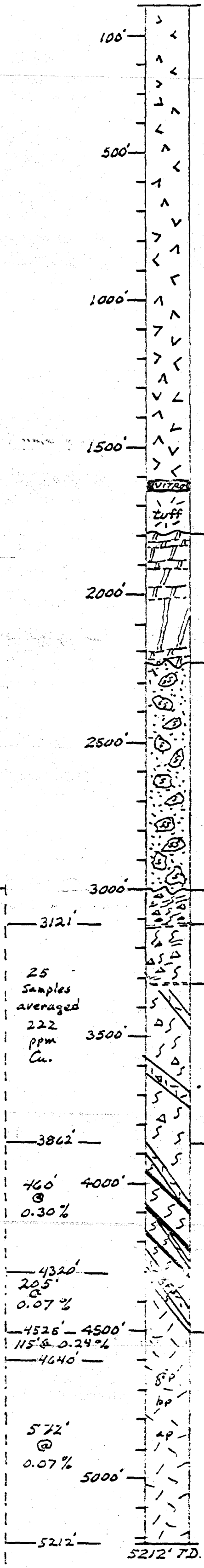
SCALE: 1" = 300'

J.D. Sell July, 1984

MVK 2486-T

A-16

Collar Elev. 4781'




## ASARCO DRILL HOLE-16

Rotary: Surface-1020', 6¼" RB.
Harness Drilling Co.
Failing 1500 DMX Holemaster
June 23 - July 16, 1987

Core: 1020-5212'
CBC Drilling Co.
1020-1380' NC. 6/14-6/23/88
1380-2446' NC. 8/21-9/20/89
2446-3000' NC.
3000-4545' NX
4545-5212' BX
} 11/1/90-3/28/91.

DACITE

Earlier Volcanics

Andesitic-basalt Flows of 12' to 194' thick, w/rubble or oxidized tops.

Whitetail Conglomerate

2231'-2320'. Red brown to brown grit. 80% clast 60% schist, 40% pegtzite, tr db.

2320'-2430'- Green-brown with red-brown grit. 70% clast. 90% schist, 5% pegtzite, 5% db.

2430'-2760'. Red-brown to green brown to green grit. 80% clast. 50% schist, 15% pegtzite, 35% db.

2760'-3010'. Green grey to red brown & brown grit. 80% clast. 65% schist, 15% pegtzite, 10% db, 5% Pioneer Shale + pegranite, 5% black porphyry.

SLIDE BLOCK. unaltered Pinal Schist bx, brick red.

Basal Fault, subhorizontal, gouge-bx, 3115'-3121'.

altered Pinal Schist, slide block, trace copper sub-horizontal fault at base (3332'-3334')

PINAL SCHIST.

Oxidized leached capping, cut by minor qtz veins, bx, + flts, with aplite + feldspar porphyry dikes. Quartz-sericite altered, some biotite, adularia, + specularite. brecciated through-out.

may have basal fault at ox-sulfide contact.

PINAL SCHIST

Schist cut by sills + dikes of quartz feldspar porphyry, black porphyry, + aplitic porphyry @ 45°. All cut by qtz veining + breccia zones w/ qtz-sericite and cc-bn diss. + seams.

QUARTZ FELDSPAR PORPHYRY

K-spar and silicification, qtz veins, shear zones, bx zones @ 45°, with variable cc-bn-cp, grading downward into cp-pyrite.

25 Samples averaged 222 ppm Cu.

460' @ 0.30%

205' @ 0.07%

115' @ 0.24%

572' @ 0.07%

T1S, R13E
SW¼ SW¼ SW¼ of Sec 23

GRAPHIC LOG & ASSAY RESULTS

DRILL HOLE A-16
SUPERIOR EAST PROJECT
Pinal County, Arizona
SCALE: 1" = 300'

JDS May 1997

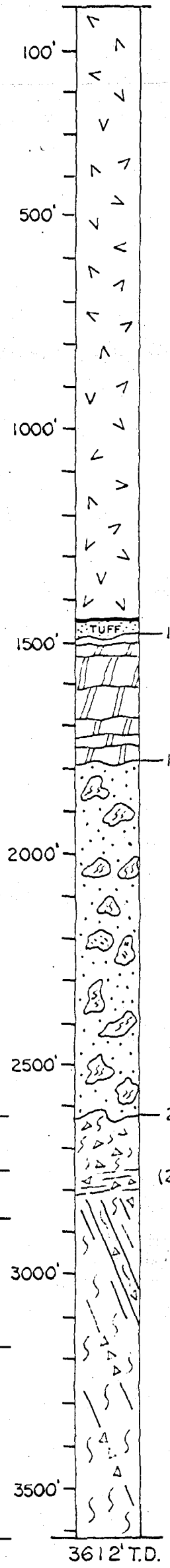
# ASARCO DRILL HOLE AI-2

AI-2
Collar Elev. 4715'

**CORE:**
Surface — 3' — (6¼" RB)
3' – 1961' NC
1961' – 2831½' NX
2831½ – 3612' BX

*Joy Manufacturing Co.*
Joy-22, HD.
Surface – 3612'
April 1, 1980 – Sept. 8 1980

*NOTE: Casing left in hole*
4": Surface – 3' (w/cap)
NX: 1600' – 1961' (361')
BX: 2420½ – 2831½
(411' including 5' NXE core barrel, bit, & shell)




DACITE

EARLIER VOLCANICS
Andesite basalt flows with oxidized tops, some reddish, some autobrecciated & gas bubbles.

WHITETAIL CONGLOMERATE
1"–3" clasts of pre-Tw, subangular, set in matrix of sand and grit of same.

1780'–1859' M: 30% red brown to gray brown.
ACP: 99% sc (15% alt.), tr db, tr p€gr.
1859'–2140' M: 30% light grey green to med. brown.
ACP: 70 sc, 30 db, tr dsq, gr.
2140'–2322' M: 25% greenish brown to lgt. med. brown.
ACP: 60 sc, 35 db, 5 dsq.
2322'–2603' M: 35%, brick red to adobe brown.
ACP: 87 sc, 12 db, 1 p€gr, tr dsq.
2603'–2616' M: 55%, reddish brown.
ACP: 99 sc, 1 p€gr.

PINAL SCHIST, oxidized, hematite-specularite, steep breccias, sulfides below 2709'.
(2748½'–2794') Basal Fault Zone @ flattish bx angles; sulfides.

PINAL SCHIST, oxidized to partially oxidized to 2920', sulfides to 3030', remainder partially oxidized. Better quartz-sericite alteration bands in better mineral zones. Breccias, steep angles throughout. Weak K-spar veining extends from 3150' to end of hole.

*% Cu*
2616' — *0.01 %*
2748½ — *0.06%*
2850' — *0.37%*
3160' — *generally below 0.10% with some bands-bx of better values*
3612'

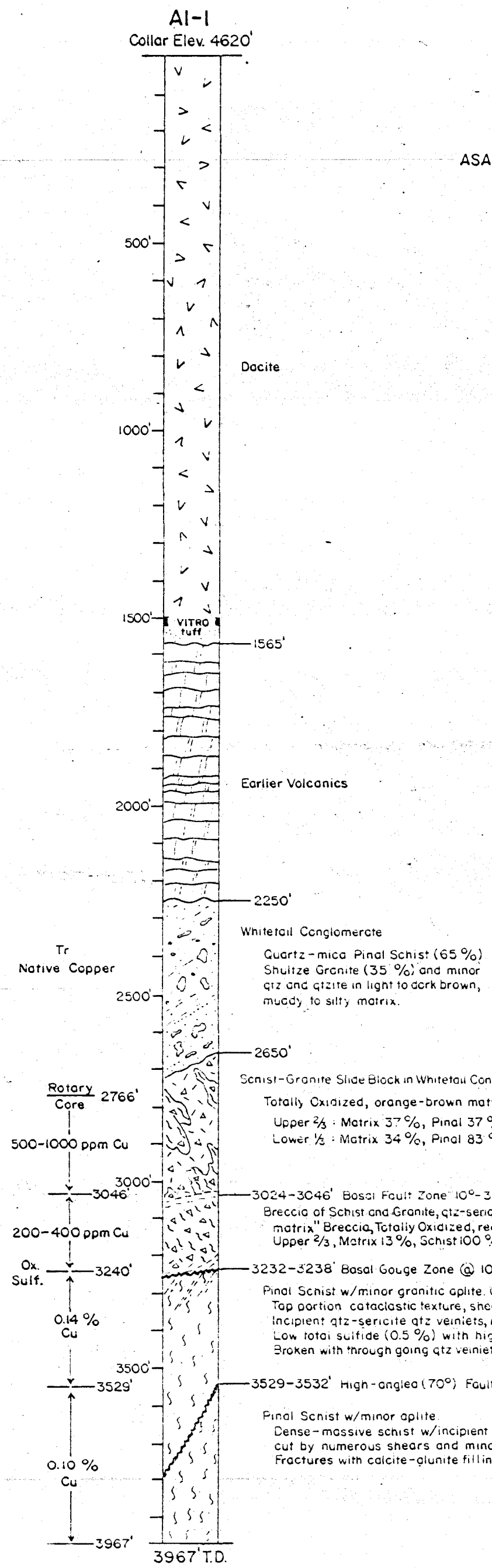
*NOTE*: Individual assays are found in Assay Report dated Aug. 14, 1981.

T. 1 S. R. 13 E.
SW¼ NE¼ SW¼ SE¼ of Sec. 23

## GRAPHIC LOG & ASSAY RESULTS of DRILL HOLE AI-2

RAWHIDE PROJECT
PINAL COUNTY, ARIZONA
SCALE 1" = 300'

J.D. Sell June 1981




## RAWHIDE PROJECT

ASARCO / INSPIRATION JOINT VENTURE

Hole AI-1

Rotary: Surface – 2766 Feet

Howard Turner Drill Master
w/Air Package
July 18 – Aug. 12, 1973
9" – 5 5/8" Hole

Core: 2766 – 3967 Feet

Boyles CP-50
Oct. 1 – Nov. 21, 1973
NC and NX Core

Summary of Weighted Averages in Sulfide Intercept:

3240-3529', 289 feet @ 1381 ppm Cu, 9 ppm Pb, 52 ppm Zn, and 31 ppm Mo.

3529-3967', 438 feet @ 990 ppm Cu, 18 ppm Pb, 57 ppm Zn, and 21 ppm Mo.

3240-3967', 727 feet @ 1145 ppm Cu, 14 ppm Pb, 55 ppm Zn, and 25 ppm Mo.

T 1 S, R 13 E.

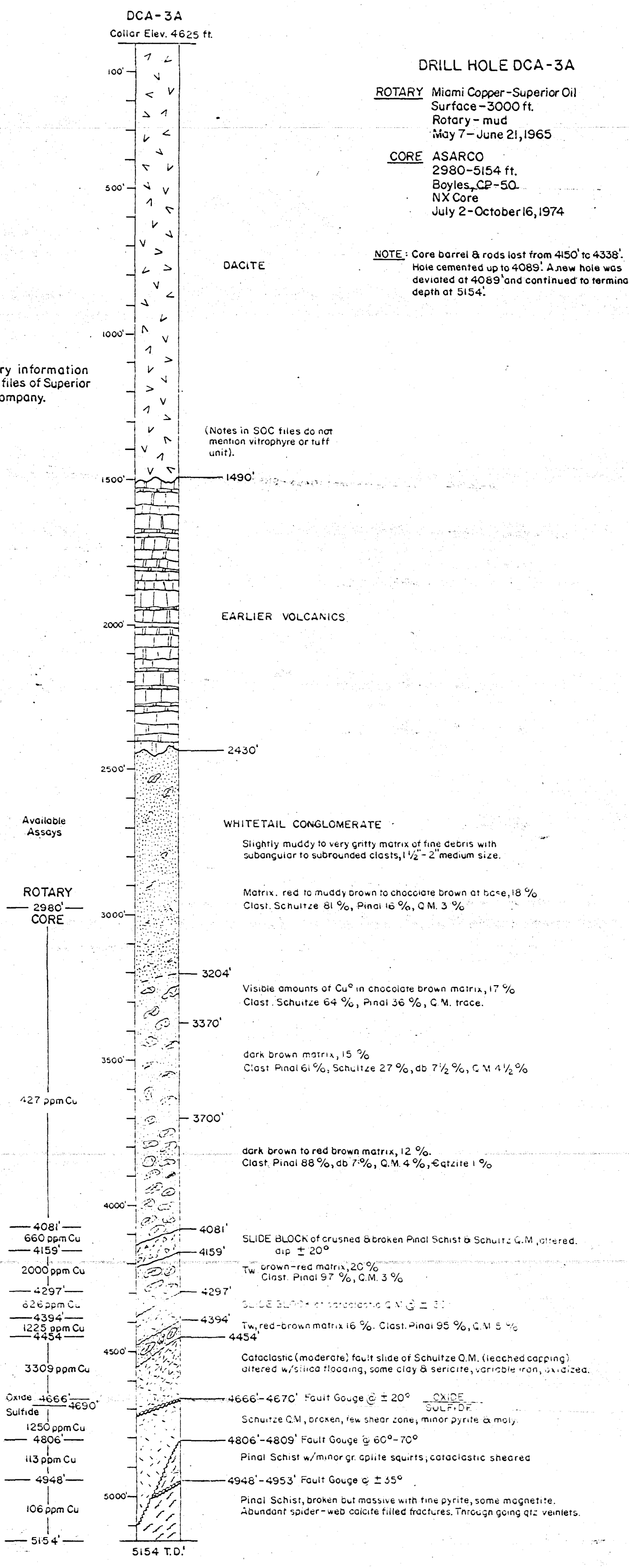
SE 1/4 SW 1/4 NE 1/4 of Sec. 23

# GRAPHIC LOG & ASSAY RESULTS of DRILL HOLE AI-1

RAWHIDE PROJECT
(ASARCO / ICC Joint Venture)
Pinal County, Arizona

SCALE: 1" = 300'

JDS Jan. 8, 1974 MVK 2700-X




T 1 S, R 13 E

SW ¼ NE ¼ NW ¼ of Sec. 23

GRAPHIC LOG & ASSAY RESULTS
of
DRILL HOLE DCA-3A

SUPERIOR EAST PROJECT

GILA & PINAL COUNTIES, ARIZONA

SCALE 1" = 300'

J.D.S. July 8, 1974

MVK 2486-H

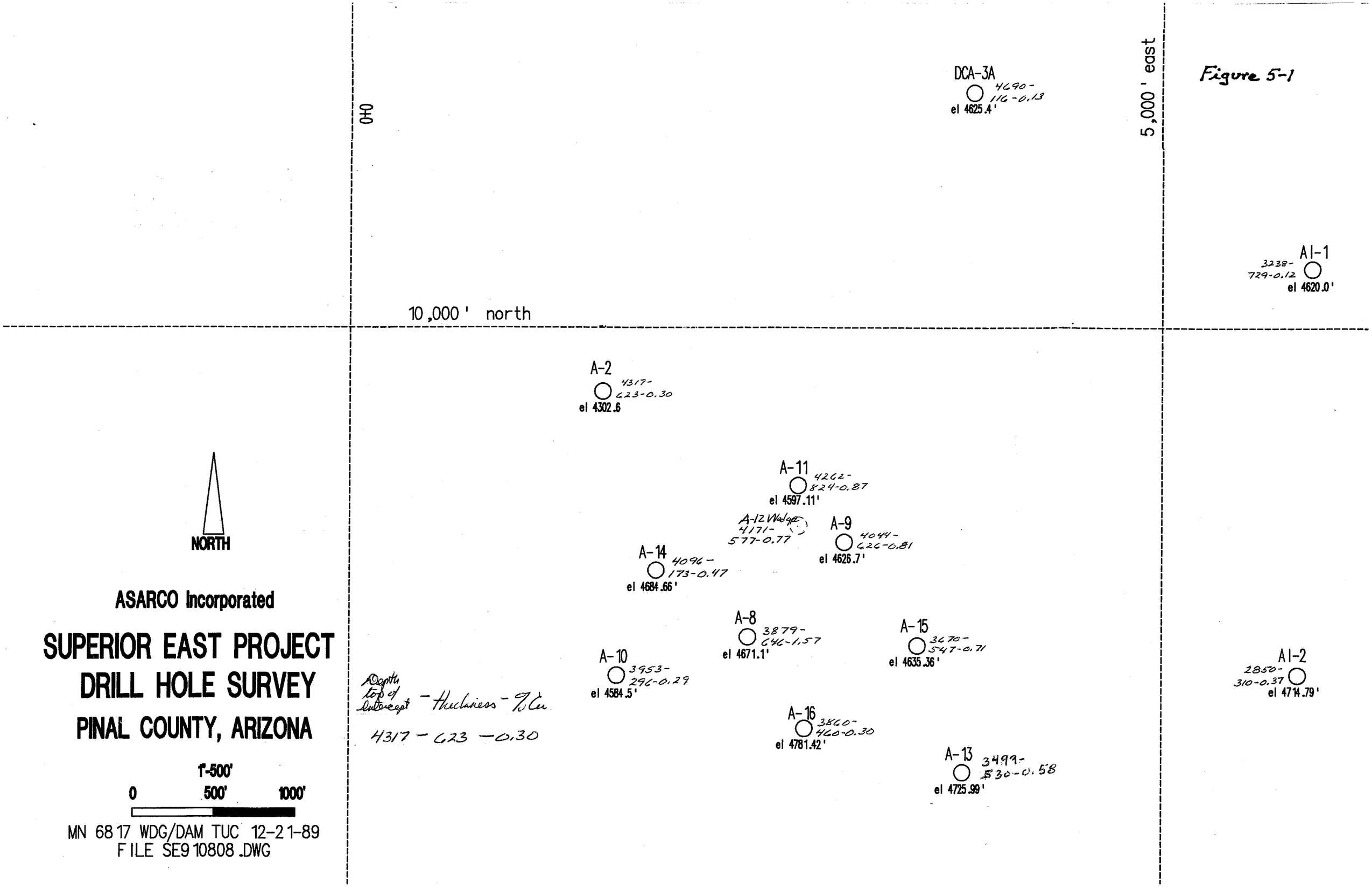
PROJECT NO. 9603
PAGE 1 of 1

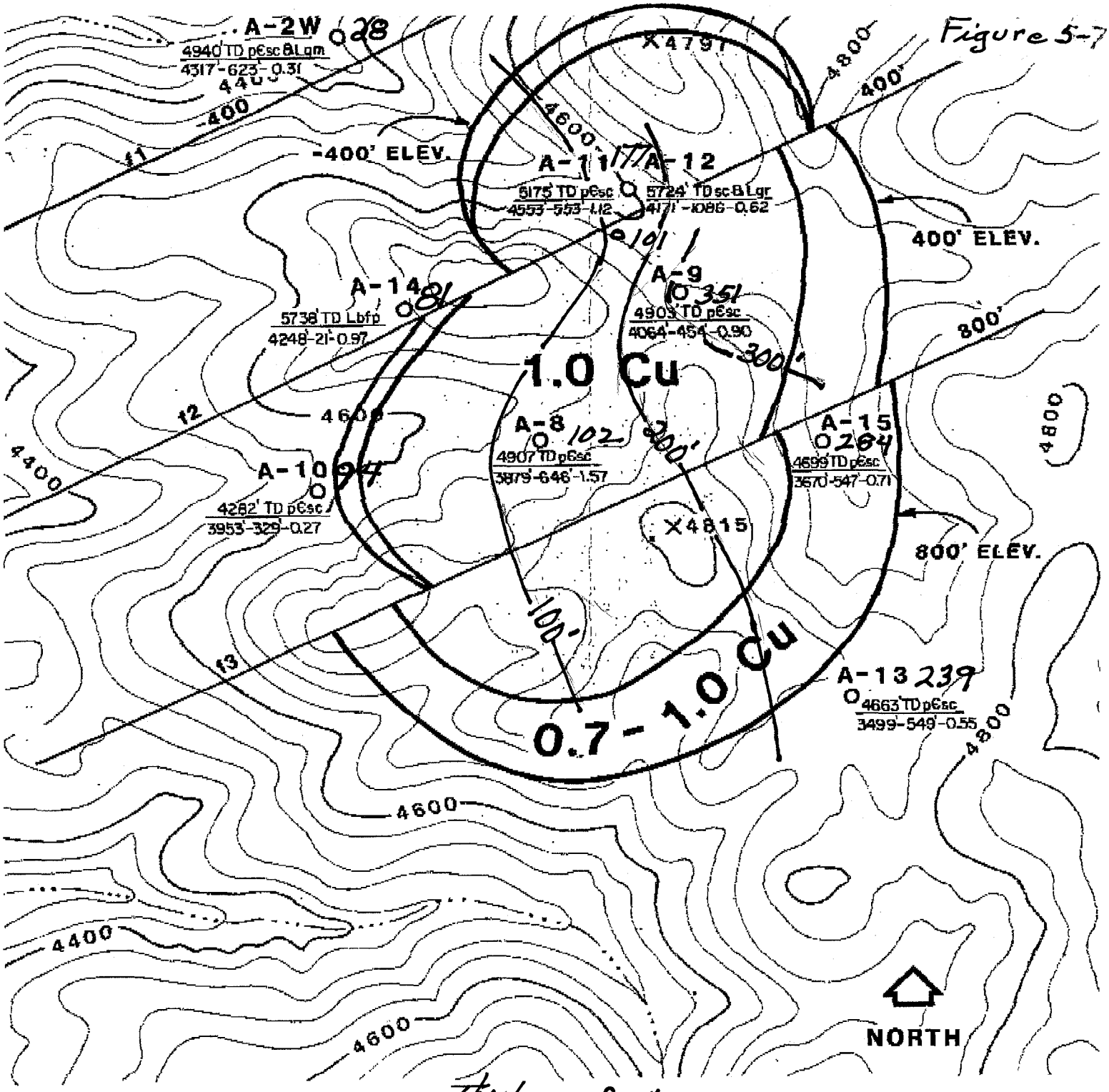
# Addendum

Graphic Log and Assay Results of:

Drill Hole A-2
Drill Hole A-2W
Drill Hole A-8
Drill Hole A-9
Drill Hole A-10
Drill Hole A-11
Drill Holes A-12 and A-12A
Drill Hole A-13
Drill Hole A-14
Drill Hole A-15
Drill Hole A-16
Drill Hole AI-2
Drill Hole AI-1
Drill Hole DCA-3A.

*Figure 5-1*


0+0
5,000' east
10,000' north
DCA-3A
4690-
116-0.13
el 4625.4'
AI-1
3238-
729-0.12
el 4620.0'
A-2
4317-
623-0.30
el 4302.6
A-11
4262-
824-0.87
el 4597.11'
A-12 Wedge
4171-
577-0.77
A-9
4044-
626-0.81
el 4626.7'
A-14
4096-
173-0.47
el 4684.66'
A-8
3879-
646-1.57
el 4671.1'
A-15
3670-
547-0.71
el 4635.36'
A-10
3953-
296-0.29
el 4584.5'
AI-2
2850-
310-0.37
el 4714.79'
A-16
3860-
460-0.30
el 4781.42'
A-13
3499-
530-0.58
el 4725.99'
Depth top of intercept - thickness - % Cu
4317 - 623 - 0.30
NORTH
ASARCO Incorporated
SUPERIOR EAST PROJECT
DRILL HOLE SURVEY
PINAL COUNTY, ARIZONA
1"-500'
0
500'
1000'
MN 6817 WDG/DAM TUC 12-21-89
FILE SE910808.DWG




Thickness, feet of In-Place Leached Capping

A-8 ASARCO hole & designation
4907' TD pЄcs — *total depth rock type*
3879'-646'-1.57 — depth-length-%copper

**PRE-MINERAL ROCK TYPE**

- *Lbfp* *Laramide biotite feldspar porphyry*
- Lgm Quartz monzonite
- Lgr Granite
- pЄsc Schist

T. 1 S., R. 13 E.

# MODELED MINERAL ZONE OUTLINE

## SUPERIOR EAST PROJECT
## PINAL COUNTY, ARIZONA

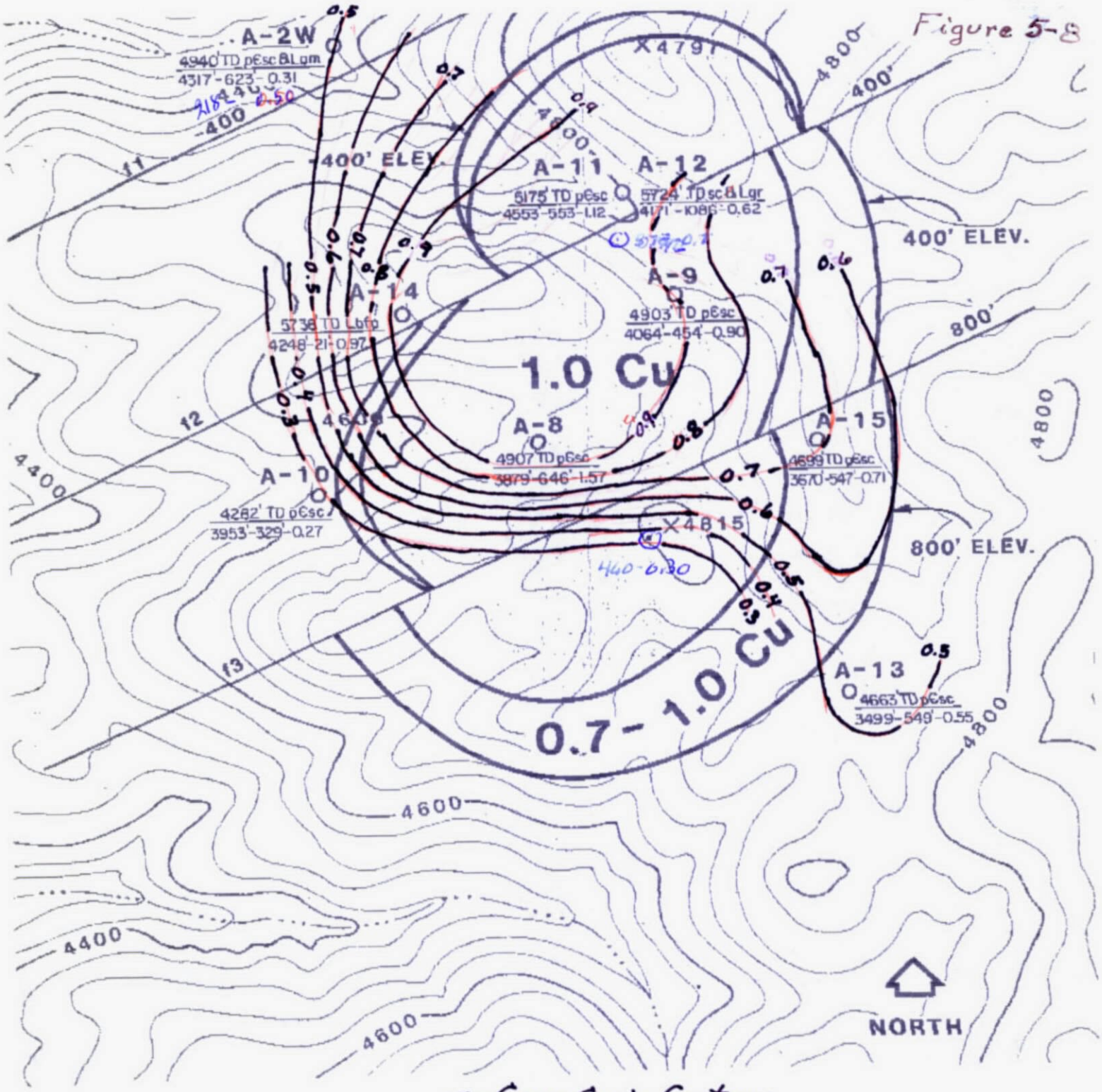
1" = 500'

JDS

DEC 1985

6340 12/85

Figure 5-8




—0.7—Copper Grade Contour

T. 1 S., R. 13 E.

A-8 ASARCO hole & designation
4907' TD pЄcs total depth rock type
3879'-646'-1.57 depth-length-%copper

PRE-MINERAL ROCK TYPE

- Lbfp Laramide biotite feldspar porphyry
- Lqm Quartz monzonite
- Lgr Granite
- pЄsc Schist

# MODELED MINERAL ZONE OUTLINE

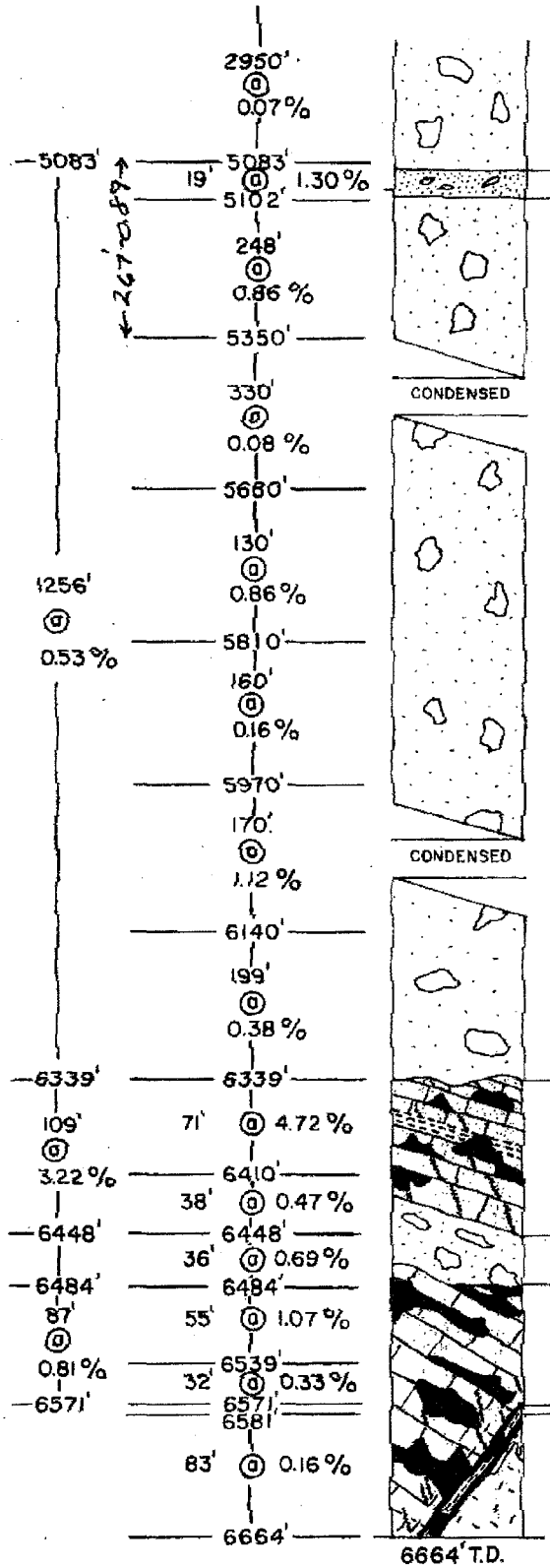
## SUPERIOR EAST PROJECT
## PINAL COUNTY, ARIZONA
## 1" = 500'

JDS

DEC 1985

6340 12/85

Figure 6-1




Whitetail Conglomerate

5083
5102 Lithic tuff marker

Whitetail Conglomerate

Typically mixed clast (schist, diabase, sediments, and porphyry) conglomerate (60%) interbedded with nearly homogeneous schist conglomerate (40%).

The mixed conglomerate is poorly sorted, relatively unpacked, with subrounded clasts set in fine to medium-grained matrix of brownish-red color. Clast/matrix ratio 60/40. Clast composition: schist 20-45%; diabase 30-50%; sediments 15-20%; porphyry 10%.

The schist conglomerate is well sorted, well packed, with clasts tabular in upper portions but becoming subrounded in lower section. Clasts set in fine-grained matrix of general dark red-brown color. Clast/matrix ratio 80/20. Clast composition: schist 90%; diabase 10%; rare sediments; porphyry up to 5%.

Copper occurs throughout as sheets along clast boundaries and as specks and sheets in clast and matrix; best in mixed conglomerate. Matrix contains gray greenish clay in lower portions in both mixed and schist conglomerate.

6339

Allochthon Limestone Block. Brecciated; moved from west; replacement zone totally oxidized; secondary oxidized copper along breccia openings

6448

Whitetail Conglomerate. Mixed conglomerate.

6484

Autochthon Limestone Block. Massive replacement textures with hematite, specularite, silica, and sulfides (now oxidized).

6571-6581 Fault Zone (1.44% Cu).

Tertiary quartz monzonite with Precambrian schist inclusions; both weakly altered and weakly mineralized.

TO ACCOMPANY Report
DATED Aug. 31, 1972
BY J.D. Sell

Graphic Log and Assay Groups
of Mineralized Units
in Drill Hole A-4

SCALE: 1" = 150'

J.D.Sell August 22, 1972

A-10

3953-3971 = 18' @ 0.53

3971-4096 = 125' @ 0.27

4096-4179 = 83' @ 0.15

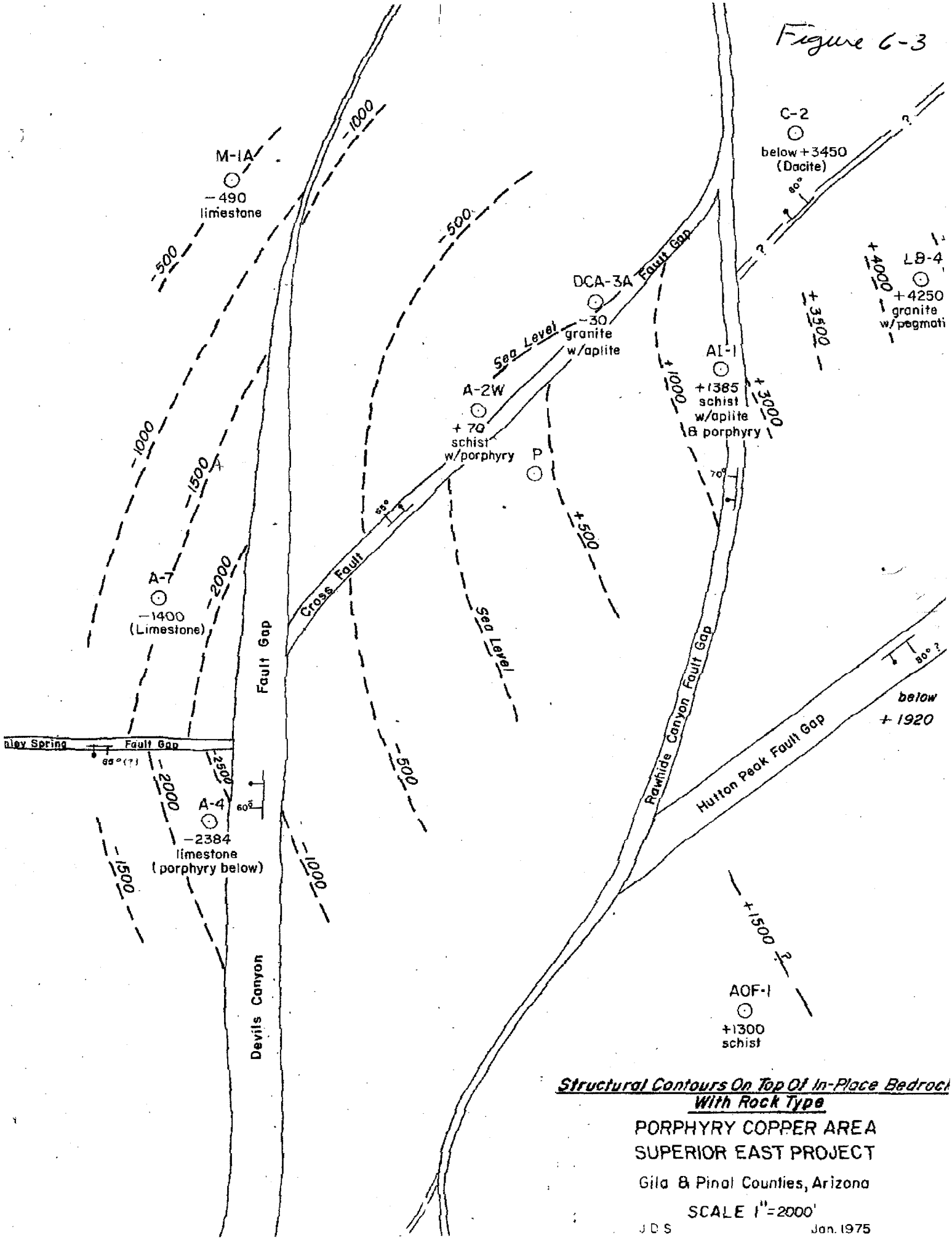
4179-4234 = 55' @ 0.33

4234-4249 = 15' @ 0.82

4249-4282 = 33' @ 0.07

329' @ 0.27

Figure 6-3




**Structural Contours On Top Of In-Place Bedrock With Rock Type**

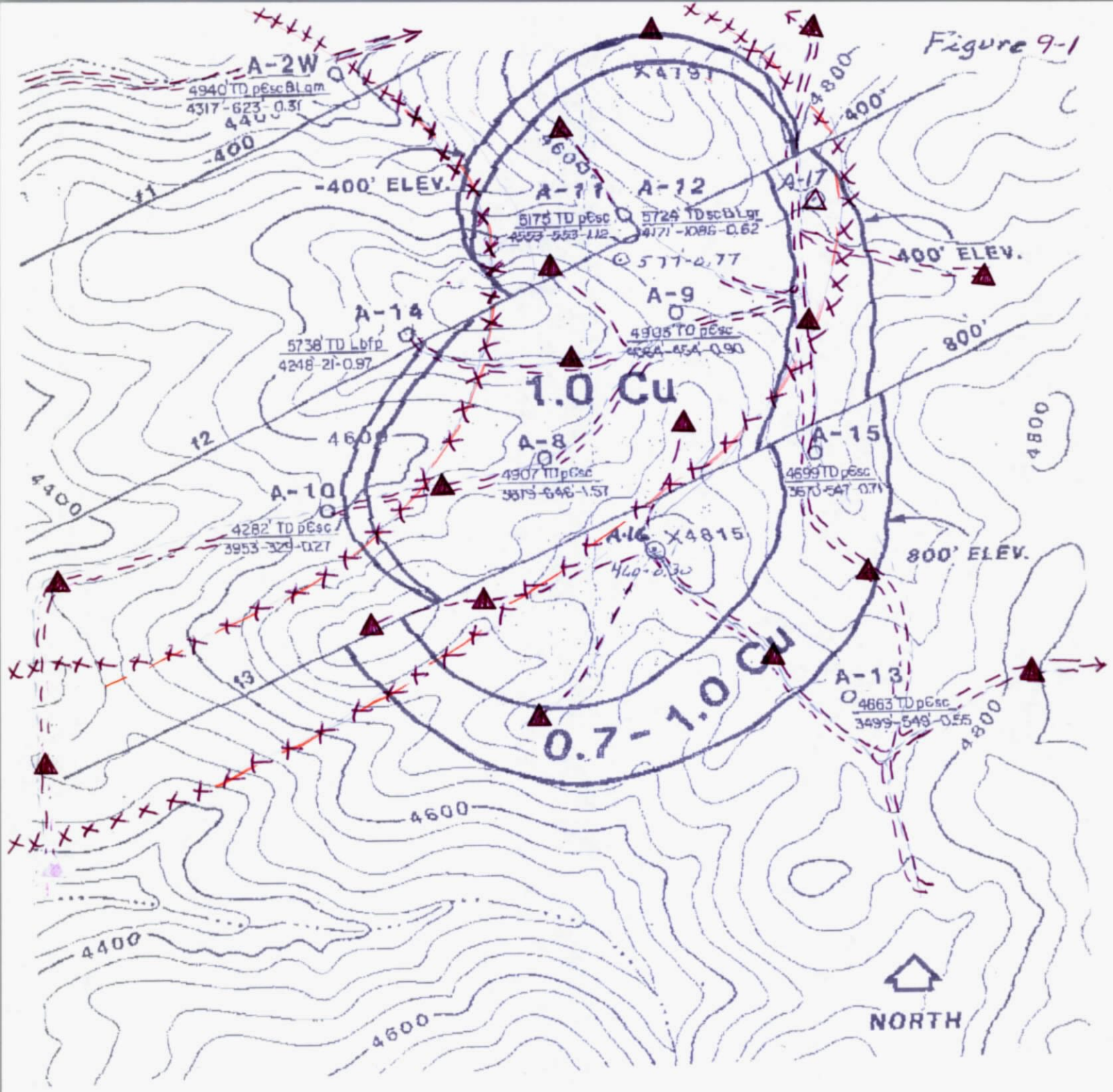
PORPHYRY COPPER AREA
SUPERIOR EAST PROJECT

Gila & Pinal Counties, Arizona

SCALE 1"=2000'

JDS Jan. 1975

Figure 9-1




T. 1 S., R. 13 E.

A-8 ASARCO hole & designation

4907' TD pЄcs — total depth rock type

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# MODELED MINERAL ZONE OUTLINE

SUPERIOR EAST PROJECT
PINAL COUNTY, ARIZONA
1" = 500'

JDS

DEC 1985

6340 12/85