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http://www.azgs.az.gov
inquiries@azgs.az.gov

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James Doyle Sell Mining Collection

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AMERICAN SMELTING AND REFINING COMPANY
SOUTHWESTERN EXPLORATION DIVISION
P. O. BOX 5747, TUCSON, ARIZONA 85703

1150 NORTH 7TH AVENUE
TELEPHONE 602-792-3010

March 3, 1972

Mr. Wayne H. Burt, President
Magma Copper Company
San Manuel, Arizona 85631

Belmont Area

Dear Mr. Burt:

I wish to thank you and Messrs. Goss, Steele, and Hammer for meeting with Mr. Sell and myself March 2, 1972, at your office. As outlined to you, Asarco believes the area from the Belmont mine eastward is a prime locality for the discovery of major copper replacement orebodies. Asarco desires to joint venture exploration with Magma Copper Company in the search for these orebodies. We envision starting a drilling program near the old Belmont workings and proceeding eastward with a "fence" of drill holes to test the down dip extension of the replacement zones.

The outline of the land in which Asarco desires to joint venture with Magma Copper Company is shown on the attached map and, in general, consists of a N70E zone about 1-1/2 miles wide centered upon the old Belmont workings. All of this ground is presently controlled by Magma.

Asarco proposes a joint venture along the following terms: Asarco would pay 60% of the exploration costs in order to earn a 50% interest. At that time when the property passes from the exploration stage into the development stage, Asarco and Magma would share equally in the costs and equally in the profits.

I will be available to discuss the Belmont area at your convenience. Again, I should like to emphasize that Asarco believes the Belmont area houses a major orebody and wants to participate with Magma in the exploration for and development of this orebody.

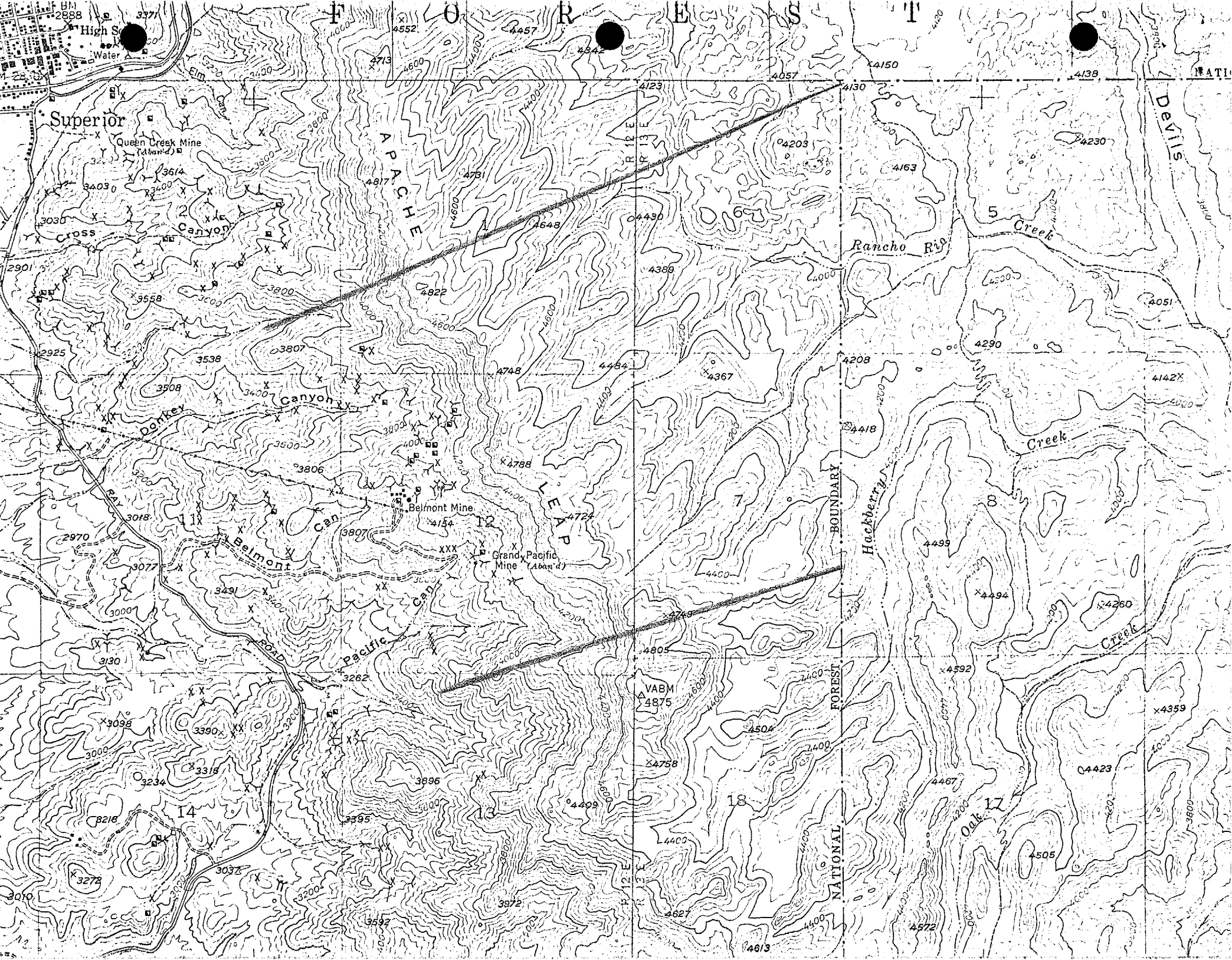
Very truly yours,

W. L. Kurtz

W. L. Kurtz
Manager of Exploration

WLK:lad
Attach.

cc: JDSell, RBCrist


F O R E S T
Superior
Queen Creek Mine
(Aban'd)
Cross
Canyon
Donkey
Canyon
Belmont
Road
Belmont Mine
Grand Pacific
Mine
(Aban'd)
Pacific
Can
APACHE
LEAP
Rancho Rio
Creek
Devils
Creek
Hackberry
Creek
Oak
Creek
BOUNDARY
NATIONAL
FOREST
VABM
4875
R 12 E
R 13 E
T 1 S
T 2 S
2
5
6
7
8
11
12
13
14
17
18

JDS-
JHC

can't put in money w/o knowing beforehand that can share in the production; however this is much better responce than anticipated!

RECEIVED
MAR 13 1972
S. W. U. S. EXPL. DIV.

MAGMA COPPER COMPANY

SAN MANUEL, ARIZONA 85631
(602) 385-2201

W. L. K.

MAR 13 1972

March 11, 1972

Mr. W. L. Kurtz
Manager of Exploration
American Smelting & Refining Co.
Southwestern Exploration Division
P. O. Box 5747
Tucson, Arizona 85703

Dear Mr. Kurtz:

This responds to your letter of March 3, 1972 concerning the possibility of a joint venture in the Belmont area.

It is our opinion that consideration of such a venture, if agreement can be reached, must be confined to exploration at this time. Any thought to joint participation in potential production operation would be premature.

Magma and ASARCO have a common interest in exploration in the Belmont area and the area immediately to the east of the Belmont ground. We are receptive to further discussion relative to such an exploration program.

Yours very truly,

Wayne H. Burt
President

WHB/aln

cc: HJSteele

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona
March 16, 1972

MEMORANDUM FOR FILES

Belmont Area
(Magma Mining Company)

I talked with Mr. Burt today and he agreed to call early next week to set up another meeting to discuss an Asarco-Magma joint venture in the Belmont Area.

Of interest is the fact that Burt said Asarco is interested because of State sections 4 and 5. I informed him (as I did at our last meeting) that Asarco was interested in the area near Belmont and that our best educated guess at this time would be that the potential orebody lies wholly within Magma ground. Asarco would like the right to help explore for and develop this potential on Magma ground. Hopefully, Magma's understanding of this will not negate a joint-venture agreement.

W. L. Kurtz

WLK:lad

cc: JDSell

~~JHC~~, ~~JDJ~~, ~~RHC~~, ~~RDC~~

MAGMA COPPER COMPANY

SAN MANUEL, ARIZONA 85631

(602) 385-2201

RECEIVED MAY 3 1972 S. W. U. S. EXPL. DIV.

W. L. K. MAY 3, 1972

May 2, 1972

Mr. W. L. Kurtz
Manager of Exploration
American Smelting & Refining Co.
Southwestern Exploration Division
P. O. Box 5747
Tucson, Arizona 85703

Dear Bill:

Please excuse the delay in getting back to you concerning joint participation in exploration of the Belmont area at Superior. We have considered your proposal for joint participation in the Belmont area and the area controlled by ASARCO to the east of the Belmont and have decided against such an arrangement at this time.

Sincerely,

Wayne H. Burt
President

WHB/aln

cc: HJSteele

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

June 9, 1972

Mr. J. J. Collins
Director of Exploration
New York Office

Magma
Belmont Area
Pinal County, Arizona

Dear John:

As you recall, during your visit to Tucson in April, we discussed the possibility of joint venturing exploration in the Belmont Area (south of Magma's mine at Superior) with Magma in the search for bedded copper replacements on ground controlled by Magma.

Mr. Wayne Burt, president of Magma, has informed us that Magma does not want to participate in joint venture exploration in the Belmont area. Since being informed of Magma's negative stance, we have learned that they are proceeding to explore this area by drilling.

Very truly yours,

Bill

W. L. Kurtz

WLK:lad

cc: JHCourtright
RBCrist
JDSell

ASARCO

Exploration Department
Frederick T. Graybeal
Chief Geologist

December 2, 1993

RECEIVED
DEC 0 7 1993
EXPLORATION DEPARTMENT

Mr. J. D. Sell
Tucson Office

Superior East Project
Arizona

You have a copy of my August 16, 1993 letter to Mr. Acosta of Magma which offers to sell the 40 acre parcel at Superior East for $1,000/acre ($40,000 total) and a 3% NSR on any metal or mineral produced from the Asarco ground. This offer to sell was made subject to prior review by Asarco of all drill information available to Magma within 4,000 feet of the boundary of the 40 acre parcel.

Enclosed please find a copy of the September 28, 1993 letter from Mr. Acosta to me which accepts our offer on the 40 acre parcel. Also enclosed is a November 8, 1993 letter from Mr. Manske of Magma which includes drill logs from all holes completed by Magma within the 4,000 foot perimeter of the 40 acre parcel. Please review these logs to determine whether there is any indication in them that the 40 acre parcel ought not to be sold. Please also forward to Mr. Manske logs with assays (no reports) of any holes drilled by Asarco within that same 4,000 foot perimeter. As discussed by you and I over the phone today, hole A-3 is the only Asarco hole which would fall within that 4,000 foot perimeter.

After you have completed your review of the Magma logs please phone me and I will call Mr. Acosta with regard to completing the sale of the parcel if there are no reasons to withdraw the offer. Please complete this review at your earliest opportunity so that we may complete this little item of business.

Very truly yours,

F. T. Graybeal

F. T. Graybeal

Enclosures

cc: TEScartaccini
PGVikre

log, assay, hole survey, temperature 229-4256

ASARCO Incorporated 180 Maiden Lane New York, N.Y. 10038 (212) 510-2000 Fax: (212) 510-1978

MB-5. Collar 4160' NE NE NW, Sec. 8, T2S, R13E.

Magma log starts in Tw at 1791', Core.

R Surface 1791 — April 1974

C 1791 - 3655 T.D. — 6/18/74.

Tgl 0-720 (720)

Tw 720 - 2537 (1817)

TPNaco 2537 - 2775 (238)

Porphyry "Mine" sill(?) 2775 - 2796 (21) — upper contact 60°, lower contact 70° to core axis — Prob. steep basal cont. of block.

TPNaco 2796 - 3235 (439) with basal maroon shale 3200-3235.

Me 3235 - 3438 (203) w/ rept beds, oxidized

Dm 3438 - 3655 T.D. (217)

Type log only, no assays. Notes include:

Tw trace Cu in db fragments and gypsum bands.

TPNaco minor FeOx

Me some FeOx, carbonate veins

Dm calcite veins, talc.

MB-6A Collar 4020 SWSWSW Sec 6, T25, R13E.
Original hole MB-6 lost early in drilling, started MB-6A at same site.
? Rotary hole MB-6, ~~cored hole MB-6A?~~ or initial ?

Magma log starts in Tw at 1803'

Rotary Surface - 1803 July 1975
Core 1803 - 3668 T.D. Aug-Dec 1975

Tql 0 - 800 (800)
Tw 800 - 2209 (1409)
Pnaco 2209 - 2838 (629)
Me 2838 - 3217 (379) flts at base
Dm 3217 - 3556 (339)
pebdsa 3556 - 3668 T.D. (112)

typed log only, no assays, Notes include:
Tw sparce cu (<0.1%)
Pnaco FeOx-MnOx on steep veinlets, oxidized
Me FeOx-MnOx, veins & along bedding, oxidized.
Dm at 3298 have 3" sphalerite-galena along bedding plane in "B" horizon, mainly oxidized. at 3450 irregular carbonate replacement. "A" bed at 3446-3541 with minor FeOx-MnOx & carbonate veinlets.
pebdsa FeOx coatings with pyrite casts at 3637. Below 3637 have 0.5% pyrite by volume to T.D. (3668).

MB-7 (Outside 4000' boundary).

On sheet with MB-8 with no footages.

NWSWNE, Sec 8, T25, R13E

? on depths.

Collar 3870' ¢ Sept 75-Jan 76, Sept-Oct 1977

Tgl 0-1100 (1100)

Tw 1100-3050 (1950)

Pnaco 3050-3090 (40) measured from section

Me 3090-3255 (165) " " "

Dm 3255-3890 (635) T.D. " " "

No info on mineralization.

MB-8 Collar 4100, NE 1/4 SW 1/4 SW 1/4, Sec. 8, T2S, R13E

Magma starts in Tw & data measured from Figure/Section with elevation notations.

Tgl Surface - 1000 (1000)
Tw 1000 - 2640 (1640)
Pnoco 2640-3365 (725)
Me 3365-3510 (145)
Dm 3510-3820 (310)
porphyry 3820-3850 (30)
Dm 3850-3900 (50)
Ebdsa 3900-3924 (24) T.D.

No assay info other than quartz, disturbed on Figure/Section (pre-mineral cents) along with MB-7.

MB-9. Collar 4122 SE¼N W¼ NW¼, Sec. 6, T2S, R13E

R, Sept-Oct 1991 Surface - 2115

C Nov 1991 - Jan 1992 2115 - 3267 T.D.

Tgl Surface - 1168 (1168) (dacite)

R 1168 - 1230 (62) vitrophyre

1230 - 1253 (23) tuff.

Tw 1253 - 2115 (862) (1402)

C Tw 2115 - 2655 (540)

Tbx 2655 - 3267 (612) T.D.

Mineralization

~~Tw 1480-1620 = 140 @ 0.17% Cu~~

~~also best zone 2010-2010 = 110 @ 0.21% Cu~~

In Tw 1485-1525 = 40' @ 0.18% Cu

Tw 1525 - 1685 = 160' @ 0.10% Cu.

Tbx oxidized to 2860±

Tbx 2655 - 2745 oxidized w/ 0.2% Mn

Tbx 2845 - 2945 = 100' @ 0.39% Cu, 0.30 oz/T Ag

and minor Pb Zn Mn.

Tbx best: 3025-3050 = 25'

@ 1.36% Cu

0.09% Pb

1.34% Zn

0.09% Mn

0.84 oz/T Ag

MB-10 Collar 4031' NE NW NW, Sec. 6, T25, R13E.

R Oct-Nov. 1991
(0-2118) T.D.

Tgl : 0 - 1170 (1170) clastic
1170-1225 (55) Vitrophyre (1230)
1225-1230 (5) tuff
Tw 1230-2118 (888)
T.D.

? on why they didn't core this hole.

Mineralization
Tw 1480-1620 = 140' @ 0.15 % Cu
TW 2000-2010 = 10' @ 0.21 % Cu (last sample)

MB-11 Collar 4080 NE, NW SW, Sec 4, T2S, R13E

~~C 0-1367 H~~

C Jan-March 1992
(0-3367) T.D.

Tgl 0-996 (996) dacite
996-1041 (45) vitrophyre (1068)
1041-1068 (27) tuff
Tw 1068-1450 (382) 1065-2[illegible]?
Tbx 1450-3367 (1917) T.D.

Mineralization
Tw 1160-1220 = 60' @ 0.20% Cu
Tw 1480-1490 = 10' @ 0.14% Cu
Tbx vn 2500-2530 = 30' @ tr Cu, tr Pb, 0.56% Zn, 1.32% Mn sulfide
Tbx vn 2905-2915 = 10' @ 0.83% Cu, 0.61% Pb, 4.47% Zn, 0.55% Mn
Tbx vn 3200-3220 = 20' @ 0.25% Cu, 13.25% Pb, 2.14% Zn, 0.29% Mn

Tbx overall 2560-3367 T.D. = 807' @
tr Cu, tr Pb, 0.93% Zn, 0.61% Mn

MB-11 A. Inclined -80°, due South. Collar 4080

NE NW SW, Sec. 4, T2S, R13E

(Same pad as MB-11).

C Dec 1992 - April 1993

(0-4667) T.D.

Tgl 0-980 (980) dacite

980-990 (10) Vitrophyre (1017)

990-1017 (27) tuff

Tw 1017-1459 (442)

Tbx 1459-4667 T.D (3208)

Mineralization

Tw 1135-1175 = 40' @ 0.23% Cu

Tbx overall, similar to MB-11

Tbx vn 2805-2840 = 35' @ tr Cu, tr Pb, 1.44% Zn, 6.21% Mn

~~Tbx vn 4232-4235 = 3' @ 2.40% Cu, tr Pb, tr Zn, tr Mn~~

Tbx vn 4570-4585 = 15' @ 1.53% Cu, tr Pb, tr Zn, tr Mn

MB-11B Wedge from MB-11A at 2792' in Tbx -63° at 51° N.
April-June 1993

Tbx 2792-3448 (656)
Ebolsa 3448-3528 (80)
Tbx 3528-4220 (692)
pEdb 4220-4349 T.D. (129) (block in Tbx?) (See MB-11A)

Mineralization

Started in Tbx. Similar overall to MB-11.

Tbx vn 3275-3285 = 10' @ tr Cu, tr Pb, 0.38% Zn, 1.35% Mn
Tbx vn 3310-3320 = 10' @ tr Cu, tr Pb, 0.18% Zn, 1.20% Mn
Tbx vn 3360-3370 = 10' @ tr Cu, tr Pb, 10.0% Zn, 0.47% Mn
Tbx vn 3615-3620 = 5' @ 0.20% Cu, 1.2% Pb, 3.5% Zn, 0.31% Mn
Tbx vn 3805-3810 = 5' @ 1.75% Cu, 0.40% Pb, 0.96% Zn, 0.20% Mn
& 0.73 oz/T Ag

MB-12 Collier 4106 SE NW SW, Sec 6, T25, R13E
C April-July, 1992 (0-4008) T.D.

Tgl 0-967 (967) Lavas
967-1041 (74) vitrophyre (1053)
1041-1053 (12) tuff
Tw 1053-1342 (289)
Tbx-Seds 1342-2712 (1370)
TPnw w/Tbx 2712-3356 (644)
Me w/Tbx 3356-3510 (154)
Tbx 3510-3842 (332)
pEdb 3842-4008 T.D. (166)

Mineralization

Tw 1060-1080 = 20' @ 0.46 % Cu.
Tbx Seds 1894-2712 = 818' @ tr Cu, tr Pb, tr Zn, 0.52 % Mn.
with best: 2229-2242 = 13' of 0.48% Cu, tr Pb, 1.95% Zn, 6.25% Mn
TPnw w/Tbx 2712-3356 = 644' of tr Cu, tr Pb, 0.03% Zn, 0.10% Mn
with best: 3220-3270 = 50' of tr Cu, tr Pb, 0.04% Zn, 0.29% Mn.
Me w/Tbx 3356-3510 = 154' of tr Cu, tr Pb, tr Zn, 0.73% Mn.
with best: 3356-3362 = 6' of 0.18% Cu, 1.8% Pb, 8.3% Zn, 4.4% Mn
lower Tbx 3510-3842 = 332' of tr Cu, 0.77% Pb, 1.94% Zn, 1.06% Mn.
with 3520-3550 = 30' of 0.04% Cu, 3.08% Pb, 4.33% Zn, 2.79% Mn.
with 3610-3625 = 15' of 0.05% Cu, 1.40% Pb, 3.82% Zn, 0.52% Mn.
with 3645-3695 = 50' of 0.44% Cu, 2.65% Pb, 4.38% Zn, 1.28% Mn
pEdb 3842-4008 T.D. = 166' of tr Cu, 0.38% Pb, 1.20% Zn, 0.75% Mn
with 3850-3860 = 10' of 0.22% Cu, 0.89% Pb, 3.48% Zn, 0.58% Mn
with 3880-3895 = 15' of 0.20% Cu, 0.43% Pb, 3.33% Zn, 1.76% Mn

MB-12A. Same pad as MB-12 Collar 4105
inclined -80°, bearing South 5° W.
C June-Sept, 1993
(0-3527 T.D.)

Tgl 0- 947 (947) dacite
947- 1007 (60) vitrophyre (1014)
1007- 1014 (7) tuff
Tw 1014-1300 (286)
Tbx 1300-1816 (516)
Pnaco 1816-2489 (673)
Me 2489-2751 (262)
Dm 2751-2851 (100)
Ebdsa 2851-3181 (330)
pedb 3181-3527 T.D. (346)

Mineralization

Tw best 1014-1030 = 24' of 0.28% Cu
Tbx No Assays
Pnaco best, 1925-1935 = 10' oxidized of 0.13% Cu, 0.34% Pb, 1.2% Zn, 2.0% Mn, 1.30 oz/T Ag
" , 2005-2025 = 20' of 0.05% Cu, tr Pb, 0.46% Zn, 1.4% Mn.
" , 2415-2420 = 5' of tr Cu, 0.26% Pb, 0.12% Zn, 1.0% Mn.
Me - "D" bed partially oxidized 2530-2570 = 40' of 0.31% Cu, 0.08% Pb, 2.13% Zn, 4.69% Mn, 0.80 oz/T Ag
Dm oxidized No Assays, log says "A" bed 5% replaced w/ some spholerite
Ebdsa sulfide No Assays, log says some marcasite, py, Cu_2S some.
pedb sulfide No Assays, log says some carbonate.

Tbx

	M-10	M-11	M-12
Tbx	2845-2945	2560-3367	3510-3842
	= 100'	= 807'	= 332'
	= 0.39% Cu	tr Cu	tr Cu
	tr Pb	tr Pb	0.77% Pb
	tr Zn	0.93% Zn	1.94% Zn
	tr Mn	0.61% Mn	1.06% Mn
	0.30 oz Ag		
best	3028-3052	2500-2530	3445-3495
	= 22' of	= 30'	= 50'
	1.54% Cu	tr Cu	0.44
	0.18% Pb	tr Pb	2.65
	1.46% Zn	0.56% Zn	4.35
	0.09% Mn	1.32% Mn	1.28

Rafl Bed Units

			Cu	Pb	Zn	Mn	oz/T Ag
	Pm						
12	3220-3270 = 50'		tr	tr	0.04	0.29	0.02
12A	1925-1935 oxd = 10'		0.13	0.36	1.20	2.00	1.3
12A	2005-2025	20	0.05	tr	0.46	1.4	0.02
12A	2415-2420	5	tr	0.26	0.12	1.0	0.23
			2.85	8.4	25.8	47.5	15.57
	ave	21	0.03	0.10	0.28	0.79	0.18
	Me						
12	3354-3362	6	0.18	1.8	8.3	4.40	1.29
partially ox 12A	2530-2570	40	0.31	0.08	2.13	4.49	0.80
	Pedb						
12	3850-3860	10	0.22	0.09	3.48	0.58	0.46
12	3880-3895	15	0.20	0.43	3.33	1.76	0.80

~~12A only none carbone~~

St	Cu	Pb	Zn	Mn	Au	Ag
5	0.71	0.04	1.09	0.04	0.001	0.26
5	4.28	0.32	3.80	0.04	0.001	1.75
5	0.23	0.03	0.39	0.06	0.010	1.08
5	0.09	0.01	0.19	0.14	0.001	0.08
5	1.50	0.05	1.06	0.15	0.004	1.05
	1.36	0.09	1.31	009	0.003	0.84

5	0.44	5	1.6
5	1.81	5	1.3
10	0.32	5	1.9
5	0.41	~~B~~	1.5
10	0.41	5	2.1
		~~B~~	4.0
		10	0.79
	(10)	10	0.44

Prod Repl Limits

~~Pr~~	PN						
12	3220-3270	50'	tr	tr	0.04	0.29	
12A	1925-1935	10'	0.13	0.34	1.20	2.00	1.30
12A	2005-2025	20	0.05	tr	0.46	1.40	
12A	2415-2420	5	tr	0.26	0.12	1.00	
	Me						
12							

Note: Scot Stock pond on Hy Section

See: Sal

Surface rights need to be secured

Maybe hole need a cover 12/13/93

? Magma Hole MB-13 within 4000'
just S of well # 4367 in upper sec. Sec. 7. S of MB-12, W of MB-6

? on hole MB-6A is this an inclined hole?
or is MB-6 the rotary portion ?

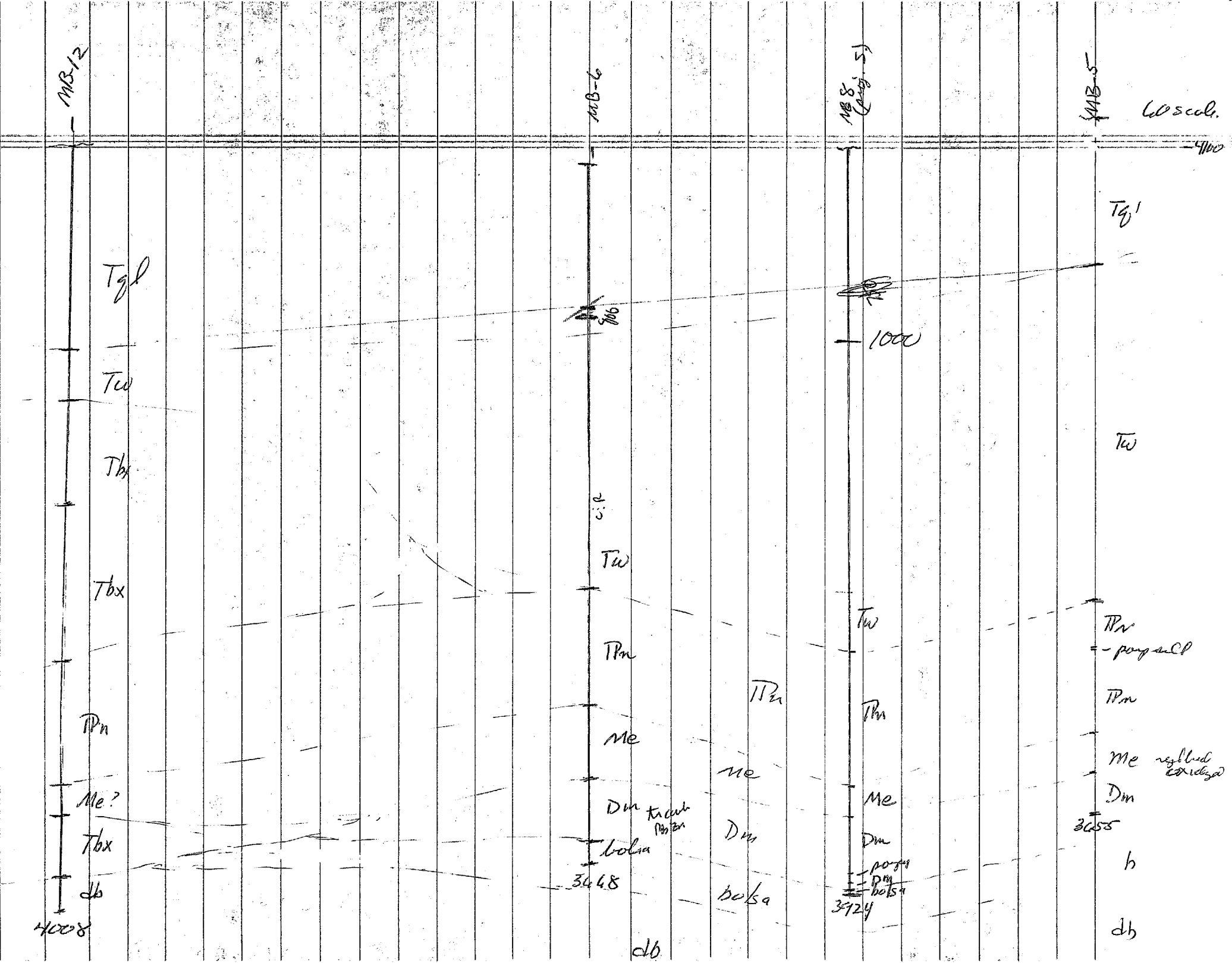
No, MB-4 lost in TQ-Tw & abandoned & started 6A on ramped
SL Maybe 12/13/93

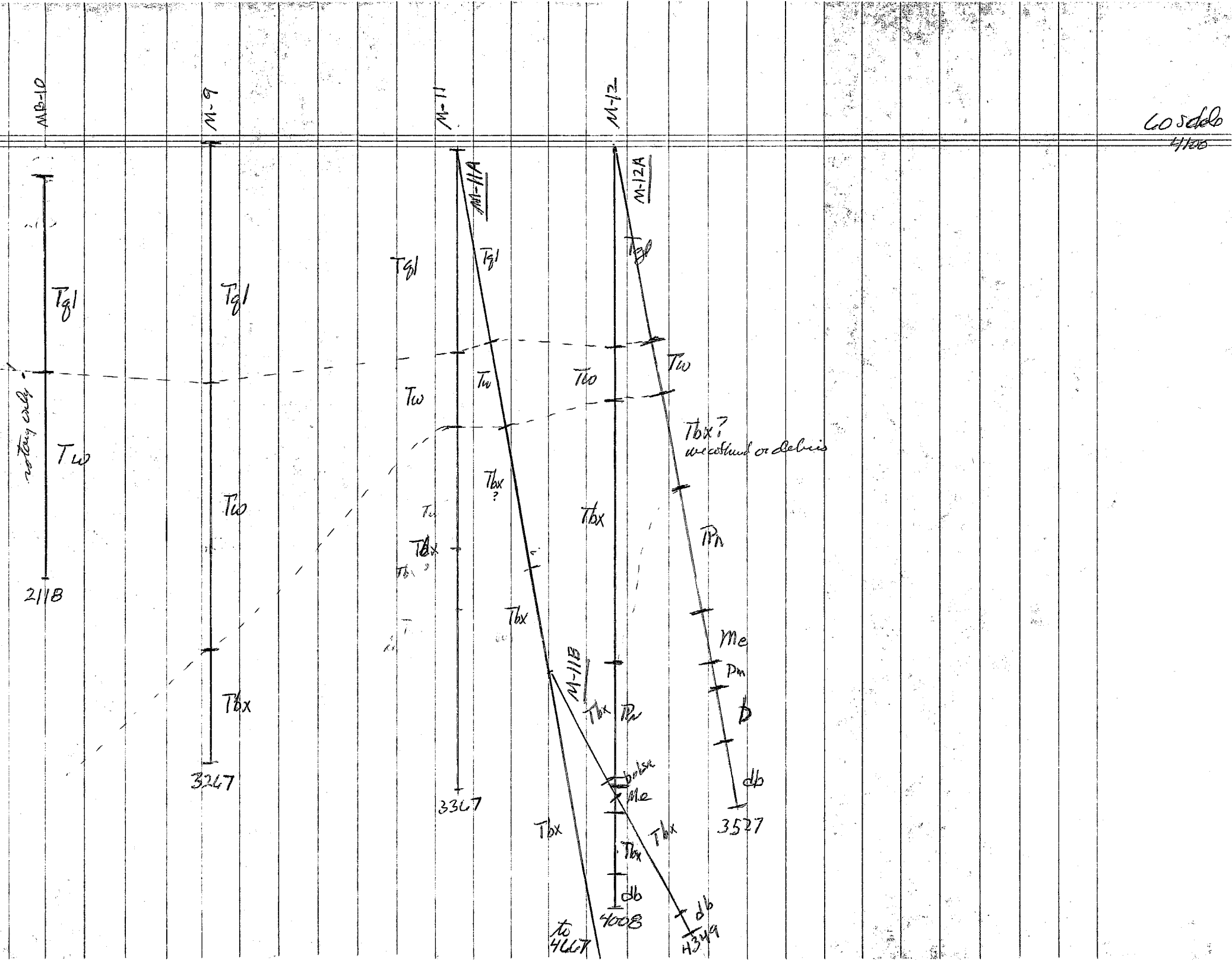
Tw -3050

Nco 3050-3090 (40)

Me 3090-3255 (165)

Dm 3255-3890 (635) T.D.


MB-12
MB-6
MB-5
60 scale
4100
Tgl
Tw
Tbx
Tbx
TPn
Me?
Tbx
db
4008
Tw
TPm
Me
Dm
bolsa
3448
db
TPn
Me
Dm
bolsa
1000
Tw
TPm
Me
Dm
3724
Tgl
Tw
TPn
TPm
Me
Dm
3655
db


M-10
M-9
M-11
M-12
Cosdolo
4/1/06
M-11A
M-12A
M-11B
Tgl
Tw
Tbx
Tbx?
wreckhead or debris
Pn
Me
Pm
b
db
211B
326.7
336.7
352.7
400.8
434.9
to 466.7
not to scale

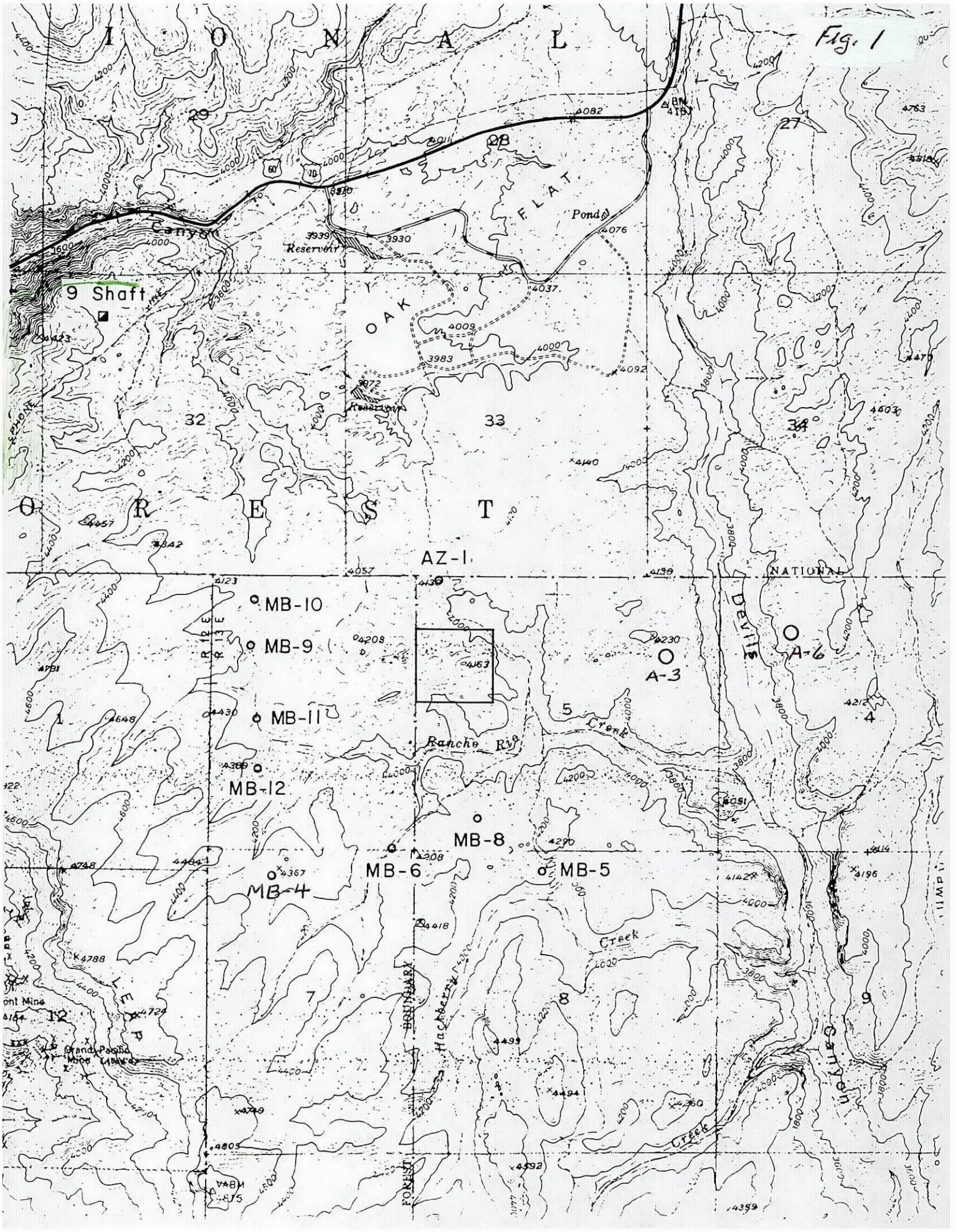
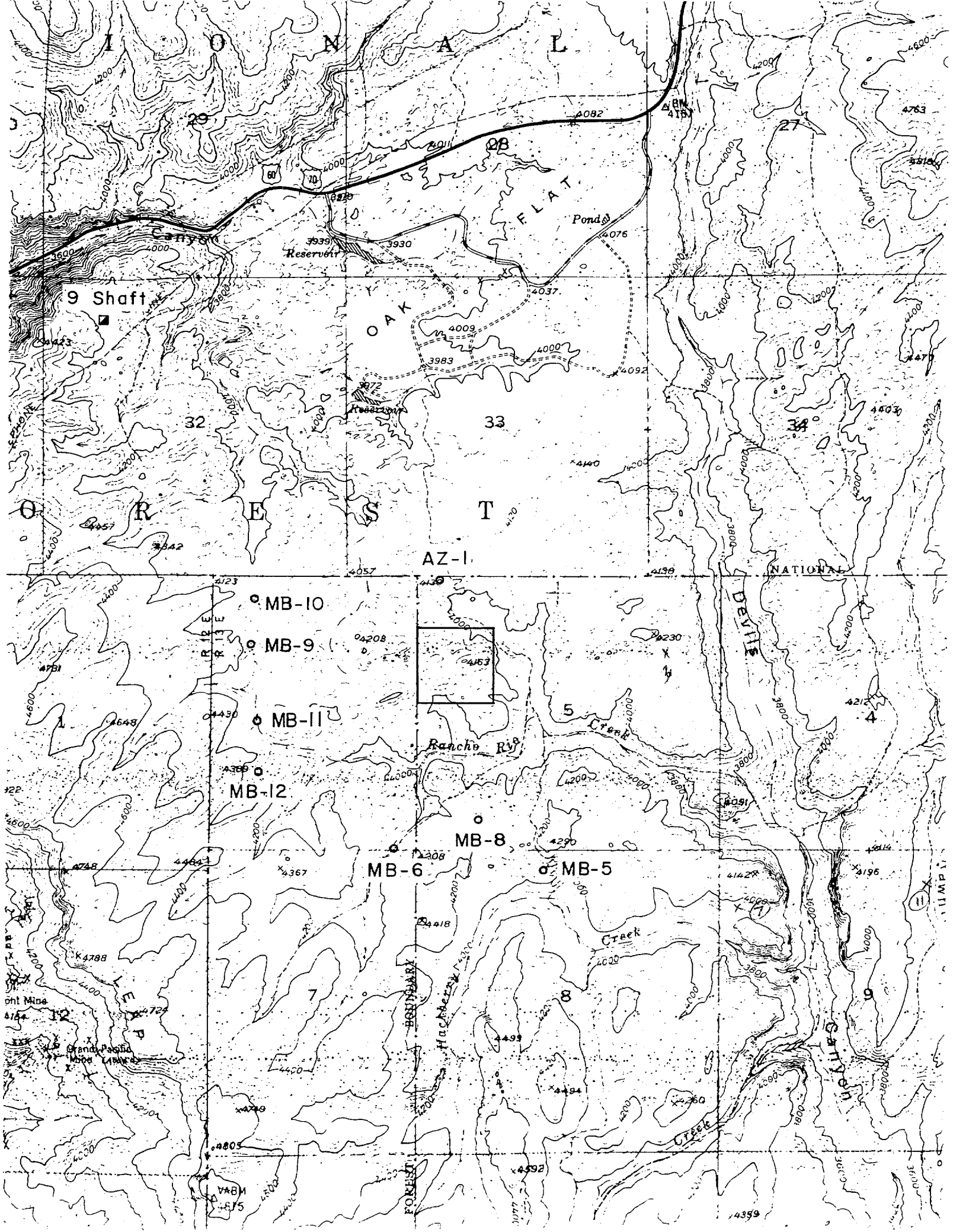


Fig. 1
I O N A L
F O R E S T
NATIONAL
OAK FLAT
Ponds
Reservoir
Canyon
9 Shaft
AZ-1
MB-10
MB-9
MB-11
MB-12
MB-8
MB-6
MB-5
MB-4
A-3
A-6
Rancho Rd
Creek
Hackberry
Devils
Canyon
BOUNDARY
FOREST
RIDGE
Grand Pacific Mine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27
Canyon
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F L A T
9 Shaft
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AZ-1
NATIONAL
MB-10
MB-9
MB-11
MB-12
MB-8
MB-6
MB-5
Ranch Rd
Devils
Creek
Canyon
Hackberry
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Grand Pacific Mine

JDS

F. T. G.
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EXPLORATION DEPT

MAGMA COPPER COMPANY
SUPERIOR MINING DIVISION

"Pursuing Team Excellence"

P.O. Box 37 Superior, Arizona 85273-0037
(602) 229-4256, Fax (602) 229-4323

November 8, 1993

Frederick T. Graybeal
Chief Geologist, Exploration Department
ASARCO, Inc.
180 Maiden Lane
New York, NY 10038

RECEIVED
DEC 07 1993
Tucson
EXPLORATION DEPARTMENT

Dear Mr. Graybeal:

In reference to terms proposed in yours of August 16, 1993, regarding the Superior East 40 acre parcel (comprising the SW¼ NW¼ of Section 5, T2S, R13E in the Superior quadrangle, Arizona), enclosed please find copies of all extent logs for Magma Copper drill holes lying within 4,000 feet of the perimeter of the parcel in question. The quality of the data is variable and unfortunately records for some of the older drilling has been lost (in particular holes MB-5, MB-6, and MB-8). No log was made for hole AZ-1, as this was a shallow rotary bore that stopped at 600' total depth in Tertiary dacite, the identical formation exposed at the surface.

Also enclosed is a 1:24000-scale topographic map with the drill hole locations relative to Magma Copper's #9 Shaft facilities and the 40-acre parcel (shaded).

Sincerely yours,

Scott L. Manske

Scott L. Manske above phone or 602-689-2444 ext. 256
Staff Geologist

Enclosure
cc: Alex Acosta
Mark VanDyke Sander
Alex Paul

This package to JD Sell.

MAGMA COPPER COMPANY
SUPERIOR MINING DIVISION

"Pursuing Team Excellence"

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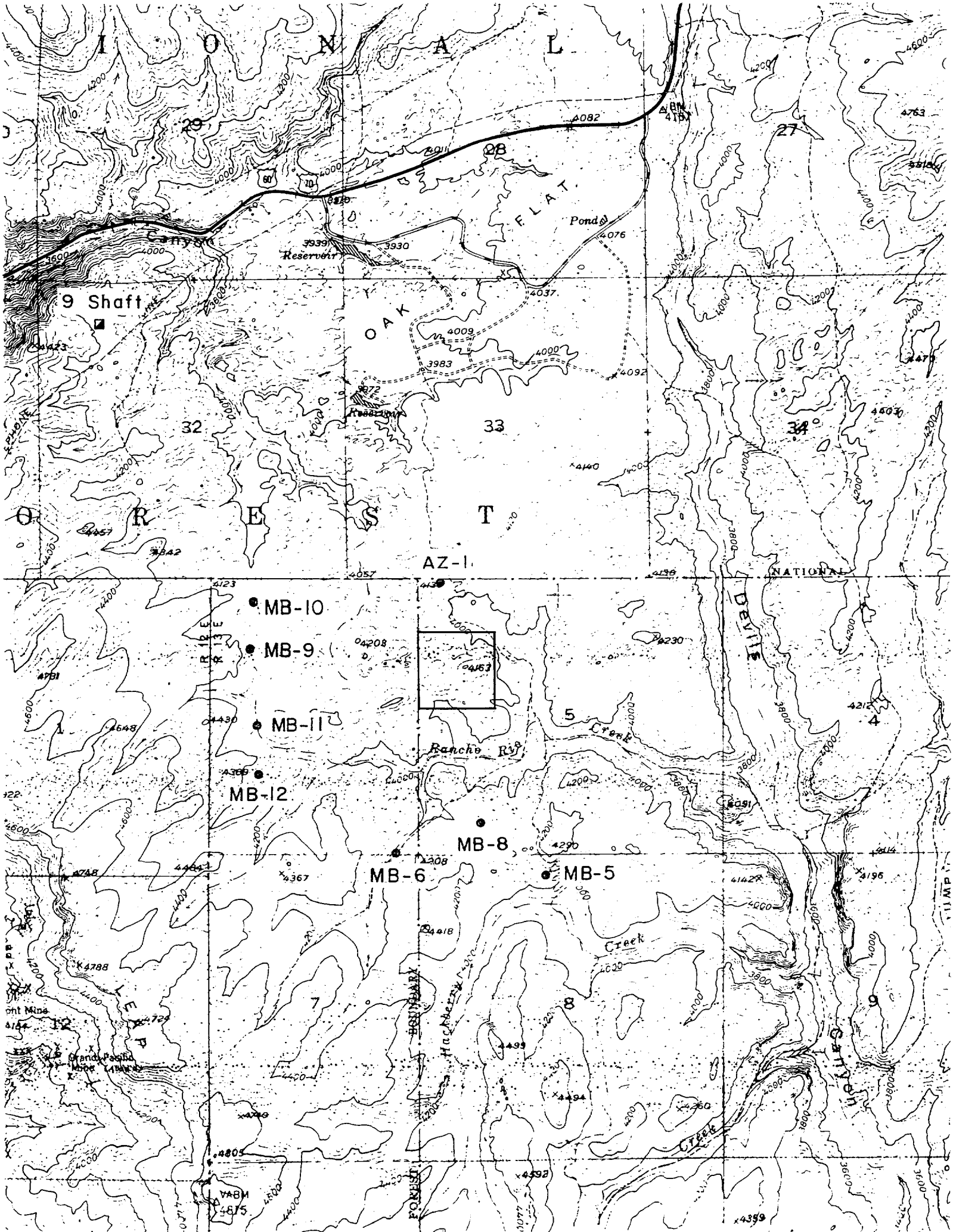
I O N A L
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MB-11
MB-12
MB-8
MB-6
MB-5
Rancho Rio
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orated

38-4930

FIRST
CLASS
MAIL

ASARCO

ASARCO Incorporated
180 Maiden Lane, New York, N.Y. 10038-4991

To:

MR. J. D. SELL

TUCSON OFFICE

ASARCO, Incorporated
P.O. Box 5747
Tucson, Arizona 85703

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EXPLORATION DEPARTMENT

MAGMA COPPER COMPANY - SUPERIOR DIVISION

Magma - Belmont
Diamond Drill Hole No. 5

1791'-1795' Tertiary Whitetail limy siltstone; maroon to chocolate; beds oriented $\pm 75^{\circ}$ to core's axis.

1795'-1830' Tertiary Whitetail sandstone; greenish-gray; fine to medium-grained; well sorted with abundant biotite and some muscovite; $\pm$25% clay. Below 1820' interval becomes more pebbly with schist clasts predominate with minor diabase.

1825'-1829' Fault at 60° to core's axis.

1830'-2206' Tertiary Whitetail conglomerate; greenish-gray; 40-60% angular to sub-rounded pebbles of schist, diabase and quartzite; $\pm$2% mineralized grains consisting of iron oxide. At 1820', a silt bed is oriented $\pm 70^{\circ}$ to core's axis; cobbles range to 18" in maximum dimension; $\pm$90% of clasts average about $\frac{1}{2}$" in maximum dimension.

1956'-1959' Ravelly, may be a fault.

2161' A bed is oriented 78° to core's axis.

2206'-2210' Tertiary Whitetail sandstone and siltstone; white; tuffaceous; beds oriented 80° to core's axis.

2210'-2430' Tertiary Whitetail conglomerate; similar to interval 1836'-2206'; native copper noted at 2370' and at 2374' as wires occupying fractures in a diabase clast; native copper at 2430' as grains entrained within a gypsum band.

2430'-2531' Tertiary Whitetail conglomerate; numerous large brecciated diabase blocks with abundant iron oxide; much serpentine and clay.

2460'-2470' Gougy; may be a fault.

At 2471' is a porphyry clast with native copper locallized within argillized plagioclase phenocrysts; beds are poorly developed but may be oriented about 40°.

2535'-2541' Gouge and breccia; may be a fault.

2531'-2534' Pennsylvanian Naco limestone; probably a boulder within the Whitetail conglomerate.

2534'-2537' Tertiary Whitetail conglomerate; gougy; may be a zone of fault breccia; contact with the underlying Naco beds appears to be normal and is subhorizontal in attitude.

2537'-2541' Pennsylvanian Naco limestone; light gray; stylolitic; cut by steep calcite veinlets.

2541'-2546' Pennsylvanian Naco limestone; brecciated with chocolate colored silt bands and irregular wisps of limy siltstone oriented 20° to core's axis.

2546'-2548' Pennsylvanian Naco limestone; similar to 2541'-2546'; brecciated and stylolitic.

2548'-2557' Pennsylvanian Naco siltstone; maroon with ±20% nodular limestone fragments; strongly brecciated.

2557'-2565' Pennsylvanian Naco limestone; medium-gray; generally fine-grained with numerous sparry fragments; stylolitized; brecciated; argillized along fractures; some minor iron oxide and manganese oxide with brown serpentine along steep fractures.

2565'-2566' Fault; gouge and breccia.

2566'-2573' Pennsylvanian Naco limestone; similar to 2557'-2565' with some manganese oxide on steep fractures.

2573'-2583' Pennsylvanian Naco limestone; medium-gray; some wispy silt bands; brecciated; much iron oxide along serpentinized fragment surfaces throughout this interval.

2583'-2591' Fault; ±25% limestone fragments in brown to red iron oxide

and silt.

2591'-2618' Pennsylvanian Naco limestone; light gray; fine-grained; stylolitized; brecciated with calcium carbonate, cement and calcite veinlets; some transported iron oxide along fractures; minor manganese oxide; as veinlets.

2618'-2624' Pennsylvanian Naco silty limestone; maroon; minor transported iron oxide along fracture surfaces.

2624'-2633' Pennsylvanian Naco siltstone; medium-dark gray to maroon; some limestone nodules; minor serpentinized patches.

2633'-2643' Pennslyvanian Naco limestone; pinkish; fine-grained; foraminal; beds oriented about 50° to core's axis.

2643'-2668' Pennsylvanian Naco limy siltstone; purplish; calcite veining.

2668'-2678' Pennsylvanian Naco limestone; medium gray; fine-grained.

2678'-2685' Pennsylvanian Naco silty limestone; purplish; beds at 40° to core's axis.

2685'-2686' Pennsylvanian Naco limestone breccia; oriented at 40° to core's axis.

2686'-2715' Pennsylvanian Naco limestone; medium gray; fine-grained; minor breccia zones with calcite cementing fragments; some leaching of calcite veinlets.

2715'-2723' Pennsylvanian Naco silty limestone; generally reddish; a few breccia zones with fragments coated by transported iron oxide; minor carbonate veining.

2723'-2726' Pennsylvanian Naco limestone; medium gray.

2726'-2736' Pennsylvanian Naco silty limestone; reddish; fine-grained.

2736'-2739' Pennsylvanian Naco limestone.

2739'-2775' Pennsylvanian Naco silty limestone; generally maroon and gray; fine-grained; beds oriented at 50° to core's axis;

minor calcite veinlets of random orientation.

2775'-2796'	Porphyry (dacite?); similar to mine porphyry; greenish-gray; consisting of 50% argillized plagioclase phenocrysts to 10 mm maximum dimension; 2% quartz as rounded phenocrysts; 8% hornblende; remainder fine-grained matrix; some iron oxide along contacts; may have been some minor indigenous pyrite; upper contact oriented 60° to core's axis; lower contact oriented 70° to core's axis; appears to be a sill.
2796'-2812'	Pennsylvanian Naco silty limestone; reddish to greenish; partly foraminal; partly nodular; beds oriented at 40° to core's axis.
2812'-2825'	Pennsylvanian Naco limestone; medium gray; fine-grained; cut by random calcite veinlets.
2825'-2826'	Fault with iron oxide along fragments of crushed limestone; structure oriented ±20° to core's axis.
2826'-2863'	Pennsylvanian Naco limestone; medium greenish-gray; sparry; irregular, poorly developed bedding planes.
2863'-2865'	Fault?; core fractured at 20° to axis; reddish; transported iron oxide coats fragments.
2865'-2878'	Pennslyvanian Naco limestone; medium gray; medium-grained; somewhat nodular with sparry grains; stylolitic; some random calcite veinlets.
2878'-2890'	Fault; fracture zone is sub-parallel to core with iron oxide cementing fragments.
2890'-2895'	Pennsylvanian Naco limestone; fine-grained; medium gray; beds oriented at 60° to core's axis.
2895'-2896'	Pennsylvanian Naco siltstone; yellow (bleached) with some iron oxide along fractures.
2896'-2917'	Pennsylvanian Naco limestone; medium gray; sparry; minor red iron oxide along fractures.

2917'-2919'	Fault?; gouge and breccia consisting of brown iron oxide soaked siltstone fragments; zone oriented $\pm 30^{\circ}$ to core's axis.
2919'-2928'	Pennsylvanian Naco limestone; medium gray; sparry; minor manganese oxide along stylolitic surfaces.
2928'-2929'	Pennsylvanian Naco siltstone; yellowish-brown; crushed.
2929'-2955'	Pennsylvanian Naco limestone; medium to light gray; fine-grained (marly) to medium-grained; stylolitic; some brown carbonate veining; abundant white calcite veining; rare chert bands.
2955'-2957'	Pennsylvanian Naco siltstone; dark bluish-gray; well foliated at 80° to core's axis.
2957'-2995'	Pennsylvanian Naco limestone; medium gray; fine-grained (marly) with sparry patches; stylolitic; some fossil trash; irregular bands of greenish-brown (bleached?) silt; beds oriented at 70° to core's axis.
2995'-2997'	Pennslyvanian Naco siltstone; greenish (bleached?).
2997'-3105'	Pennsylvanian Naco limestone nodules in siltstone matrix; greenish-gray with silt bleached green to 3065'; minor iron oxide along beds and fractures; beds at 70° to core's axis.
3105'-3111'	Pennsylvanian Naco silty limestone; dark greenish-gray (bleached?); irregular beds oriented about 70° to core's axis.
3111'-3114'	Fault; gouge and breccia generated from Naco siltstone and limestone; no mineralization.
3114'-3129'	Pennslyvanian silty limestone (similar to 3105'-3111').
3129'-3132'	Pennsylvanian Naco limestone in siltstone matrix; reddish.
3132'-3136'	Pennsylvanian Naco siltstone; reddish; well fractured; minor

iron oxide along parting planes and fracture surfaces.

3136'-3139' Pennsylvanian Naco nodular limestone set in reddish siltstone matrix.

3139'-3144' Pennsylvanian Naco siltstone; greenish; bleached; beds oriented 70° to core's axis.

3144'-3145' Pennsylvanian Naco nodular limestone set in greenish siltstone matrix.

3145'-3150' Pennsylvanian Naco limy siltstone; bleached greenish-gray; minor residual iron oxide pigment (may have contained minor original pyrite).

3150'-3152' Pennsylvanian Naco nodular limestone in greenish siltstone matrix.

3152'-3200' Pennslyvanian Naco limestone (partly silty); light to medium gray; strongly stylolitic with some calcite veining along steep fractures; at 3167', minor steep fault with 2" of gouge and breccia; at 3143' is a minor steep fault with 2" of breccia cemented by calcite; minor iron oxide along fragments throughout the interval with minor silt layers; silt generally bleached with some minor alteration clay developed within the silty zones; bleaching very pronounced below 2197'.

3200'-3235' Pennsylvanian Naco (maroon) shale; light greenish-yellow (strongly bleached); sheared and brecciated throughout; ±10% of interval gouge; some green serpentinized slicks along steep structure; rather abundant red and yellow-brown iron oxide stains along fractures; may have been minor indigenous sulfide content; much gouge from 3233'-3235' indicating a strong fault with some manganese oxide.

3235'-3237' Mississippian Escabrosa limestone; medium gray; fine-grained; hard (semi-replacement texture); unit ±395'

above base of Escabrosa.

3236'-3237' Rubble and breccias; probably a small fault.

3237'-3239' Mississippian Escabrosa limestone; similar to 3235'-3237' except ±5% manganese oxide replacement along beds.

3239'-3244' Mississippian Escabrosa limestone; medium gray; fine-grained (semi-replacement texture); minor calcite veining and some bands of recrystallized carbonate spar along beds; 2" of chert at 3244'.

3244'-3251' Mississippian Escabrosa limestone; coarse; sparry; moderately fractured with tan carbonate veinlets along fractures; some minor manganese oxide with rare alteration clay patches along fractures.

3251'-3282' Mississippian Escabrosa limestone; dark medium gray (replacement texture); fine-grained with abundant random white-tan calcite veinlets.

3260'-3261', 3265'-3266', 3270'-3271' are zones of much hydrothermal leaching with alteration clay and iron oxide along fractures oriented $\pm 40^{\circ}$ to the core's axis.

3282'-3283' Mississippian Escabrosa replaced bed; manganese oxide replacing a limestone breccia oriented $\pm 40^{\circ}$ to core's axis.

3283'-3285' Mississippian Escabrosa limestone; medium to dark gray (replacement limestone); strongly brecciated; partly recrystallized to white calcite; much iron oxide staining along beds and fractures.

3285'-3297' Mississippian Escabrosa limestone; dark brownish-gray; fine-grained (semi-replacement texture); very closely fractured-to crushed; minor iron oxide along fractures.

3297'-3301' Mississippian Escabrosa limestone; light gray; coarse grained; stylolitic; minor fracturing and calcite veining.

3301'-3303'	Mississippian Escabrosa limestone; dark brownish-gray; similar to interval 3297'-3301'.
3303'-3333'	Mississippian Escabrosa limestone; very light to medium gray; fine-grained (marly); becomes oolite below 3315'; minor talc blebs and some calcite veining.
3333'-3339'	Mississippian Escabrosa limestone; medium-dark gray (replacement texture); sedimentary banding oriented 40° to core's axis; abundant calcite veining; minor iron oxide and greenish alteration clay along fractures in bedding planes.
3339'-3343'	Mississippian Escabrosa limestone; light gray; fine-grained; stylolitic; alteration clay with iron oxide along fractures.
3343'-3351'	Mississippian Escabrosa limestone; medium gray-to greenish-brown; medium-grained; crushed with alteration clay and iron oxide on fracture and fragment surfaces; 3351' is probably a small fault.
3351'-3358'	Mississippian Escabrosa limestone; medium to light gray (replacement texture); abundant thin calcite veinlets.
3358'-3361'	Mississippian Escabrosa limestone; sandy; medium gray; fine-grained; several sand layers oriented at 75° to core's axis; strong argillization within sand zones.
3361'-3365'	Mississippian Escabrosa limestone; medium-light gray; fine-grained; closely fractured; some leached openings along fractures; some iron oxide in alteration clay along fractures.
3365'-3366'	Fault filled with sandy brown gouge oriented at 45° to core's axis.
3366'-3390'	Mississippian Escabrosa limestone; medium gray (replacement texture); crushed with talc along fragment surfaces.
3390'-3400'	Mississippian Escabrosa limestone; similar to 3366'-3390'; strongly brecciated; may be a fault; some iron oxide along fractures.

3400'-3436'	Mississippian Escabrosa limestone; medium to light gray; medium- to fine-grained (some replacement texture); abundant recrystallized bands and calcite veinlets with talc spots; from 3426'-3428', stylolites and numerous leached openings along fractures (this is probably cliff-forming unit).
3436'-3438'	Fault; a breccia of yellow-brown Escabrosa replacement limestone with abundant red iron oxide (partly indigenous) along fragment surfaces; limestone is hard and may be silicified or sandy.
3438'-3455'	Devonian Martin "Last Black" Shale; black; ±15% of interval is brecciated; minor random calcite veining; not greatly fissile; beds oriented at 40° to axis.
3455'-3475'	Devonian Martin limestone; black; looks like the last black shale but contains less silt; sedimentary bands oriented at 30° to core's axis; minor calcite veinlets of random orientation; minor crushing.
3475'-3505'	Devonian Martin limy siltstone; black; sedimentary bands oriented at 50° to core's axis; minor crushing; rare random calcite veinlets.
3505'-3514'	Devonian Martin limestone; fossiliferous; generally medium gray; irregular, but well developed beds oriented 50° to core's axis; some minor crushing with a fault breccia and gouge from 3496'-3497'; minor calcite veining.
3514'-3519'	Devonian Martin limestone; dark gray; fine-grained; uniformly bedded with bedding grains oriented 50° to core's axis.
3519'-3526'	Devonian Martin limestone; dark gray with irregular beds; numerous white spots; may represent faunal remains; beds oriented 60° to core's axis.

3526'-3541'	Devonian Martin sandy limestone and limy sandstone; light to medium gray; well fractured with some iron oxide along fractures.
3541'-3550'	Devonian Martin limestone; medium gray; fine to sparry; well fractured with abundant random calcite veinlets.
3550'-3566'	Devonian Martin sandstone; fine-grained; well sorted; well rounded; brownish-gray.
3566'-3578'	Devonian Martin limestone; black; fine-grained; beds oriented at 50° to core's axis.
3578'-3593'	Devonian Martin limestone and siltstone, alternating; interval consists of 35% thin, irregular sand layers within silty limestone; beds oriented about 65° to core's axis.
3593'-3600'	Devonian Martin limestone; black; silty; thin bedded to shaly.
3600'-3605'	Devonian Martin limestone; "cloudy banded".
3605'-3615'	Devonian Martin limestone; black; silty; thin bedded.
3615'-3622'	Devonian Martin limestone; "cloudy banded".
3622'-3636'	Devonian Martin siltstone and sandstone; black; calcareous.
3636'-3645'	Devonian Martin limestone; black to dark gray with abundant light calcareous spots; irregular beds oriented at 65° to axis.
3645'-3655'	Devonian Martin limestone; black to light gray; very fine-grained; closely fractured to crushed; abundant random calcite veining and talc.

End of Hole MB-5.

DFH:lah
6/28/74

MAGMA COPPER COMPANY - SUPERIOR DIVISION

Magma-Belmont Drill Hole #6A

0-1803	Rotary drill hole.
1803-2140	Tertiary Whitetail conglomerate: greenish gray; clasts range to 6" in maximum dimension, 95% of clasts <1"; conglomerate unit consists of 50% to 70% clasts and 50% to 30% sand-silt matrix, clasts are ± 80% schist and less than 5% diabase; crudely bedded, with bedding planes oriented 70° to cores' axis. Rare copper grains disseminated in matrix (less than .1% Cu). 1912 to 1914 is crushed (fault?); 2044-2047 is unconsolidated silt and sand.
2140-2173	Tertiary Whitetail sandstone: (greenish yellow) grading into siltstone (chocolate); calcareous; beds oriented 45° cores' axis, very poorly consolidated - bad spot in hole. 2149-2153 is conglomerate containing native copper in matrix.
2173-2179	Tertiary Whitetail conglomerage: similar to 1803 to 2140; contains only minor Cu.
2179-2186	Tertiary Whitetail sandstone; greenish.
2186-2209	Tertiary Whitetail conglomerate: 90% clasts (40% diabase, 60% schist) 10% matrix; clast size-3" maximum, 95% 1" in maximum dimension. Minor Cu largely as films coating diabase clasts. Contact with Naco formation oriented 55° to cores' axis.
2209-2225	Pennsylvanian Naco Limestone: medium-gray-brown; thick bedded; moderately fractured with sand filling along some fractures. Some red gouge coating fracture surfaces.

2225-2245	Pennsylvanian Naco sandstone; white quartz sand; well sorted; bleached; minor fault intervals with gouge and breccia.
2245-2251	Pennsylvanian Naco siltstone; greenish yellow; very well sorted.
2251-2257	Pennsylvanian Naco limestone; coarse-grained to sparry; numerous calcite lined vugs along bedding planes and random open fractures.
2257-2274	Pennsylvanian Naco limestone; silty to sandy; greenish-to-pinkish gray; minor carbonate veinlets along steep fractures; a few fractures are lined with coarse calcite crystals.
2274-2275	Fault; gouge; attitude not determined; minor manganese oxide stains gouge.
2275-2279	Pennsylvanian Naco limestone; stylolitic; MnOx films along stylolitic surfaces.
2279-2281	Fault? Naco siltstone gouge; MnOx oxide and minor FeOx in gouge.
2281-2292	Pennsylvanian Naco siltstone, calcareous; purplish; thin carbonate fillings along steep fractures.
2292-2355	Pennsylvanian Naco limestone; medium gray with yellow silt 2299-2300; fine grained; silt beds oriented 70° to cores' axis. Clay and MnOx along most beds and certain steep fractures; minor random carbonate veinlets. 2294-2296 is a strong fracture at 5° to cores' axis, filled with 1/2" clay and MnOx; 2320-2321 is crushed and MnOx soaked.
2355-2399	Pennsylvanian Naco siltstone and silty-sandy limestone alternating in 2'-4' intervals; pinkish-gray to purplish; generally fossiliferous, 2372-2373 is "shark tooth" bryozoan marker. Core is cut by steep MnOx and coarse carbonate veinlets; interval is generally well altered.

2399-2404	Pennsylvanian Naco limestone: coarse-grained-to sparry.
2404-2531	Pennsylvanian Naco limestone: medium-to-dark gray; generally fine grained; fossiliferous. Limestone alternates with siltstone generally as irregular interbeds and silty mottled horizons 1' to 2' thick and spaced about 10" apart. Silt is yellowish-brown with minor FeOx along fracture surfaces. Beds oriented $\pm$ 60° to cores' axis. Minor steep carbonate veinlets with minor FeOx stain throughout; minor MnOx along bedding planes and steep fractures. At 2438 and also 2464 is 3/4" thick vein of FeOx, oriented 30° to cores' axis. Major silt intervals: 2470-2472, 2521-2523,2529-2531.
2531-2591	Pennsylvanian Naco limestone, nodular, set in wispy irregular silt layers: silt is generally greenish-yellow (bleached) but minor residual purple remains in limey zones; beds oriented 60° to cores' axis. Minor carbonate veinlets and some FeOx-MnOx along steep fractures; pink jasperoid rims limestone nodules at 2576.
2591-2610	Pennsylvanian Naco siltstone: greenish-gray; poorly bedded. Clay and FeOx along random fractures.
2160-2684	Pennsylvanian Naco limestone; nodules, set in wispy irregular silt and sand interbeds: most silt is greenish-yellow (bleached). Minor carbonate along steep veinlets; FeOx along a steep veinlet at 2660 to 2662. Major silt intervals: 2625-2626, 2632-2636, 2647-2645, 2666-2667.
2684-2690	Pennsylvanian Naco siltstone, calcareous: purple, partly bleached to greenish-yellow; beds oriented 50° to cores' axis.

2690-2692	Pennsylvanian Naco limestone: nodular, interbedded with brown wispy silt layers.
2692-2696	Pennsylvanian Naco limestone: medium-gray; sparry, with abundant fusilinids.
2696-2706	Pennsylvanian Naco siltstone, calcareous: black; thin bedded; the beds oriented at 70° to cores' axis. At 2706 is a fault filled with 3" of gouge and breccia.
2705-2787	Pennsylvanian Naco limestone: limestone nodules (70%) set in irregular silt interbeds (30%); silt is generally purplish to maroon, no significant bleaching. 2718-2719 is a fault (crushed zone). 2719-2722 is a zone of silt and sand. At 2752, minor FeOx stains random fractures.
2787-2791	Pennsylvanian Naco chert: Sand bed silicified to massive quartz, breccia texture.
2791-2812	Pennsylvanian Naco limestone: medium-gray-pink to yellowish-brown, partly bleached. Unit contains $\pm$ 8% silt as thin films on bedding planes.
2812-2820	Pennsylvanian Naco siltstone and sandstone. Crushed, bleached and leached throughout interval 2812 to 2817 (fault zone). MnOx and FeOx stains at 2812.
2820-2828	Pennsylvanian Naco sandstone, pink; silicified. Minor FeOx along steep fractures and bedding planes.
2828-2838	Pennsylvanian Naco siltstone, calcareous: reddish FeOx stains to 2834 yellowish and sandy below 2834; interval is crushed and gougey, may represent a fault. Minor carbonate veinlets.

2838-2874	Mississippian Escabrosa limestone: medium-gray; sparry; some stylolites. FeOx and clay coat rare bedding planes and fractures oriented 30° to cores' axis. 2863-2865 contains an open steep fracture with 1/4" MnOx and FeOx replacing selvages.
2874-2941	Mississippian Escabrosa dolomite, siliceous: (replacement texture notdeveloped); light green; fine grained abundant thin carbonate veinlets with random orientation. Below 2882 are talc coatings, as much as 1/4" thick, along bedding planes; talc probably is altered residue of silt deposit on bedding planes.
2941-2964	Mississippian Escabrosa "replacement" dolomite: medium blue-gray. Closely fractured-splintery. Abundant FeOx and clay along fracture surfaces; FeOx is after indigenous sulfide. Some random carbonate veinlets.
2964-2994	Mississippian Escabrosa limestone, oolitic: medium-gray; stylolitic. Clay and FeOx coat stylolitic surfaces. Abundant random carbonate veinlets to 1/4" in thickness. A few open calcite crystal-lined vugs.
2994-3025	Mississippian Escabrosa limestone: light-gray; fine grained; abundant chert bands 1" to 2" in thickness. Abundant talc along bedding planes oriented 45° to cores' axis. Some random carbonate veinlets.
3025-3045	Mississippian Escabrosa limestone: light-gray; coarse grained. To 3032 rock is intensely argillized (talc?) with MnOx and FeOx rimming fragments and lining fractures. Numerous open spaces, developed through leaching of the rock, are largely filled with coarse calcite crystals.
3045-3065	Mississippian Escabrosa limestone. Similar to interval 2994 to 3025.

3065-3092	Mississippian Escabrosa limestone, oolitic: medium-gray; medium grained; abundant stylolites reflect steep structure. Random carbonate veinlets and leached open spaces are developed throughout interval. Certain bedding planes host green clay and FeOx.
3092-3095	Fault, gouge and breccia.
3095-3096	Calcite (massive): white.
3096-3197	Mississippian Escabrosa dolomite (no replacement texture); black; fine grained. Abundant carbonate and clay along fractures and bedding planes.
3107-3153	Mississippian Escabrosa ("Marly" cliff forming unit): light gray; abundant stylolites. Unit is strongly leached with clots and masses of creamy carbonate replacing limestone. Talc and clay coat bedding planes and structure surfaces. Very weak FeOx stains fracture surfaces.
3153-3164	Mississippian Escabrosa limestone; (recrystallized to "gnarled" carbonate): light tan. MnOx is abundant as coating on fractures and as small irregular replacements along beds. Abundant clay and talc, and minor FeOx, developed throughout unit. 3154-3155 is sand bed.
3164-3217	Mississippian Escabrosa "replacement" dolomite: medium to light gray; medium grained. Abundant talc and clay and very minor FeOx developed along bedding planes. Minor veinlets and masses of carbonate, as well as vuggy openings, are developed along steep structure.
	Mississippian Escabrosa basal unit (fossil trash horizon) is missing; MeDm contact is a fault oriented 30° to cores' axis.
3217-3233	Devonian Martin siltstone (last black shale): bedding surfaces oriented 40° to cores' axis. Minor carbonate veinlets. 3217-3218 is crushed and sheared (fault?).

3233-3258	Devonian Martin limestone, silty limestone and dolomite: generally irregular bedding planes. Some bleached yellowish clay developed along bedding planes. Minor carbonate veinlets to 3/8" in thickness developed along structures oriented 30° to cores' axis.
3258-3282	Devonian Martin limestone, silty: black; very fine grained, "semi-replacement" to stony texture; beds oriented 60° to cores' axis. Some random carbonate veinlets.
3282-3310	Devonian Martin limestone: medium gray; coarse grained; wavy, irregular bedding planes. Rare random carbonate veinlets. At 3298 is 3" of sphalerite and galena replacement along a bedding plane in the "B bed" horizon.
3310-3311	Fault?; crushed and gougey limestone. Minor FeOx.
3311-3322	Devonian Martin limestone: fossiliferous; dark gray; irregular thin beds. Brown FeOx. from 3313-3319. 6" of gouge along faults at both 3314 and 3317.
3322-3329	Devonian Martin siltstone and silty limestone: black; thin bedded; beds oriented at 40° to cores' axis. Crushed to 3326; strong fault from 3322 to 3325.
3329-3342	Devonian Martin sandstone and silty sandstone alternating: medium gray, stained light tan by FeOx; beds oriented 60° to cores' axis. Minor carbonate.
3342-3346	Devonian Martin siltstone; black, with minor bleaching.
3346-3370	Devonian Martin limestone nodules set in irregular silty interbeds; medium gray. Random thin carbonate veinlets.
3370-3375	Devonian Martin "replacement" dolomite, recrystallized; stained reddish-brown. Abundant talc along bedding planes. Numerous carbonate blebs.

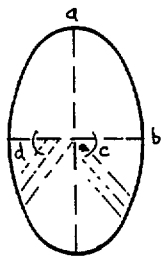
3375-3386	Devonian Martin sandstone-calcareous sandstone. Random thin veinlets and minor blebs of carbonate.
3386-3391	Devonian Martin dolomite, sandy; dark gray; wavy, irregular bedding planes. Minor carbonate veinlets.
3391-3394	Devonian Martin sandstone.
3394-3403	Devonian Martin limestone: black, very fine grained. Numerous carbonate veinlets.
3402-3407	Devonian Martin limestone, silty; medium gray; very fine grained. No visible alteration.
3407-3416	Devonian Martin dolomite, sandy; medium gray; medium grained. Minor random carbonate veinlets; no other significant alteration.
3416-3417	Fault; crushed shale. No mineralization.
3417-3425	Devonian Martin limestone: dark gray to bleached green. Minor FeOx and clay coated fracture planes oriented 45° to cores axis.
3425-3431	Devonian Martin limestone (silicified); medium gray; closely fractured to crushed. Abundant talc along fractures, bedding planes and as coatings on fragments. Minor open spaces along fractures.
3431-3441	Devonian Martin limestone, dolomitic: medium gray. Some carbonate and talc along bedding planes; minor random carbonate veinlets.
3441-3450	Devonian Martin limestone: dark gray; irregular, closely spaced bedding planes. Black clay coatings on bedding planes; random thin carbonate veinlets and irregular carbonate replacement masses near 3450.
3450-3451	Devonian Martin shale; black serpentine coatings along fracture surfaces.

3451-3466	Devonian Martin limestone, dolomitic: medium gray; 6" shale beds at 3470 and 3473. Minor thin carbonate veinlets throughout.
3466-3531	Devonian Martin "hanging wall" dolomite: dark gray; friable. Several thin carbonate veinlets; steep carbonate filled fracture 3521 to 3523. Some MnOx and FeOx with carbonate along bedding plane(?) at 3525.
3531-3534	Devonian Martin "replacement" dolomite (A-bed horizon): black. Only minor carbonate veinlets.
3534-3541	Devonian Martin "replacement" dolomite. Crushed and sheared at 30° to cores' axis. Abundant green chlorite and minor FeOx coat fractures within this zone.
3541-3544	Devonian Martin "footwall" siltstone. Sheared. Rare carbonate replacement blebs.
3544-3556	Devonian Martin "Basal" sandstone. Moderate to strong carbonate veinlets.
3556-3668	Cambrian Bolsa Quartzite: light tan to white; medium grained; well sorted; beds oriented 70° to cores' axis. Generally well fractured to crushed. Abundant FeOx coats fracture surfaces; FeOx is red-brown to 3601, and yellow-brown from 3601 to 3656; at 3637 FeOx after pyrite fills fractures oriented 10° to cores' axis. Below 3656 rock contains about 0.5% pyrite by volume.

Notes & Explanations

- All angles measured from core axis (i.e., faults, veins, shears, contacts).

- Rake of slicks measured on FW surface sloping toward viewer, thus:



a = Plane containing core axis
b = horizontal
c = Rake angle to Right (CW)
d = Rake angle to Left (CCW)

- Symbol for veins & veinlets

- RQD = # of coherant pieces of core ≥ 6" long per 10' interval. (Note: method amended in subsequent holes after MB-9, such that percentage of core in lengths ≥ 6" per drilled/recovered interval is then recorded.)

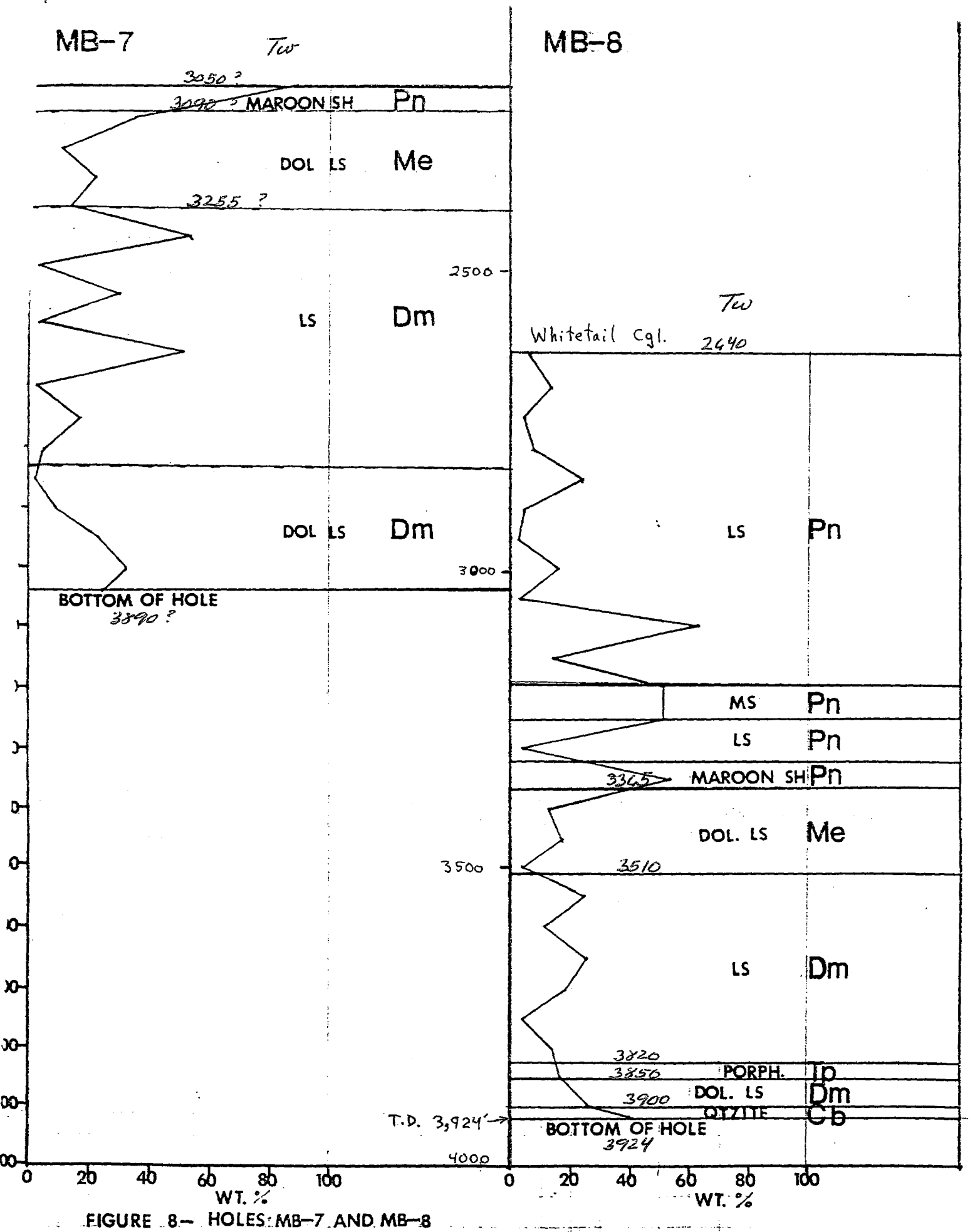


FIGURE 8.— HOLES: MB-7 AND MB-8
DISTRIBUTION OF QUARTZ

MAGMA COPPER COMPA. Y

Division: Superior **Drill Hole:** MB-9 **Location:** T25 R13E NW1/4 S. 6

Coordinates: 99,139 N, 15495 E **Collar Elev:** 4121.6' **Total Depth:** 2,116'

Date Collared: 9/20/91 **Completed:** 10/13/91 **Angle:** -90°

Bearing: X **Core Size:** X (Rotary) **Logged By:** D. Lorge, M. Fitterle

Reviewed under binocs. by SLM, 10/17/91

Scale: 1" = 50'

Depth	Rock Type	Alteration/Mineralization (Vol. %)	% Oxidized	% Rec'd	RQD	Comments	Assay (Cu, Au, Ag)
0–450	Dacite	(weathered); Goet. tr.; Mt. acc. <1%; Goet. tr.; Mt. tr.; Mt. acc. <1%; Mt. acc. <1%; Mt. acc. <1%	100%		F	Lt. purplish gray, poorly welded med. x-line dacite tuff. Drk. purplish gray when wet. (Weathered; ~1% biot.) Most goethite/limonite to ≥450' is F. Some goeth. blebs after Mt. 60'-70' – Lithic frag. = qtzite. 70'-90' Grad'l change from purp-gray to pale lavender. 80-90 Few blebs of very soft (1-2) white zeolite? or alt. flds. 0-175' – acc. Mt. weathered to goethite. 160'-170' Lithic frag. = qtzite. All magnetite is D to ≥450' 240'-250' Lithic frags. = qtzite. Hole: 290-300' sft-hrd intervals, jnts. bit stuck 300' – inject mud & H_2O. no return 300-305'. no return 315'-317'. stop inject. 310'. 310'-320' Lith. frag. = qtzite. 380'-390' – Lithic frag. = qtzite. 390'-400' – Striated surfaces on dacite (slicks) frags. 400' – "Brown tuff" more densely welded. 420'-430' Lithic frags. = qtzite. hrd drilling from 432'-437' welded tuff, lavender, zeolites, biotite nonwelded 437'→	Blank = not analy

F = frac. controlled
D = disseminated
tr. = trace
acc. = accessory

MAGMA COPPER COMPANY

Division: Superior **Drill Hole:** MB-9 **Location:** T 2S R 13E NW 1/4 Sec.

Coordinates: 99161.8 N, 15479.5 E **Collar Elev:** 4120' **Total Depth:**

Date Collared: 9/20/91 **Completed:** 10/13/91 **Angle:** -90°

Bearing: X **Core Size:** Rotary **Logged By:** D L Orge
Checked w/ binocular scope SLM

Scale: 1" = 50' **Page** 2 **of** 5

Depth	Rock Type	Alteration/Mineralization (Vol. %)	% Oxidized	% Rec'd	RQD	Comments	Assay Cu, Au, Ag
450						440-460 Noted color variations in dry cuttings from gray to purple and reddish purple. Then back to pale purple. Same tuff.	Notes: 450-470 Sma frags. of da qtzite pres
460		Calc. <<1%; Tr. Goet.					
470		acc. Mt <1%					
480		Hc 0 [illegible]				480-490 Calcite veinlets or vugs, x-taline calcite. Few xtals in sample. Noted several "Volc. clasts" w/ dark brn matrix and fine gr. lt. acicular x-tals, randomly oriented.	
490							490 – Frag. o mt-bearing di
500							
510							
520		Lost Circ.				500-510 Small chips of dacite? Noted "resinous" of mainly qtz-feld (light) and only ~5% matrix. Same texture.	520 – Small f of gray qtzite
530							530 – Gouged, sl dacite frag. n
540							
550						520-550 Large pebble size fragments being returned. Noticable orient. of tremolite in these.	
560							560-600 – Scat Bio pseudomorph after amph in dacite
570							
580		Bio pseudomorphs; Tr.					
590		Calc.; F				588-590 worked through a lost circ. zone. Large fragments, thin calcite veinlets or vugs (x-taline) and yellow/tan clay coating fract. surfs.	
600		F					
610						590-600 Same, but no clay. Zeolites common. Clay coating [illegible]	610 – Slicked su on dacite frac Some zeolite o fracs. (looks cubi
620						620 → Dacite appears the same as seen in the water table.	
630							
640							
650							
660							
670						670' – Gouge + slicked fragments of dacite	
680						680' – Small frag. of gray qtzite. 680-700' – Sandy gouge in dacite. Poor return	
690							
700		acc.				700' – T.D. Going w/ mud after casing. 700'-800' – Coarse-sand-sized frags. of dacite returned, w/ lots of LCM.	
710							
720							
730							
740							
750							
760							
770							
780							
790							
800						800'-900' – Poor return of coarse sand-fine pebble-sized frags. of dacite.	
810							
820							
830							
840							
850		acc.					
860							
870							
880							
890							
900						900' – Small frag. of dk. qtzite.	

F = frac. controlled
D = disseminated
tr. = trace
acc. = accessory

MAGMA COPPER COMPANY

Division: Superior **Drill Hole:** MB-9 **Location:** T2S, R13E NW¼ Sec. 6

Coordinates: 99161.8N, 15477.5E **Collar Elev:** 4120' **Total Depth:** _____

Date Collared: 9/20/91 **Completed:** 10/13/91 **Angle:** -90°

Bearing: — **Core Size:** Rotary **Logged By:** J. Lange

Checked w/ binocular 'scope SLM

Scale: 1" = 50'

Depth	Rock Type	Alteration/Mineralization Vol. % (Vn. Qtz, Vn. Chal., Vn. Calc., Chl, Clay, Ep, Hm, Goet., Mn-ox, Cu-ox, Mt, Py)	% Oxidized	% Rec'd	RQD	Comments	Assay Cu, Au, Ag
900–1350	Fill?	acc.; acc. (<1%); acc.; acc.; Chalced. <1%; Tr. epidote; Poor return				Dissem. acc. Mt (<1 vol %) Poor return; Sand-sized cuttings; Poor return; 1030'– Frags. of dacite are bleached, soft, argillic.; 1050 to 1060 [illegible] sample Helper washed drill rig down [illegible]; 1120'-1140'– Frags. of dk. gray f.g. qtzite in tuff; 1150'– Tiny striated chips of crustiform chalced.; 1160'-1170' – v. contam. sample. Full of grease.; 1168 Vitrophyre (black) w/ dacite tuff frags.; 1170'-1180' – 50:50 normal dacite and vitrophyre. Some tiny qtzite frags.; 1180'– All Vitrophyre; 1230 Tuffaceous seds high; 1240 Tuff "rhyolite" = unwelded dacite; 1252 Tuff "rhyolite" Brick red. Mc grains, some qtzite, blk diabase, maybe Limestone.; 1253 Top of White Tail, Cgl./ss/sltst.; 1250'-1260' – Epidotitic frag. probably Mz cgl.; 1280' – Ls frags in mix. A frag. of qtz-mt vn.(?) also noted at 1270'.; 1300'– Frag. of Ls. brx noted.; 1300-1320' – Mainly frags. of gray Ls. and qtz. Some frags. of specularite noted at 1310'.; [illegible] in matrix	

F = frac. controlled
D = disseminated

tr. = trace
acc. = accessory

MAGMA COPPER COMPANY

Division: Superior **Drill Hole:** MB-9 **Location:** T2S R13E NW ¼ Sec. 6

Coordinates: 99161.8 N, 15977.5 E **Collar Elev:** 4120 **Total Depth:** _____

Date Collared: 9-20-91 **Completed:** 10/13/91 **Angle:** -90°

Bearing: — **~~Core Size~~:** Rotary **Logged By:** D. Lorge
Checked by binocs, SLM.

Scale: 1" = 50'

Depth	Rock Type	Alteration/Mineralization Vol. % (Vn. Qtz, Vn. Chal., Vn. Calc., Chl, Clay, Ep, Hm, Goet., Mn-ox, Cu-ox, Mt, Py, Cu°)	% Oxidized	% Rec'd	RQD	Comments	Assay Cu, Au, Ag %
1350						1350'-1360' — Poor return	
1360						1360'-1400' — Sand-sized cuttings, w/ grains of qtz, felds., dk. lithics, a few musc. flakes. Scattered chips of reddish siltstone.	
1370							
1380							
1390							
1400						1400'-1430' — V. poor return.	
1410							
1420							
1430						1430'-1440' — Siltstone chips.	.055,
1440						1440'-1450' — Sand-sized cuttings of qtz, flds, dk. lithics, some bio. flakes.	
1450						1455 Mdst, red, v. fgv., Fe rich, sli. calc. 1450	.063,
1460						Siltstone, w/ minute mica flakes. Matrix commonly weakly calcareous.	.084,
1470							~~.130, <.001, <~~
1480							1480
1490							.230, .002, <.
1500		Lines mineralized			Tr. Cu°	1500 Sn, red, st. Fe.	.166, <.001, <.
1510						1510 V.fg. brn. calc. Md. st. + Wht. L.S. 1500 .50 150	.162, .001, <
1520						1520 As above no L.S.	.159, <.001, <.
1530						1530 Trace of f.g. Sand ST., Gyp.	.099,
1540						1540'-1570' — Poor return. Scattered siltstone chips in LCM.	.071,
1550						1550	.099, <.0
1560							.149, <.0
1570						1570'-1600' — Red-brn siltstone/mdstone chips, containing tiny bio. flakes.	.136, <.0
1580							.103, <.0
1590							.118, <.0
1600						1600'-1620' — Mixed mdstn/siltst. w/ gypsum laminae(?) 1600	.119, .06
1610							.100, <.0
1620							.104,
1630						1630 Md. st, st. st. + red sd. Yes Sand? 1630 Gyp. Drilling faster. Brick red to gry. ss/siltst./mdst. w/ gypsum laminae. Clastic seds. weakly calcareous. 1650	.097,
1640							
1650							.083,
1660						1670 Mdst. Yes + diabase? frags. Gyp.	.096
1670							
1680							
1690							.066
1700						1700	
1710						1710 As above. Sand grains pres. fine v.fg gray sd st.	.062
1720						1710 ~10% sand. V. Poor recovery. 1720'- Tiny schist frag. noted, plus qtz, diabase. Matrix is mudst./siltst.	.075
1730						1750 V.red. fine-grained schist. 1760 Mdst frags. some qtz frags. Matrix is red-brn mdst./siltst. 1730	.085
1740							
1750							
1760							.068
1770							.075
1780							.051
1790						1790 Mostly mudst. Diabase noted.	.061
1800							

F = frac. controlled tr. = trace
D = disseminated acc. = accessory

MAGMA COPPER COMPANY

Division: Superior **Drill Hole:** MB-9 **Location:** T 25, R 13E NW¼ Sec. 6

Coordinates: 99161.8 N, 154275 E **Collar Elev:** 4120 **Total Depth:**

Date Collared: 9-20-91 **Completed:** 10/13/91 **Angle:** -90°

Bearing: — **Core Size:** Rotary **Logged By:** D. Lorac

Scale: 1" = 50' **Page** 5 **of** 5

Depth	Rock Type	Alteration/Mineralization Vol. % (Vn. Qtz, Vn. Chal., Vn. Calc., Chl, Clay, Ep, Hm, Goet., Mn-ox, Cu-ox, Mt, Py, Cu)	% Oxidized	% Rec'd	RQD	Comments	Assay Cu, Au, Ag %
1800						Tuff, slst, cdst, sch, gtz, calc. frag. Red-brn sltst. matrix.	.068
1810							.069
1820							.069
1830							.065
1840							.068
1850						1850	.101, <.001, <
1860						A grain of Mt. noted.	.062
1870						1870 - Mdst, sltst, qtz, diabase, mst frags	.052
1880		Tr. Cu° <<1%				1880'-1890' - Traces Native Cu° on diabase frags.	.055
1890							.062
1900						1910 frags - slst, mdst, gtz, tuff, diabase	.066
1910						Frags. of coarse ss, weathered granite in siltst. matrix. Also schist.	.180, <.001, <
1920							.073
1930		Tr. Cu°				1940' - Native Cu° on diabase, gtzite frags.	.059
1940						1950 mdst, slst, gtz, sch, fluor.	.058
1950							.090, <.001, <
1960							.066
1970							.082
1980						2000 ~50% [illegible] 50% sand frags, predom diabase, plus qtz, gtzite, [illegible] sch, gyp. V. poor recovery, (lost clay).	.060
1990							.077
2000							.056
2010							.072
2020							.052
2030							.050
2040							.056
2050						2060	.109, <.001, <
2060							.139, <.001, <
2070						2070 ~20' [illegible] mdst, diabase sch, gtz, calc, sl matrix [illegible] disseminated Cu also in mafic sch.	.085
2080							.060
2090							.065
2100						2080' - Chips of epidotitic Mz clastics, present. 2100	.048
2110		Tw				2100' T.D. Schist, gtz, diabase frags. in sltst. matrix.	
2120						Rotary conventional circ. T.D. 2116	
2130							
2140							
2150							
2160							
2170							
2180							
2190							
2200							
2210							
2220							
2230							
2240							
2250							

F = frac. controlled
D = disseminated
tr. = trace
acc. = accessory

MAGMA COPPER COMPANY

Division: Superior **Drill Hole:** MB-9 **Location:** NW1/4 Section 6

Coordinates: 99138.6 N, 15495.1 E **Collar Elev:** 4,121.6' **Total Depth:** 3,267'

Date ~~Collared~~ re-entered: 11/21/91 **Completed:** 1/12/92 **Angle:** -90°

Bearing: — **Core Size:** NX **Logged By:** S. Manske

Scale: 1:300 (1" = 25') **Page** 1 **of** 6

Alteration/Mineralization Vol. %: Vn. Qtz, Vn. Chal., Vn. Calc., Chl, Clay, Ep, Hm, Goet., Mn-ox, Cu-ox, Mt, Py, Native Cu

Depth 2,110 – 3,325

Drilled Rotary; 0'-2,115'

Hem. paint on isolated breaks <<1% by vol.

Tr Blebs and tiny crusts of Native Cu.

<1%

Hem. paint on isolated breaks

<1%

Scaly blk. ce on breaks + partings

% Rec'd	RQD
4%	0
90%	0
93%	7
98%	5
100%	7
81%	4
91%	6
100%	7
98%	9
100%	6
97%	11
99%	10
99%	11
100%	6
81%	7
100%	6
100%	8
100%	9
100%	9
97%	6
91%	5
96%	7
100%	

Comments

2,115'-2,655'—Whitetail Cgl.

3,115 - 2150' — Subang. to subround. cobbles and pebbles in brown sand/silt matrix, moderately indurated. Cobbles ≤ 30 cm in max. apparent dimension. >50% of frags. are diabase, ~30% are schist. Less common are porphyry, epidotitic rock, qtzite.

2137', Surface @ 55°. Slicks rake 28° Left

One frag. of skarn/Ls noted at 2139'.

2,146'

2150'-2,200' — Subang. to rounded pebbles + cobbles ≤ 30 cm in apparent max. dimension, 40% diabase, 40% schist, 10% Ls; rest = granitic rocks (incl. porphyry), black chert, qtzite, rare skarn/hornfels (= pyx-gnt in Ls/shale).

2140'-2225' — Traces Cu° (<< 1 vol. %) generally as scabs and crusts on diabase frags. A few blebs in sandy matrix ≤ 5 mm in size.

2187' Slicks rake 25° R.

2,200'-2250' — Subang. to subrounded pebbles and cobbles, clasts up to 33 cm in apparent max. dimension. Cobbles 52% diabase, 32% schist, 5% Ls, 4% granitic rocks; rest qtzite, slate, bull qtz. Matrix weakly calcareous.

2204' Slicks rake 20° R

2217' - A large diabase cobble cut by a chlorite veinlet (matrix not cut.)

Sericitic

2242' - Cobble of argillized granite

2246' - Slicks rake 80° R.

2,250 - 2300' — Subang. to rounded pebbles + cobbles up to 25 cm in size; most ± 5 cm in max. apparent dimension. Some sandy, silty interlayers 1'-2' thick. Clast population about 55% diabase, 33% schist, 10% Ls, w/ remainder qtzite, slate, bull qtz, and rare aplitic fragments. Also older conglom. Blebs of native Cu 1-2 mm in size observed, generally attached to diabase frags.

2260' - Bedding plane in sandy zone at 65° to core axis.

2280' Cobble of Scanlon or Barnes Cgl.

2292-2300' — White calcite crust on fragments

2300'-2350' — Subang. to subrounded pebbles + cobbles up to 13 cm in size in weakly calcareous sandy matrix. Clasts ~60% diabase, 15% schist, 10% Ls, 10% granitic rocks; rest slate, older cgl, qtz, epidotitic fragments.

2317' — Slicked surface at 40° to core axis; rake on FW 10° L.

2329' - Bedding in sandy layer at ~ 70° to core axis.

Assay Cu, Au, Ag, —

F = frac. controlled
D = disseminated
tr. = trace
acc. = accessory

MAGMA COPPER COMPANY

Division: ______ Drill Hole: MB-9 Location: ______

Coordinates: ______ Collar Elev: ______ Total Depth: ______

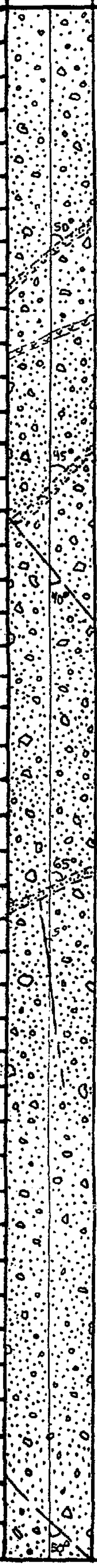
Date Collared: ______ Completed: ______ Angle: ______

Bearing: ______ Core Size: ______ Logged By: S.L. Manske

Scale: 1:300 (1" = 25')

Depth | Rock Type | Alteration/Mineralization: Vn. Qtz, Vn. Chal., Vn. Calc., Chl, Clay, Ep, Hm, Goet., Mn-ox, Cu-ox, Mt, Py, Native Cu (Vol. %) | % Oxidized | % Rec'd | RQD | Comments | Assay: Cu, Au, Ag, –

Depth marks: 2,350 · 2,375 · 2,400 · 2,425 · 2,450 · 2,475 · 2,500 · 2,525 · 2,550



Alteration/Mineralization:

- Vn. Calc., 2,345–2,400: Scabby wh. calcite coating breaks, rims of frags. <1%
- Hm, 2,345–2,418: Hem. paint F, <<1%
- Native Cu, about 2,350: F
- Vn. Calc., 2,441–2,529: Scabby white calcite on breaks, rims of clasts. <1% by vol.
- Hm, 2,441–2,466: Hem. paint F, <<1%
- Native Cu, 2,441–2,455: Tr. <<1%
- Native Cu, about 2,475–2,500: Traces Cu° <<1%
- Native Cu, about 2,525–2,550: Trace Cu, <1%
- Hm, about 2,555: F, <<1%

% Rec'd (interval ending at depth)	RQD
100% (2348)	5
96% (2351)	8
100% (2361)	6
87% (2370)	5
100% (2376)	5
100% (2384)	6
99% (2396)	4
95% (2410)	4
100% (2422)	4
100% (2423)	4
93% (2432)	7
100% (2445)	12
96% (2465)	4, 5
100% (2483)	5, 4
98% (2495)	6
100% (2508)	4
100% (2525)	6, 6
96% (2543)	4, 7
99% (2550)	4
90% (2560)	2

Comments:

2350'–2400 – Angular to subround. pebbles and cobbles up to 20 cm in size (most 5-8 cm) in weakly calcareous, brown sand/silt matrix. Clasts ~50% diabase, 20% Ls, 15% qtzite, 10% schist, w/ less common slate, qtz, older breccia, granitic frags, black chert, siliceous epidotitic rock. Unit is mostly framework supported.

- 2372' – Bedding in pebbly Ss layer.
- 2,385' – A xtal-lithic tuff layer ~10 cm thick.

2400'–2450' – Ang. to subround. pebbles and cobbles up to 24 cm across (most < 10 cm) in reddish-brn, weakly calcareous sand/silt matrix. Clast population ~45% diabase, 20% Ls, 15% qtzite, 15% schist. Remainder = qtz, chert, granitic frags, epidotitic rocks, talcose fragments, limonitic pebbles, older cgl. Unit is mostly framework supported.

- 2407' – Bedding in pebbly Ss.
- 2418' – Rake on slicks ≈ 90° R
- 2,442' – Calcite-xtal-lined vug in clast.

2450'–2500' – Subang. to subround. pebbles + cobbles up to 25 cm across (most 5-8 cm) in red-brown sandy matrix. Clasts are ~50% diabase, 25% qtzite, 15% Ls. Schist frags are rare. Some ls partly metasomatically alt. to specularite or pyx-gnt (?). Qtzite frags. may be cut by mm-thick qtz veinlets or limonite veinlets. Other rocks in clast population include black chert, andesite (?), Barnes conglomerate, qtz, granitic rocks. Cgl mostly framework supported.

- 2466' – Bedding laminae in sandy layer ~3' thick.
- 2477' – Rake of slicks on irreg. subvertical slip ≈ 25° R.
- 2487–2500' – Blebs of Cu° 1-2 mm across, commonly attached to diabase

2500'–2550' – Subang. to rounded pebbles and cobbles up to 15 cm across (most 5-8 cm) in a brown, weakly calcareous sand/silt matrix. Cgl is mostly framework supported, as above. Clast population ~65% diabase, 20% qtzite, 8% Ls, 5% granitic or aplitic frags. Remainder chert, slate, qtz, epidotitic or limonitic fragments. Schist pebbles are rare.

- 2527' – A cobble of crinoidal Ls.
- 2533'–2547' – Blebs of native Cu 1-3 mm across, commonly attached to diabase frags.
- 2555' – Slicks on FW of shear rake ~25° L.

F = frac. controlled
D = disseminated
tr. = trace
acc. = accessory

MAGMA COPPER COMPANY

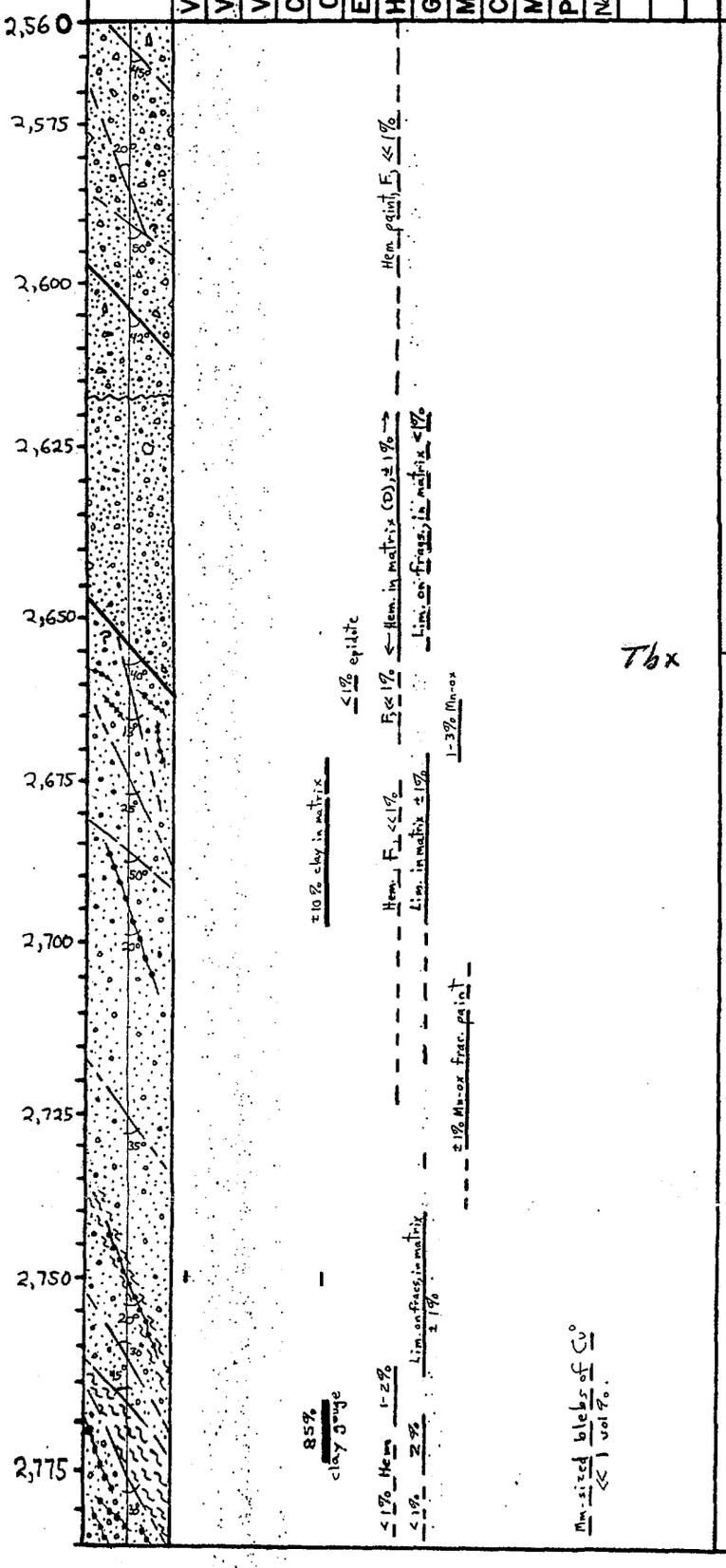
Division: _____ **Drill Hole:** MB-9 **Location:** _____

Coordinates: _____ **Collar Elev:** _____ **Total Depth:** _____

Date Collared: _____ **Completed:** _____ **Angle:** _____

Bearing: _____ **Core Size:** _____ **Logged By:** _____

Scale: 1:300 **Page** 3 **of** 6



Comments	Assay (Cu,Pb,Zn,Mn %; Ag, Au oz/T)
2563'-Slicks on FW of slip rake 75° R.	
2550'-2600' — Ang. to subround. pebbles and a few cobbles up to 15cm in diameter (most clasts ≤ 5 cm across) in a brown-to yellowish-tan sandy/silty matrix. Cgl. commonly framework supported. Core is v. rubbly this interval. Clasts ~40% diabase, 33% qtzite, 5% Ls, 5% granitic rocks, 10% volcanic rocks (Mz and ?), the latter commonly partly epidotitic. Frags. of slate + qtz + specularite also appear, but schist is rare.	
2586'-Slicks on FW of slip rake 70° R.	
	2600'
2,600-2,617' — Ang. to rounded pebbles + small cobbles (<10cm) of qtzite, diabase, granitic frags. (no schist) in wdly calc. red-orange sand matrix.	
2,617'-2655' — Arkosic pebble Cgl. Subang. to subround. pebbles and rare cobbles ≤20cm across, of both porphyritic and equigranular granitic to granodioritic rx. Rare frags. of diabase and schist. Matrix is indurated, stained red-orange by Fe-ox; weakly calcareous in places. In fault contact w/ underlying Mz (?) section.	.08,.01,.03,.04 %; <.03,.004 oz/T .10,.02,.05,.04 %; <.03,.004 oz/T .12,.02,.06,.04 %; .09,<.001 oz/T .05,.02,.05,.04 %; <.03,.003 oz/T
	2650'
2,655'-3,267' = Older Pebble Cgl (Mz). Where unox., dark gray-grn rock w/ pebbles (subang. to rd.) and rare small cobbles of primarily granitic and volcanic rocks in a well-indurated sandy matrix. Small pebbles of Pinal Schist also common.	.06,.02,.13,.17 %; .03,.001 oz/T .08,.05,.17,.34 %; .09,<.001 oz/T .10,.09,.07,.08 %; .09,<.001 oz/T
2658'-Slicks on FW of slip rake 80° R.	
2663-2673-Irreg. Mn-ox w/ts effect patchy replacement of matrix.	
2674'-Rake of slicks on slip 85° R.	
2687'-Rake of slicks on FW = 80° R.	.04,.07,.11,.06 %; .12,<.001 oz/T
2695'-Lim-hem. frac. filling 5mm thick. Sheared, w/ rake on FW 80° R.	Bleached .08,.09,.12,.12 %; .12;<.001 oz/T
	2700'
Where Mz Cgl. is prominently stained w/ limonite-hematite on fracs. and in the matrix, the rock commonly has a bleached appearance under the coating of Fe-ox. Where Mn-ox frac. coatings predominate, the rock is gray-green.	.11,.10,.14,.31 %; .09, .003 oz/T .06,.02,.23,.25 %; .03,<.001 oz/T .09,.01,.19,.31 %; .03,<.001 oz/T .13,.03,.19,.29 %; .03,<.001 oz/T
2726'-Frac w/ hem. paint, Mn-ox-stained selvages ~5mm wide.	
2776-2785' — Cgl largely bleached, espec. matrix.	
2750'-A disrupted qtz vein 5-8 cm thick, w/ bleached, sheared + argillized walls. Plentiful lim-hem (after sulfides?)	.03,.06,.09,.05 %; .03,<.001 oz/T
	2750'
	.03,.12,.05,.04 %; .06,<.001 oz/T .03,.12,.04,.03 %; .03,<.001 oz/T
2774'-Slicks on FW of fault zone rake ~20° R.	
2775-2785'-Rock in FW of fault zone is quite bleached, partly silicified w/ limonite ± Cu° vnlts @ 30°-45° to core axis.	.04,.07,.02,.03 %; <.03,<.001 oz/T .07,.01,.05,.03 %; .09,<.001 oz/T

F = frac. controlled
D = disseminated
tr. = trace
acc. = accessory

18

MAGMA COPPER COMPANY

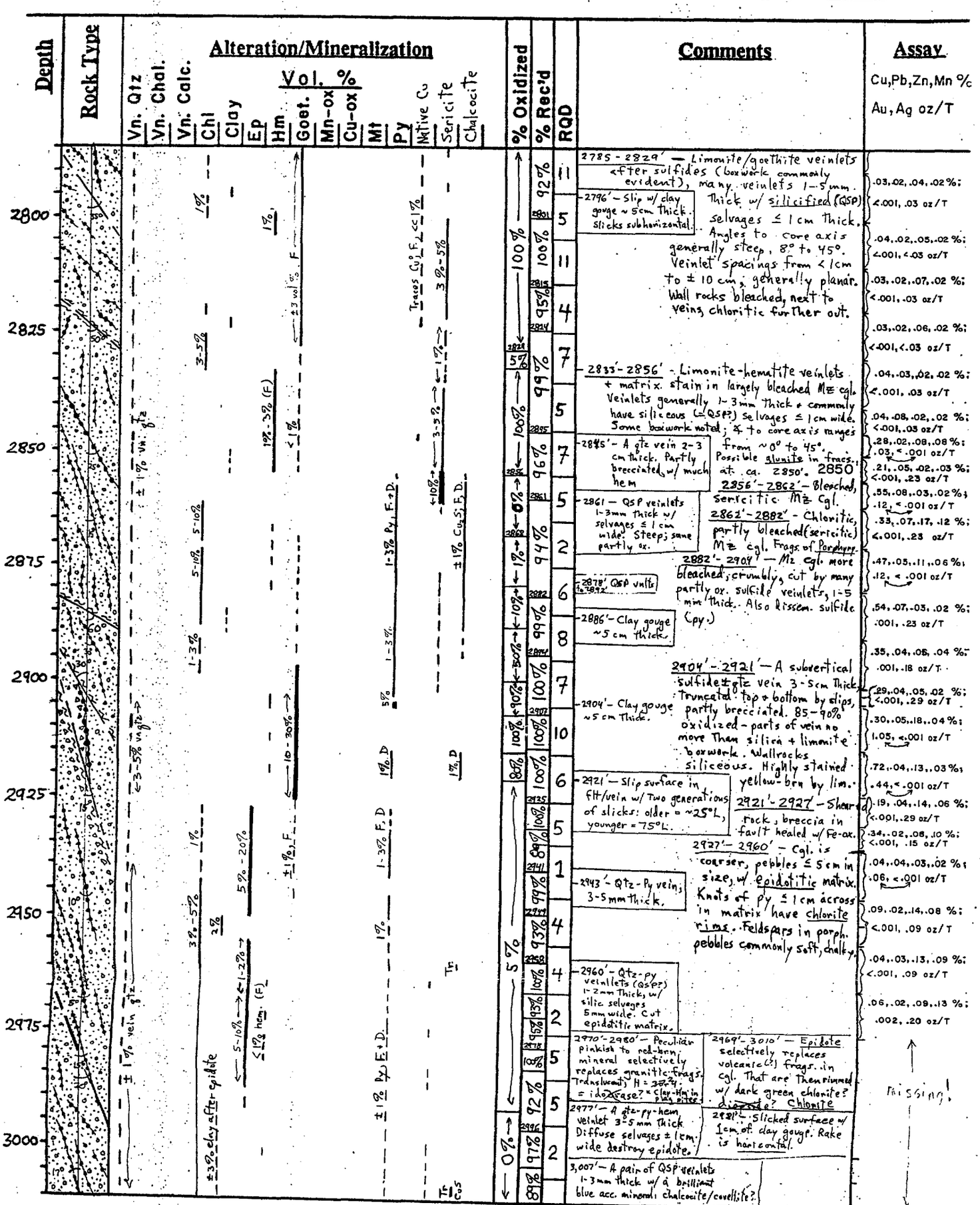
Division: _____ **Drill Hole:** MB-9 **Location:** _____

Coordinates: _____ **Collar Elev:** _____ **Total Depth:** _____

Date Collared: _____ **Completed:** _____ **Angle:** -90°

Bearing: _____ **Core Size:** NX **Logged By:** SLM

Scale: 1:300



MAGMA COPPER COMPANY

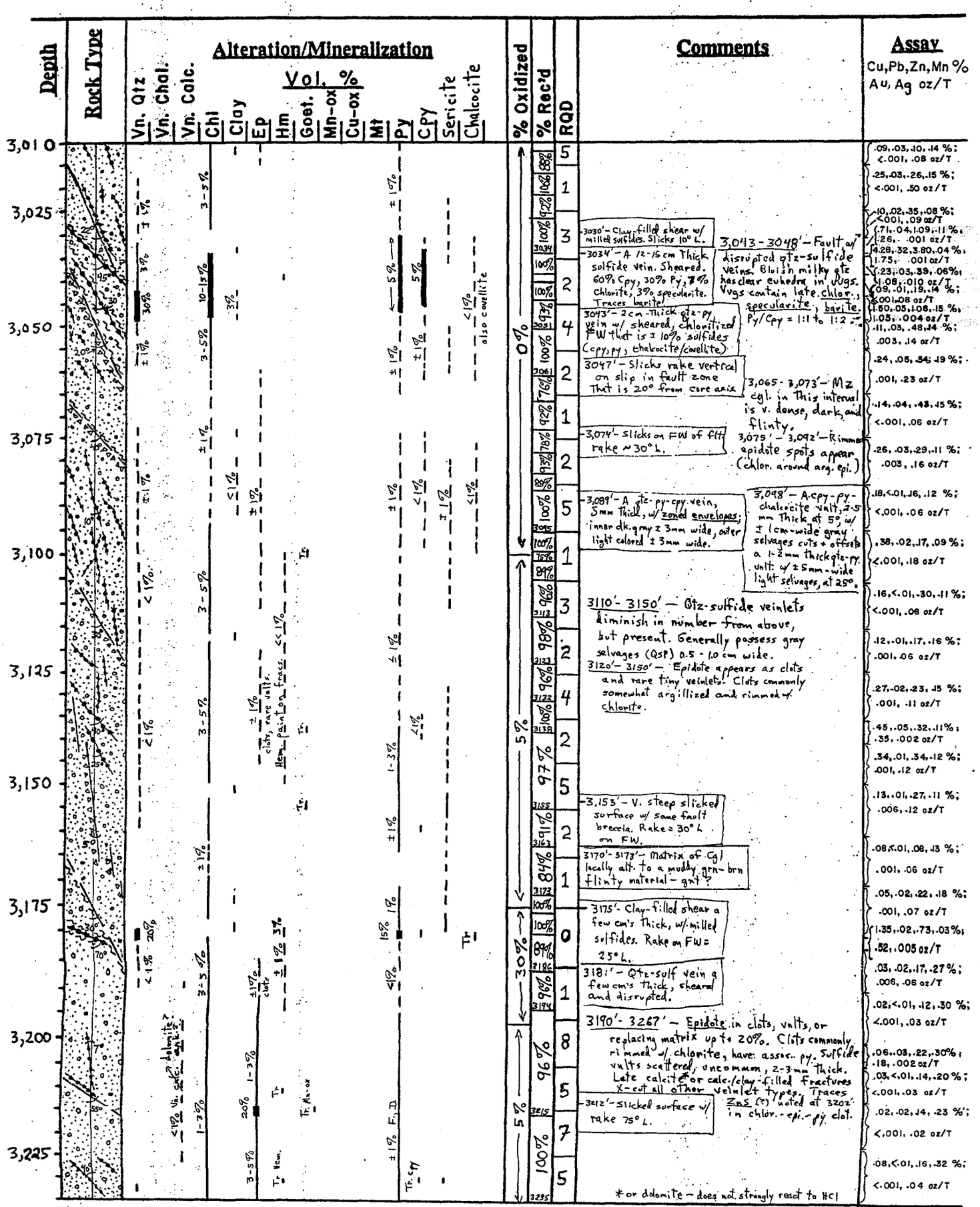
Division: _____ **Drill Hole:** MB-9 **Location:** _____

Coordinates: _____ **Collar Elev:** _____ **Total Depth:** _____

Date Collared: _____ **Completed:** _____ **Angle:** -90°

Bearing: _____ **Core Size:** NX **Logged By:** SLM

Scale: 1:300 **Page** 5 **of** 6



F = frac. controlled
D = disseminated
tr. = trace
acc. = accessory

MAGMA COPPER COMPANY

Division: _____ Drill Hole: MB-9 Location: _____

Coordinates: _____ Collar Elev: _____ Total Depth: _____

Date Collared: _____ Completed: _____ Angle: -90°

Bearing: _____ Core Size: NX Logged By: SLM

Scale: 1:300

Depth	Rock Type	Alteration/Mineralization (Vol. %)	% Oxidized	% Rec'd	RQD	Comments	Assay (Cu, Pb, Zn, Mn %; Au, Ag oz/T)
3,235		Vn. Qtz: - ; Vn. Chal.: <1%; Vn. Calc.: 1-3%; Chl: 3-5%; Clay: 20%; Ep: 3-5%; Hm: <1%, F; Goet.: ; Mn-ox: ; Cu-ox: ; Mt: ; Py: ±1%, F, D; Cpy: tr; Sericite: tr; Chalcocite: tr	5%	97%	0		.07, <.01, .14, .20 %; <.001, .04 oz/T
3,250'				3254	4	3246' - Lone qtz-py vn ±1cm thick w/ gmy selvages (ser.) Traces Cpy, chalcocite/covellite.	.04, .01, .14, .26 %; <.001, .05 oz/T
				91%	1		.07, <.01, .18, .19 %; <.001, .05 oz/T
), = 3,267		Tbx		3267			.06, .02, .17, .14 %; .15, <.001 oz/T

Bottomed because of long interval of sparse mineralization.

3,275

3,300

F = frac. controlled
D = disseminated

tr. = trace
acc. = accessory

MAGMA COPPER COMPANY

Division: Superior Drill Hole: MB-10 Location: T.2 S, R13E Sect. 6

Coordinates: 99,999.1N, 15485.3E Collar Elev: 4,030.5' Total Depth: 2,013' Casing to 2,118

Date Collared: 10-24-91 Completed: 11/15/91 Angle: -90°

Bearing: ~~X~~ Core Size: Rotary Logged By: M. Pitterle, D. Lorge
checked on binders by S. Manske

Scale: 1" = 50' (1:600) start 12¼" (9" casing) 8', 8¾" to 590' (7" casing) Page 1 of 5

Depth	Rock Type	Alteration/Mineralization Vol. % (Vn. Qtz, Vn. Chal., Vn. Calc., Chl, Clay, Ep, Hm, Goet., Mn-ox, Cu-ox, Mt, Py)	% Oxidized	% Rec'd	RQD	Comments	Assay Cu, Au, Ag
0–10	dac. AFT	Weathered; dacite				Bldhd AFT dacite; pnk, dacite zeolite, fldsp, qtz	
10–90						10'-90' – Traces hem. F. ("AFT" = air fall tuff)	
80–90		Acc. Mt.				80'-90' – Acc. Mt.	
90–100						90'-100' – Qtzite fragment noted.	
100–147						pnk, AFT dacite sli-mod weld'd, str qtz ≈ qtz porph, fldsp xls, zeolite, magn.	
147–149						147-149 cly, pnk, damp. Small slip plane?	
200–210						200'-210' – Qtzite frag. noted	
210–240		Acc. Mt. << 1%					
240–250						240'-250' – Qtzite frag. noted.	
250–262						250-262 clay layer = small slip?	
262–300						Tuff, brn-prl, dacite, sli-mod weld'd qtz + fldsp xls, zeolite, magn. 280-300' – Qtzite fragments in tuff.	
310						+ lg qtz xls	
340–350						340'-350' – Some yellow lim.-stained dacite frags.	
360–370						360'-370' – Lithic frags = diorite porph. (?), schist.	
380–430		Acc. Mt. << 1%				Calcite xls = 1 vol.% vn. calcite/vugs. lg calc. xls + 1-2cm chips of vf xln wht calc. no wht calc. more calc xls	

F = frac. controlled tr. = trace
D = disseminated acc. = accessory

MAGMA COPPER COMPANY

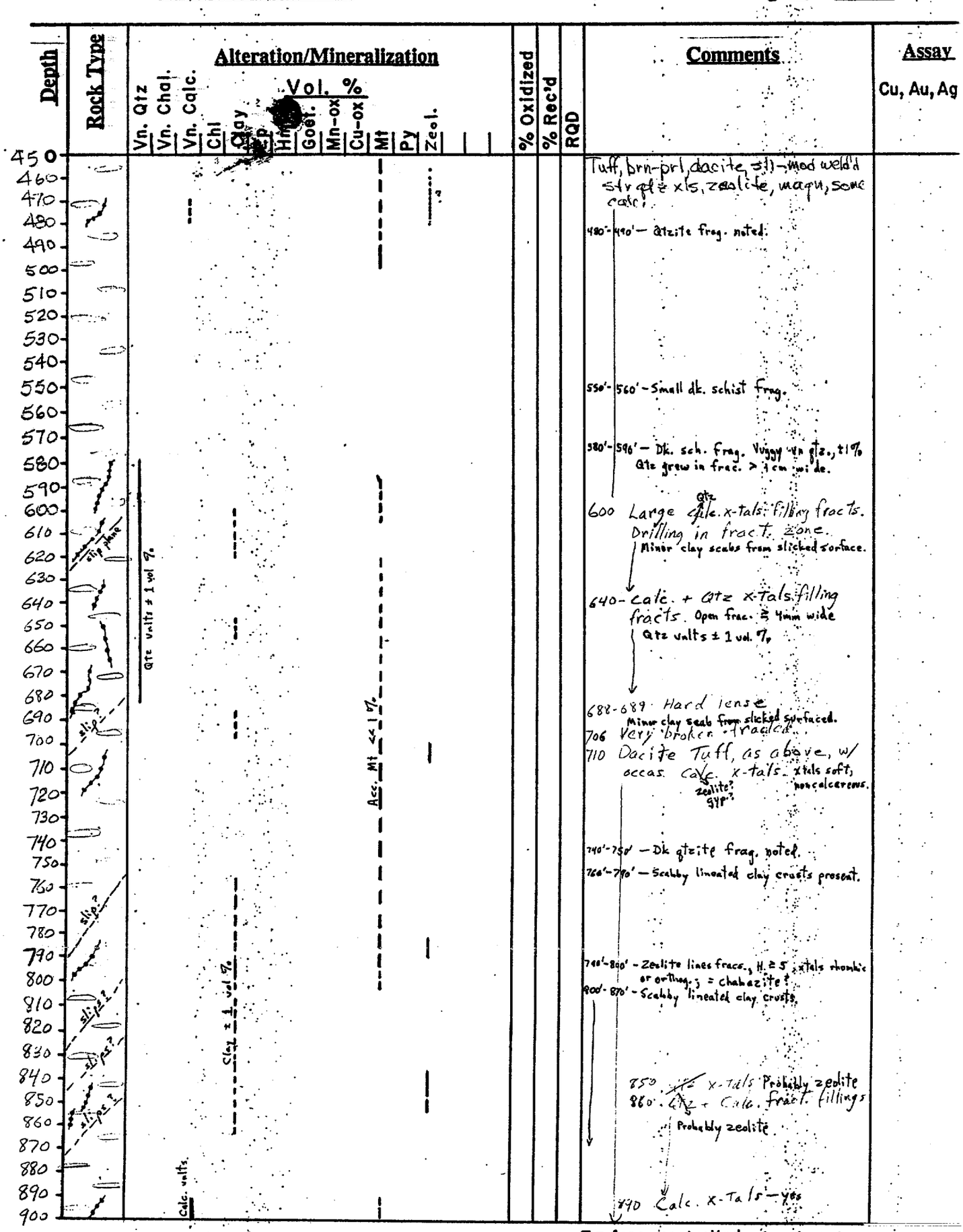
Division: _____ **Drill Hole:** MB-10 **Location:** _____

Coordinates: _____ **Collar Elev:** _____ **Total Depth:** _____

Date Collared: 10-24-91 **Completed:** _____ **Angle:** 90°

Bearing: _____ **Core Size:** Rotary **Logged By:** _____

Scale: 1" = 50'



F = frac. controlled tr. = trace
D = disseminated. acc. = accessory

MAGMA COPPER COMPANY

Division: _____ **Drill Hole:** MB-10 **Location:** _____

Coordinates: _____ **Collar Elev:** _____ **Total Depth:** _____

Date Collared: 10-24-91 **Completed:** _____ **Angle:** 90°

Bearing: _____ **Core Size:** Rotary **Logged By:** M. Pitterle & D. Lorne

Scale: 1" = 50'

Depth	Rock Type	Alteration/Mineralization Vol. %													% Oxidized	% Rec'd	RQD	Comments	Assay Cu, Au, Ag
		Vn. Qtz	Vn. Chal.	Vn. Calc.	Chl	Clay	Ep	Hm	Goet.	Mn-ox	Cu-ox	Mt	Py	Zeolite					
900																			
910																		Tuff - brnish purp dacite, slite - med wld'd w/ qtz + feld x-tals. Occas x-tals qtz + calc? as fract. fillings, zeolite, magn.	
920																		910-1000' — Common scabs of striated clay from slip surfaces.	
930																		940'-950' Qtzite frag. noted.	
940																			
950																			
960																			
970																		970'- Small frag. of diorite noted.	
980																			
990																			
1000																		No more qtz x-tals (Probably zeolite (& chabazite?))	
1010																		1000-1050' — Tiny clay scabs still present	
1020																		1030 — Calcite xtals	
1030																		1030-1070' — Small fragments of qtzite.	
1040																			
1050																		1050-1100 — Scattered, tiny striated clay scabs from slip surfaces.	
1060																			
1070																		1067-1069 Hard zone	
1080																			
1090																			
1100																			
1110																		1110' — Zeolite-filled fracs.	
1120																		1120 Gradual color chng from purp-brn to lt. brn at 1140	
1130																		1130 - Qtz veins a fraction of a mm thick.	
1140																		1140 Dacite tuff, mod. welded Lt. Brn.	
1150																		1130-1150 — Tiny qtzite frags. entrained in tuff.	
1160																			
1170																		1170 Bt. vitrophyre	
1180																		1180' — Tiny clay scabs from slip surface.	
1190																			
1200																			
1210																			
1220																			
1230																		1225 tuff, arg. alt, mod wld vs. ash	
1240																		1230 Sandy/conglomerate. Orange, pink, gray, wht. Lt. frags in 25-30% Qtz, feld? magnetite frags; ~20% blk vitrophyre; probably contamin. Also diabase frags, schist. Not noted w/ binocs.	
1250																			
1260																			
1270																			
1280																			
1290																			
1300																		1300 Predom. rdsh brn clay w/ minor sand/frags as above.	1300'-1320'
1310																			
1320																			1320'-1340'
1330																			
1340																		Partly contaminated w/ dacite washdown.	1340-1360 .0
1350																			

F = frac. controlled tr. = trace
D = disseminated acc. = accessory

MAGMA COPPER COMPA Y

Division: _____ **Drill Hole:** MR-10 **Location:** _____

Coordinates: _____ **Collar Elev:** _____ **Total Depth:** _____

Date Collared: 10-22-91 **Completed:** _____ **Angle:** 90°

Bearing: _____ **Core Size:** Rotary **Logged By:** [illegible]

Scale: 1" = 50' **Page** 4 **of** _____

Depth	Rock Type	Alteration/Mineralization Vol. % (Vn. Qtz, Vn. Chal., Vn. Calc., Chl, Clay, Ep, Hm, Goet., Mn-ox, Cu-ox, Mt, Py)	% Oxidized	% Rec'd	RQD	Comments	Assay Cu, Au, Ag,
1350						Fe rich mudstone. Minor pebbles, some sandy zones.	.054 % Cu
1360							
1370							
1380						1380	
1390						1390' – Increase in limy chips perhaps = lacustrine Ls.	.044
1400						1400	
1410						1400 Reddish brn clay w/ more cr. to fr. sand frags; i.e. schist, etc. [illegible] (1230-1300) Possible [illegible]. Also [illegible] reddish-brn [illegible] <5% [illegible]	.030
1420							
1430							.038
1440							
1450							.050
1460						1400-1500 – Reddish to yellowish-siltstone and mudstone. V. few clasts in return -- mostly just muck. 1460	
1470							.063
1480							1480
1490							
1500							.129
1510						1500	
1520						1500-1600 – Yellowish, sticky siltstone and mudstone. Few clasts or chips.	.192
1530							
1540							.195
1550							
1560							.194
1570							
1580							.112
1590							
1600							.111
1610						1600	
1620							.107
1630							1620
1640							.066
1650						1640 Brn + red clay chips. [illegible] grit – Some washdown contam. [illegible] frags.	.069
1660							
1670							.086
1680							
1690							
1700							.071
1710						[illegible] clay chips. [illegible] grit.	
1720							.062
1730						1730' Begin [illegible] silty clay.	.054
1740							
1750							.050
1760							
1770							.053
1780						1770 [illegible] v.fa. sandy clay	
1790							.057 % Cu
1800							

F = frac. controlled
D = disseminated

tr. = trace
acc. = accessory

MAGMA COPPER COMPA Y

Division: _____ **Drill Hole:** MB-10 **Location:** _____

Coordinates: _____ **Collar Elev:** _____ **Total Depth:** _____

Date Collared: 12-24-91 **Completed:** _____ **Angle:** 75°

Bearing: _____ **Core Size:** Rotary **Logged By:** [illegible]

Scale: 1" = 50' **Page** 5 **of** 5

Depth	Rock Type	Alteration/Mineralization Vol. % (Vn. Qtz, Vn. Chal., Vn. Calc., Chl, Clay, Ep, Hm, Goet., Mn-ox, Cu-ox, Mt, Py, Cu°)	% Oxidized	% Rec'd	RQD	Comments	Assay Cu, Au, Ag
1800						Clay, brn silty-sdy (< 5% Cu slag) w/ minor red-brn clay an	.060 % Cu
1810						Appears sandy; some small pebbles.	
1820						Clay, brn w/ frags red-brn mdst, slst, Ls, qtz, sch; vitrophere, arg alt; non-weld tuff	.068
1830							
1840							
1850							.063
1860		Tr				Clay, red-brn 40%, Ash, gry, arg, qtz, biot, strer dk min's, calc + frags red-brn slst, Ls	
1870							.055
1880						cht, mag, cu carb	
1890						+ diabase, sch, mag	
1900						Clay, brn, Ash arg, slt brn-grn, (arayuacta), AFP, qtz, mag, diab	.038
1910						malachite in fn sd clay	
1920						Clay, brn, slst red-brn (60% in grn sch, vfn sd, vitrophere	.070
1930		Tr				Ash + clay gry-brn, slst red-brn, diab sch + grn sch, qtz, Ls; Cu ox, clay	.048
1940						+ cht, diab alt to chl.	
1950							.040
1960							
1970						+ more sch frags + feld	.041
1980							
1990							.038
2000						Clay, dk brn, stiff, frags slst, diab, grn sch, qtz, epidote, qtz sch	
2010		Tr					.211 % Cu
2020						T.D. reached 2013'	
2030							
2040							
2050							
2060							
2070							
2080							
2090							
2100							
2110							
2120							
2130							
2140							
2150							
2160							
2170							
2180							
2190							
2200							
2210							
2220							
2230							
2240							
2250							

F = frac. controlled
D = disseminated
tr. = trace
acc. = accessory

MAGMA COPPER COMPA

Division: SUPERIOR Drill Hole: MB-11 Location: SE 1/4 SW 1/4 NW 1/4 Sect. 6 T2S R13E

Coordinates: 97,805 N, 15565 E Collar Elev: ~4,079.8' Total Depth: 3,367'

Date Collared: 1/23/92 Completed: 3/6/92 Angle: -90°

Bearing: ——— Core Size: HQ/NX Logged By: S.L. Manske, 2/4/92

Scale: 1:300 Page 1 of 15

Depth	Rock Type	Alteration/Mineralization Vol. % (Vn. Qtz, Vn. Chal., Vn. Calc., Chl, Clay, Ep, Hm, Goet., Mn-ox, Cu-ox, Mt, Py)	% Oxidized	% Rec'd	RQD	Comments	Assay (Cu, Au, Ag, -)
0						0'-11' — Colluvium and 'dozer fill.	
		3-5%		11 / 98% / 21	29%	11'-1,068' --- Apache Leap dacite tuff (Td). Gray to reddish-gray to brown to black (vitrophyre) welded tuff w/ scattered lithic fragments. Core skeletonized as drilled, saving 10' of every 100' until reaching vitrophyre. Acc. biotite and magnetite.	
25							
50						11'-21' — Core is v. weathered, argillic	
75							
100							
				111 / 95% / 121	61%	111'-121' — Reddish-gray, competent rock w/ eutaxitic streakiness aligned ~ 75° to core axis. Scattered lithic frags (felsite, older volcanics) ≤ 5cm across.	
125							
150							
175							
200				211 / 95% / 221	69%	211'-221' — Competent reddish-gray rock as above, w/ a few mm-thick, irreg. vnlts. of chalcedonic silica.	
225							

F = frac. controlled
D = disseminated

tr. = trace
acc. = accessory

MAGMA COPPER COMPA[illegible]

Division: _____ Drill Hole: MB-11 Location: _____

Coordinates: _____ Collar Elev: _____ Total Depth: _____

Date Collared: _____ Completed: _____ Angle: _____

Bearing: _____ Core Size: _____ Logged By: S.L. Manske, 2/4/92

Scale: _____

Depth	Rock Type	Alteration/Mineralization Vol. % (Vn. Qtz, Vn. Chal., Vn. Calc., Chl, Clay, Ep, Hm, Goet., Mn-ox, Cu-ox, Mt, Py)	% Oxidized	% Rec'd	RQD	Comments	Assay (Cu, Au, Ag, .)
225							
250							
275							
300							
				311–321: 94%	65%	311'-321' – Competent, reddish-gray tuff w/ eutaxitic streakiness ~ 80° to core axis. A few scattered lithic frags, lithophysae.	
325							
350							
375							
400							
				411–421: 97%	87%	411'-421' – Competent, reddish-gray xtal-vitric tuff. Scattered lithic frags.	
425							
450							

F = frac. controlled
D = disseminated

tr. = trace
acc. = accessory

MAGMA COPPER COMPA. I

Division: _____ Drill Hole: MB-11 Location: _____

Coordinates: _____ Collar Elev: _____ Total Depth: _____

Date Collared: _____ Completed: _____ Angle: _____

Bearing: _____ Core Size: _____ Logged By: S.L. Manske, 2/4/92

Scale: _____

Depth	Rock Type	Alteration/Mineralization Vol. % (Vn. Qtz, Vn. Chal., Vn. Calc., Chl, Clay, Ep, Hm, Goet., Mn-ox, Cu-ox, Mt, Py)	% Oxidized	% Rec'd	RQD	Comments	Assay Cu, Au, Ag,
450							
475							
500		≤1%		511' 88% 521'	43%	511'-521' — Reddish-gray tuff broken and argillic along fracture zone at ~40° to core axis. Open fractures clean-vile.	
525							
550							
575							
600		1-3%		611 70% 621	20%	611'-621' — Red-gray xtal-vitric tuff in this interval largely rubbleized (= fault breccia?). Argillic.	
625							
650							
675							

F = frac. controlled
D = disseminated

tr. = trace
acc. = accessory

MAGMA COPPER COMPANY

Division: _____ Drill Hole: MB-11 Location: _____

Coordinates: _____ Collar Elev: _____ Total Depth: _____

Date Collared: _____ Completed: _____ Angle: _____

Bearing: _____ Core Size: _____ Logged By: S.L. Manske, 2/4/92

Scale: _____ Page 4 of 15

Depth	Rock Type	Alteration/Mineralization Vol. % (Vn. Qtz, Vn. Chal., Vn. Calc., Chl, Clay, Ep, Hm, Goet., Mn-ox, Cu-ox, Mt, Py)	% Oxidized	% Rec'd	RQD	Comments	Assay Cu, Au, Ag,
675							
700							
				711' 95% 721'	81%	711'-721' – Reddish to gray-brn; competent xtal-vitric tuff. "Clinkery." Glass fraction of matrix increased over that of section above. Eutaxitic streaks ~ 80° to core axis.	
725							
750							
775							
800							
				811' 89% 821'	7%	811'-821' – Red-brown xtal-lithic tuff. "Clinkery." Quite broken by open fractures on steep, irregular splits, but not appreciably argillic.	
825							
850							
875							
900							

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MAGMA COPPER COMPANY

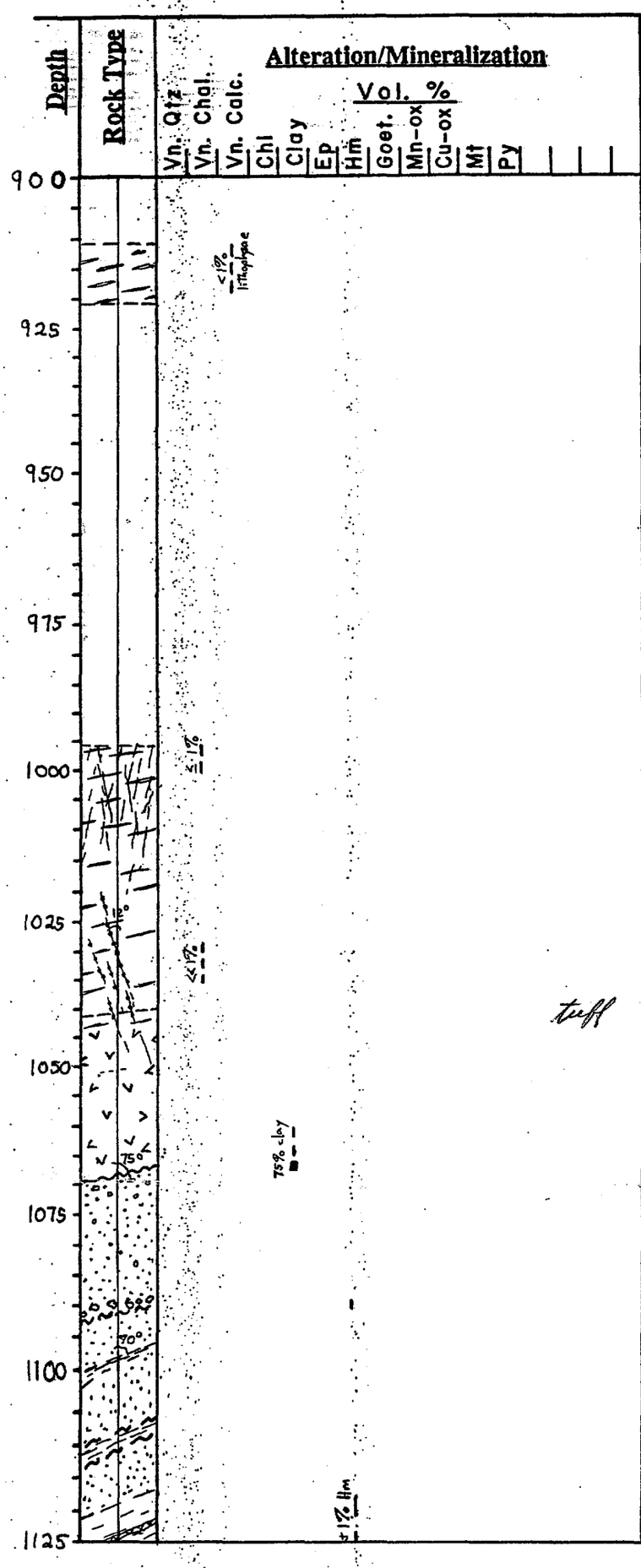
Division: _____ Drill Hole: MB-11 Location: _____

Coordinates: _____ Collar Elev: _____ Total Depth: _____

Date Collared: _____ Completed: _____ Angle: _____

Bearing: _____ Core Size: _____ Logged By: S. L. Manske, 2/4/92

Scale: _____ Page 5 of 15



% Oxidized	% Rec'd	RQD	Comments	Assay (Cu, Au, Ag,.)
	911' – 921'		911'-921'- Red-brn, "clinkery" xtal-vitric tuff; rather densely welded. A few lithophysae ≤ 2 cm across, filled w/ calcite.	
	96%	69%		
	921'			
	996		996'-1,040'- Vitrophyre. Dark, dense, brittle black glass w/ ± 10% xtals. Some lithophysae 1-2 cm across, filled with agate. Many steep fractures, especially in upper part.	
	← 96% →	← 2 % →		
	1046			
	100%	← 42% →	1036-1038'- Several mm-thick chalced. vnlts.	
	1036			
	98%	51%	1,041'-1,068'- Black glassy matrix disappears 1,040-1,041'. Yellow-brn to light gray mod. to weakly welded tuff replaces vitrophyre. Argillized right at base in contact w/ Whitetail.	
	1046			
	92%	61%		1050'
	1056			
	99%	62%		
	1066			
	100%	65%	1,068'-2401'- Whitetail "Cgl." Medium-grained Ss w/ a few subang. pebbles of diabase, Ls at top. Fines downward to gypsiferous siltstone/mudstone by 1120'. Ss has calcareous matrix and is generally well-indurated. 1068'-1120'. Unit coarsens from silts to sands ~1300'-1325', becomes pebbly and cobbly at ca. 1475'. Intensely hematitic redbeds at base, 2350'-2400'.	.034 % Cu
	1076			
	100%	69%		.017 %
	1086			
	98%	79%	1090'- Narrow zone of Ls rubble. Sheared.	
	1096			.021%
	98%	70%	1098'- Bedding of silty laminae in Ss.	1100'
	1106			.017 %
	100%	67%		
	1116			.024 %
	100%	26%	1120'- section passes down into brick-red gypsiferous siltstone. Sectile; poorly ind.	
				.029 %

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MAGMA COPPER COMPANY

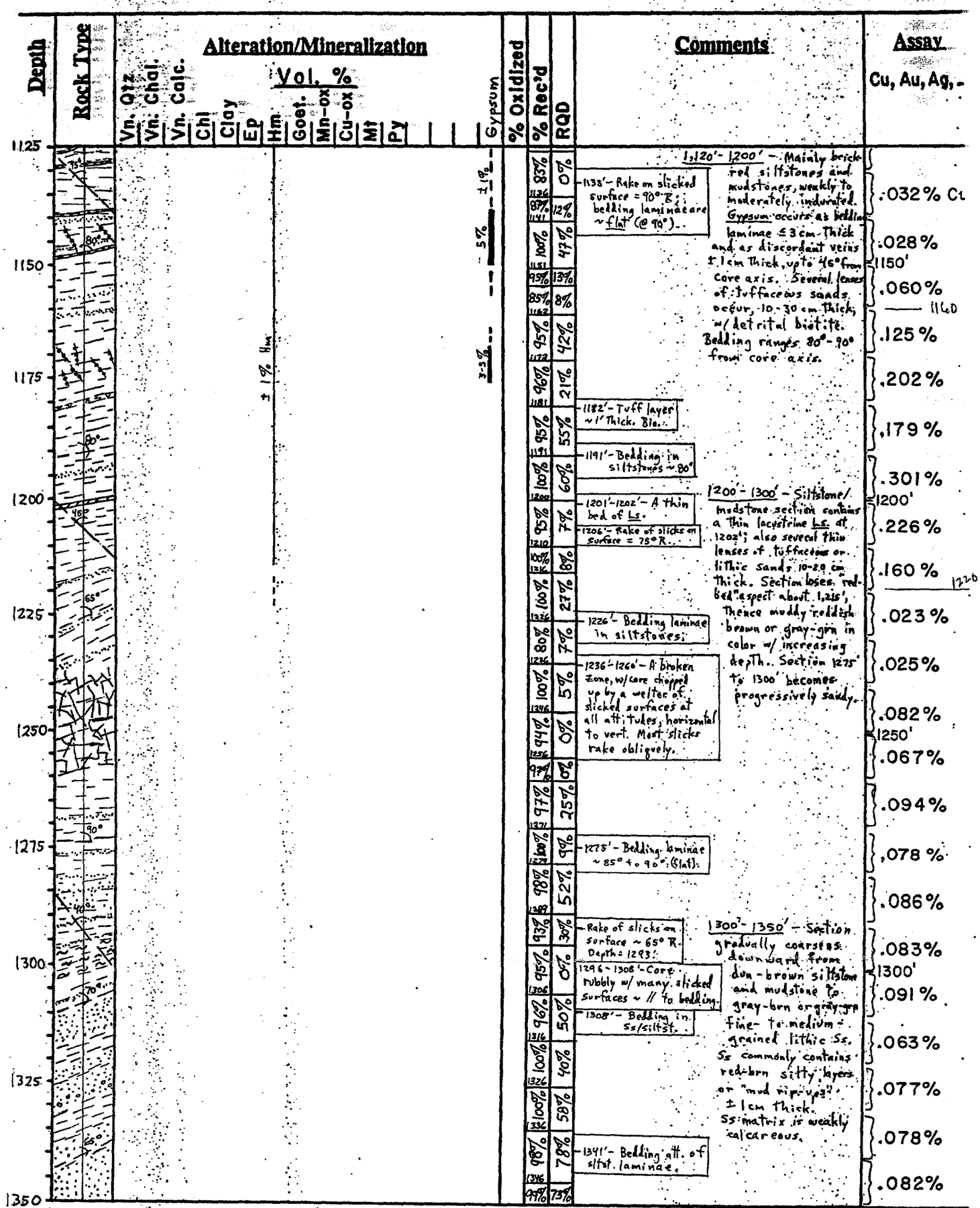
Division: _____ **Drill Hole:** MB-11 **Location:** _____

Coordinates: _____ **Collar Elev:** _____ **Total Depth:** _____

Date Collared: _____ **Completed:** _____ **Angle:** -90°

Bearing: — **Core Size:** HQ/NC **Logged By:** S.L. Manske 2/5/92

Scale: 1:300



F = frac. controlled
D = disseminated

tr. = trace
acc. = accessory

MAGMA COPPER COMPANY

Division: Superior **Drill Hole:** MB-11 **Location:**

Coordinates: **Collar Elev:** **Total Depth:**

Date Collared: **Completed:** **Angle:**

Bearing: **Core Size:** **Logged By:** S.L. Manske 2/7/92

Scale: 1: 300 **Page** 7 **of** 15

Depth	Rock Type	Alteration/Mineralization (Vol. %)	% Oxidized	% Rec'd	RQD	Comments	Assay Cu, Au, Ag, -
350				1355		1350'-1450' — Gray-brn fine- to medium-grained lithic Ss, weakly to mod. indurated. Interlamination 1-2 cm thick of brick-red mudst. are common. Section becomes pebbly toward base w/ ang. to rounded clasts of schist, diabase, qtzite.	.057% Cu
				99%	80%		.064%
				1365			
				100%	73%	1370' - Bedding of siltst. laminae in Ss.	.059%
1375				1375			
				100%	88%		.046%
				1385			
				100%	100%		.056%
				1395			
1400				99%	73%	1401' - Bedding ∡ of mudst. laminae in Ss.	1400'
				1405			.072%
				100%	93%		.077%
				1415			
				100%	68%		.053%
1425				1425			
				96%	88%		.046%
				1435			
				100%	73%	Tbx	.042%
				1445		1445' - Slicked surface in Ss w/ Rake = 65° L.	
1450				100%	70%	1448' - Bedding ∡ of Mudst. lamina. 1450' - 1500', Gray-brn medium- to coarse-grained pebbly Ss w/ some cobbles up to 6 cm in diam. of schist, Ls, diabase, volcanics, qtzite. A brick-red siltst. zone appears, 1480'-1491'. Pebbly zones mostly matrix-supported, w/ weakly calcareous matrix.	1450'
				1455			.038%
				100%	95%		.024%
				1465			
				99%	68%	<<1%	
1475		<1% Hm in matrix		1475			.035%
				99%	79%		
				1485			
				100%	55%	1487' - Bedding ∡ in Ss-siltst.	.144%
				1495		1500'-1550' — Gray-brn Ss and sandy Cgl. w/ cobbles up to 15 cm across (most ∡ 5 cm). Clasts comprise mix of schist, diabase, Ls, vein qtz, qtzite, generally matrix-supported. Tuff layers of xtal-lithic airfall (?) material 10-15 cm thick appear. Clasts in cgl. are subang. to subround.	.027%
				96%	62%		1500'
				1505			
				99%	55%		
				1515			
				100%	48%		
1525		<1% Hm in matrix		1525			
				98%	49%	1531' - A tuff layer ~17 cm thick.	
				1535			
				100%	81%		
				1545		1545' - Bedding ∡ of mdst. lamina in cgl. 1550' - A tuff layer ~12 cm thick. Bio. 1550'-1600' — Matrix-supp. cobble cgl., w/ subang. to rounded clasts comprising ~40% diabase, ~20% schist, 10% qtzite, 10% granitic rx, 5% Ls, 5% vein qtz, and remainder chert, hornfels. Cobbles up to 25 cm across; most 5-10 cm in size. Talcose clast noted.	
				99%	42%		
				1555			
				99%	55%		
				1565			
1550				98%	14%		
				1575			
1575							

F = frac. controlled tr. = trace
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MAGMA COPPER COMPANY

Division: _____ **Drill Hole:** MB-11 **Location:** _____

Coordinates: _____ **Collar Elev:** _____ **Total Depth:** _____

Date Collared: _____ **Completed:** _____ **Angle:** -90°

Bearing: — **Core Size:** HQ/NC **Logged By:** S.L. Manske, 2/9-2/10/92

Scale: 1:300 **Page** 8 **of** 15

Depth	Rock Type	Alteration/Mineralization (Vol. %): Vn. Qtz. / Vn. Chal. / Vn. Calc. / Chl / Clay / Ep / Hm / Goet. / Mn-ox / Cu-ox / Mt / Py / Native Cu	% Oxidized	% Rec'd	RQD	Comments	Assay Cu, Au, Ag,
1575				98%	64%		
				99%	44%		
				93%	28%	1595' Xtal-lithic tuff layer ± 15 cm thick.	
1600				100%	49%	1,600-1,650 — Hetero lithic pebble- to cobble cgl., w/ subang. to rounded clasts up to 12 cm across (most ± 5 cm) in a brown, weakly indurated sandy matrix. Poorly sorted; commonly appears framework supported. Clast population: ~40% schist, 25% diabase, 10% qtzite, 10% granite/aplite, 5% vein qtz, remainder mixed Ls, andesite (?), chert, slate.	
				100%	21%		
1625				100%	55%		
				100%	51%		
				97%	40%		
1650				99%	49%	1,650'-1,700' — Hetero lithic, poorly sorted cobble cgl. w/ subang. to subrounded clasts ≤ 15 cm across (most 5-10 cm). Commonly framework supported; matrix is weakly indurated, brown silt+sand. Clast population ~ 50% diabase, 30% schist, 10% qtzite, remainder is bull qtz, slate, granite/aplite, hornfels, older cgl., ferruginous breccia frags.	
				100%	58%		
1675				98%	25%		
				90%	52%		
				99%	61%		
1700				100%	48%	1,700'-1,750' — Hetero lithic cobble cgl. as above, w/ subang. to subround. clasts ≤ 15 cm across (most ± 5 cm) in a poorly indurated, brown, sandy/silty matrix. Mostly framework supported. Clast population ~ 50% diabase, 20% schist, 20% qtzite; remainder Ls, granite/aplite, bull qtz, slate, hornfels, epidotitic fragments.	
				96%	35%	1709' Rake of slicks on surface = 80° R	
1725				100%	33%		
				100%	28%		
				82%	22%		
1750				91%	52%	1,750'-1,800' — Hetero lithic, poorly sorted cobble cgl. w/ clasts up to 17 cm across, although most ≤ 10 cm in diameter. Frags. subang. to subrounded. Mostly framework supported, w/ matrix as above. Clast population ~ 50% diabase, 25% schist, 10% Ls, 5% qtzite; remainder granitic or rhyolitic clasts, bull qtz, slate, hornfels.	
				99%	37%		
				96%	32%		
1775				98%	57%		
				98%	13%	1789' Rake of slicks = 10° L.	
1800				100%	17%		

F = frac. controlled
D = disseminated

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acc. = accessory

MAGMA COPPER COMPANY

Division: _____ Drill Hole: MB-11 Location: _____

Coordinates: _____ Collar Elev: _____ Total Depth: _____

Date Collared: _____ Completed: _____ Angle: -90°

Bearing: _____ Core Size: _____ Logged By: S.L. Manske 2/11/92

Scale: 1:300

Depth	Rock Type	Alteration/Mineralization (Vol. %): Vn. Qtz, Vn. Chal., Vn. Calc., Chl, Clay, Ep, Hm, Goet., Mn-ox, Cu-ox, Mt, Py, Native Cu	% Oxidized	% Rec'd	RQD	Comments	Assay (Cu, Au, Ag, -)
1800				1804 100%	24%	1800'-1850' — Heterolithic pebble/cobble cgl., framework supported, w/ subang. to subround: clasts up to 27cm across in brown sand/silty matrix. Poorly sorted. Clast population ~ 45% diabase, 20% schist, 20% qtzite, 5% Ls; remainder granite, bull qtz, slate, talcose frags, hornfels, epidotitic rx.	
				1814 98%	20%		
				1822 81%	25%		
1825		Tr		1832 95%	0%	1831' - Rake of dicks is horizontal (0°).	
				1839 100%	16%		
				1844 90%	54%	1850'-1900' — Cobble cgl. as above, w/ angular to subround. clasts up to 21 cm across (most 5-8 cm). Poorly sorted, framework supported in most part. Bedding indistinct. Clast population ~ 30% diabase, 40% schist, 10% Ls, 5% granite or hypabyssal rocks, 5% qtzite, remainder bull qtz, slate, old volcanics, and qtz-specularite vein frags.	
1850				1854 97%	35%	Bedding in sandy zone at 1853'	
				1864 99%	25%		
				1874 100%	51%		
1875				1884 97%	38%		
				1893 94%	38%		
				1903 98%	24%	1895' - A fragment of qtz-specularite vn. material, 5 cm across.	
1900				Ma3 100%	73%	1900'-1950' - Cobble cgl. much as above w/ ang. to subround. clasts ≤ 30 cm across (most 5-8 cm). Clast pop. is ~ 35% diabase, 30% sch., 15% qtzite, 5% Ls, 5% granite/aplite, remainder bull qtz, silicified rx, andesite (?), slate, epidotitic fragments, specularite.	
				1911 100%	50%		
				1916 100%	46%		
1925		Cu° <1%		1926 95%	56%		
				1936 94%	42%		
				1946 98%	41%	1950'-2,025' — Cobble cgl. w/ subang. to rounded clasts up to 25cm across (most ≤ 10 cm). Mainly framework supported; poorly sorted, bedding indistinct. Clast population ~ 60% diabase, 20% qtzite, 10% schist, w/ lesser Ls, granitic or aplitic frags, bull qtz, slate, hornfels, specularite.	
1950				1956 98%	48%		
				1966 100%	55%		
				1976 100%	31%		
				1986 100%	14%		
				1996 98%	49%		
				2006 100%	56%		
1975		Cu° in mm-sized blebs, <1%		2016 98%	58%	2019' - A clast of specularite 5 cm across.	
2000							
2025							

F = frac. controlled
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MAGMA COPPER COMPANY

Division: Superior **Drill Hole:** MB-11 **Location:**

Coordinates: **Collar Elev:** **Total Depth:**

Date Collared: **Completed:** **Angle:** -90°

Bearing: — **Core Size:** HQ/NC **Logged By:** S.L. Manske 2/12/92

Scale: 1:300 **Page** 10 **of** 15

Depth	Rock Type	Alteration/Mineralization (Vol. %)	% Oxidized	% Rec'd	RQD	Comments	Assay Cu, Au, Ag, -
2,025				100%	51%	2,025-2100' – Heterolithic pebble- to cobble cgl., framework-supported w/ bm sand/silt matrix and angular to subround. clasts up to 20 cm across. (Most in range 1-8 cm.) Schist frags. not common, especially below ~2,050'. Clast population ~70% diabase, 10% qtzite, 7% schist, 5% granite/aplite, remainder Ls, slate, hornfels, andesite, epidotitic rx, Fe-ox-stained bleached frags. Bedding indistinct.	
2,050		Cu° in med-sized blebs ≪1%		98%	45%		
				97%	25%		
				97%	18%	2062' - A tuff layer some 23 cm thick, floored by a slip plane as shown w/ rake of slicks 70° L.	
2,075				98%	28%		
				95%	28%		
				98%	32%		
2,100		?		96%	43%	2100'-2150' – Heterolithic pebble- to cobble cgl. as above. Clasts ang. to subrounded, up to 20 cm across but most 1-5 cm in size. Schist frags rare or absent; most Ls. clasts appear altered as if hornfelsed or partly silicified and commonly are veined by qtz. or lim. Limonitic "gossan" pebbles are fairly common. Clast population ~60% diabase, 20% Ls (or altered ls), 5% granite/apl; remainder black chert, qtzite, Mz. volcanics, limonite frags.	
				100%	14%		
				100%	48%		
2,125		≪1%		100%	27%		
				97%	37%		
2,150		≪1%		98%	10%	2150'-2200' – Heterolithic cgl. as above. Clasts ang. to subround., framework supported in main part, up to 20 cm across but most ≤5 cm. Schist pebbles rare; Ls clasts commonly partly alt. (silic. or hornfels). Clast population ~60% diabase, 15% Ls, 15% qtzite, 5% hypabyssal porphyritic rock; remainder black shale, slate, gossany frags. Matrix mod. to strongly stained w/ limonite and lesser hem. from ~2,170'. Clasts of volcanics + specularite noted. Bedding indistinct.	
				98%	7%		
				93%	12%		
2,175		≪1%		98%	29%		
				99%	5%		
2,200		≪1% Cu° ≪1%		100%	24%	2200'-2250' – Heterolithic cgl. w/ ang. to subrounded clasts up to 25 cm across, at the most ≤5 cm. Rather weakly indurated yellowish to reddish brown sand/silt matrix. Clast population ~60% diabase, 12% qtzite, 5% Ls, 5% felsic to intermed. hypabyssal rock. Remainder is varied mix of slate, red shale, jasper, epidotitic rx, limonitic "gossan" frags, black chert. Schist not noted. Bedding indistinct.	
				100%	29%		
				100%	0%		
2,225		med-size blebs, last		70%	0%		
				98%	6%		
				94%	12%		
2,250							

Lim. ≥1% in matrix — Lim. ±1% in gossany clasts

<1% tm in matrix — ≤1% in matrix or in gossany frags

F = frac. controlled
D = disseminated

tr. = trace
acc. = accessory

MAGMA COPPER COMPANY

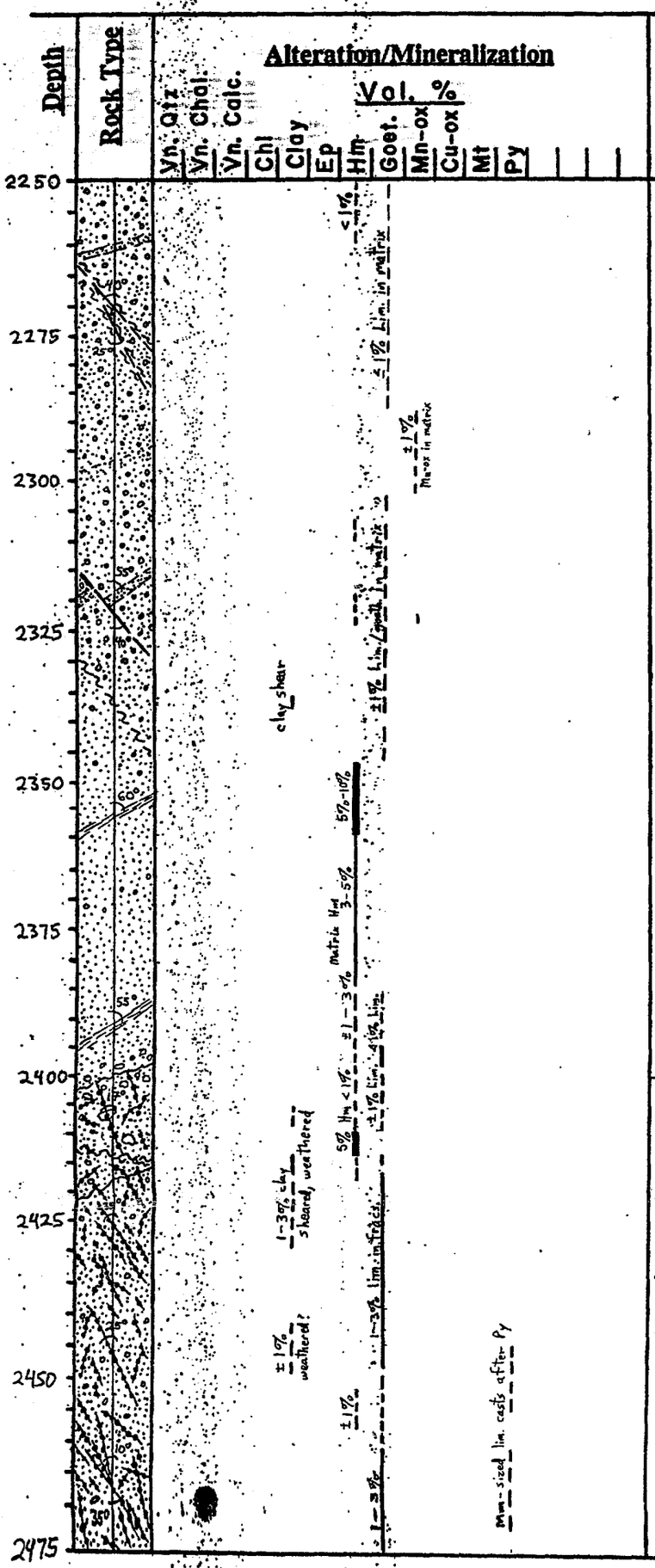
Division: _____ **Drill Hole:** MB-11 **Location:** _____

Coordinates: _____ **Collar Elev:** _____ **Total Depth:** _____

Date Collared: _____ **Completed:** _____ **Angle:** -90°

Bearing: — **Core Size:** HQ NMLC **Logged By:** S.L. Manske 2/13/92

Scale: 1:300 **Page** 11 **of** 15



% Rec'd	RQD
100%	0%
71%	0%
91%	0%
94%	0%
95%	0%
82%	6%
86%	10%
94%	20%
100%	23%
97%	11%
98%	47%
100%	58%
100%	40%
99%	77%
100%	64%
100%	57%
83%	41%
100%	99%
100%	88%
97%	41%
95%	31%
100%	69%
98%	55%
100%	60%
99%	89%

Comments

2250-2300' – Pebble to cobble cgl. w/ ang. to subround. clasts mostly ≤ 8 cm across. Core v. broken, rubbly. Altered granitic frags are prominent, espec. below 2275'. Clast population ~30% diabase, 40% granitic frags, 25% qtzite (perhaps incl. hornfelsed Ls), remainder comprises black chert, black shale, rare schist, specularite, limonitic breccia, bull qtz, slate, epidotitic frags, volcanics. Mn-ox occurs in matrix; also as dendrites in alt. granitic clasts.

-2270' – A shear zone w/ clay gouge. Rake of slicks on main slips ~90°.

2300'-2350' – Weakly indurated cobble cgl. to pebbly Ss. Cobbles decrease markedly in abundance below ~2330'. Clasts subang. to subround., never > 8 cm across, and are dominated by granitic or hypabyssal rocks. Also appearing are qtzite, various volcanics, bull qtz, talcose or epidotitic frags, and at least one small cobble of brecciated silic. Ls cemented w/ Mn-ox. Matrix colored w/ yel-brn limonite and brownish-blk Mn-ox. Diabase frags. uncommon; no schist noted.

-2322' – Rake of slicks on surface ~50°. Bedding just above in sand/pebble interlayers at 55° from core axis.

2350'-2400' – Weakly to mod.-indurated "redbed" pebbly Ss, w/ scattered granitic cobbles. Clasts mostly < 2 cm, ang. to subround. granitic or hypabyssal rocks w/ lesser qtzite, volcanics, epidotitic rocks, and rare schist. Ls not noted. Some shale partings in Ss; matrix by and large highly charged w/ earthy red hematite up to ≈20% by volume in local laminae.

-2356' – Bedding laminae in a thin red shale.

-2392' – Bedding laminae in red shale layer, ±10 cm thick.

2,401'-3,367' T.D.

Mz (?) Clastic Rocks

2401'-2420' – Volcaniclastic Ss w/ cobbles of diabase, qtzite. Well indurated where unweathered; riddled w/ lim-hem veinlets.

2420'-2498' – Weathered arkosic Ss w/ scattered pebbles of granite, volcanics, qtzite, siltstone, black shale, black chert in a yellowish quartz-feldspar sand matrix. Riddled w/ planar to irreg. mm's-thick limonite ± hem. veinlets. Weakly to moderately indurated. A few small schist pebbles noted.

-2468' – Ox. sulfide veins 3-5mm thick in sheeted frac. Py casts.

Assay

Cu, Pb, Zn, Mn %
Au, Ag oz/T

.19, .02, .29, .10 %; .15, .003 oz/T
.15, .02, .19, .10 %; .12, .003 oz/T
.06, .04, .10, .05 %; .18, .002 oz/T
.09, .07, .13, .06 %; .08, .001 oz/T
.12, .04, .18, .12 %; .09, .002 oz/T
.06, .05, .09, .07 %; .12, .003 oz/T
.04, .26, .12, .05 %; .12, .002 oz/T
.04, .40, .13, .09 %; <.001, .04 oz/T
.05, .23, .16, .20 %; .09, .003 oz/T
.03, .11, .17, .08 %; <.001, .03 oz/T
.02, .08, .09, .04 %; <.001, .03 oz/T
.01, .03, .08, .04 %; <.001, .03 oz/T
.02, .04, .09, .05 %; .001, .03 oz/T
.01, .04, .10, .05 %; .06, .002 oz/T
.01, .04, .13, .04 %;

F = frac. controlled
D = disseminated
tr. = trace
acc. = accessory

MAGMA COPPER COMPA

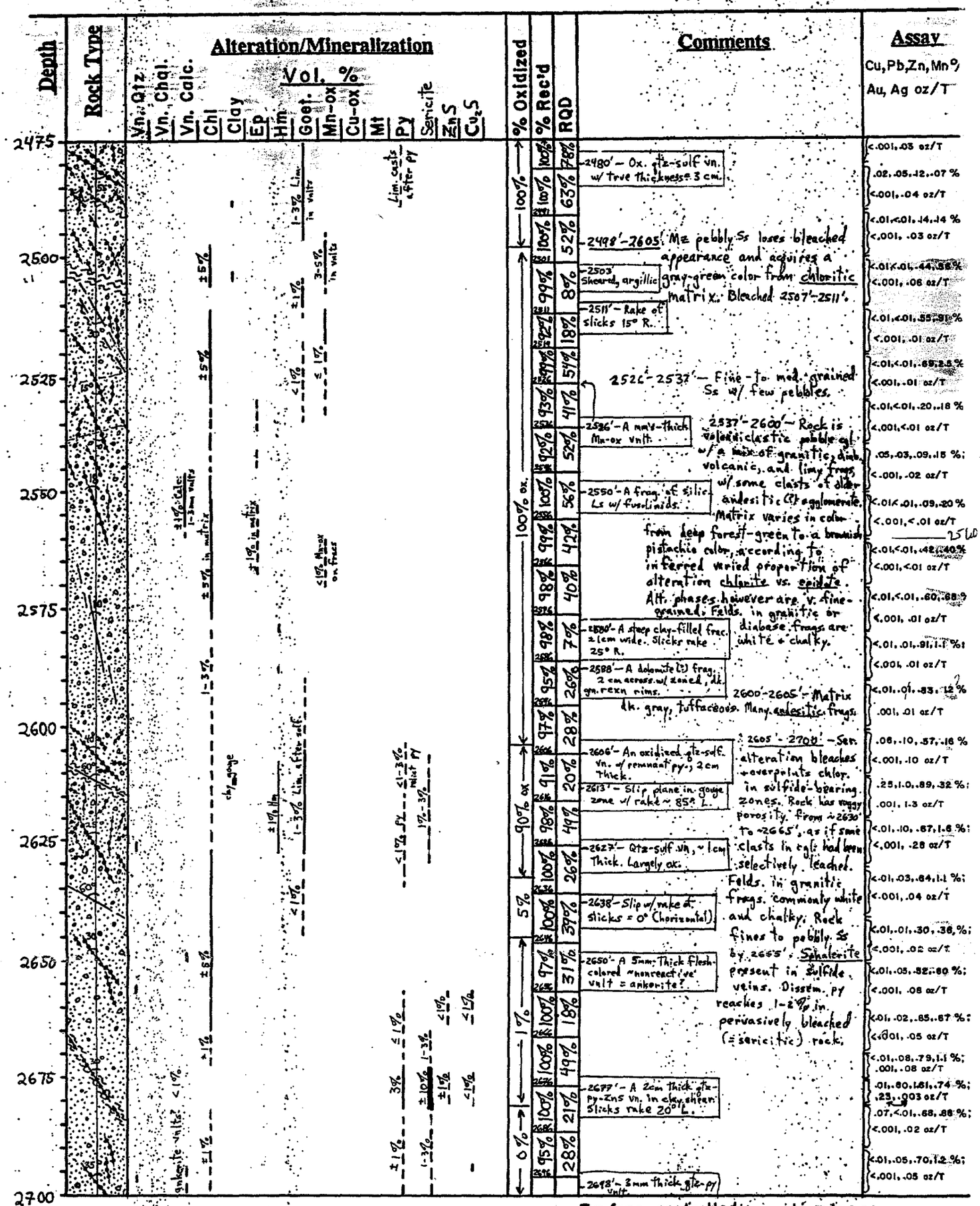
Division: _____ **Drill Hole:** MB-11 **Location:** _____

Coordinates: _____ **Collar Elev:** _____ **Total Depth:** _____

Date Collared: _____ **Completed:** _____ **Angle:** _____

Bearing: _____ **Core Size:** HQ **Logged By:** S.L. Manske 2/21/92

Scale: 1:300



F = frac. controlled
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MAGMA COPPER COMPANY

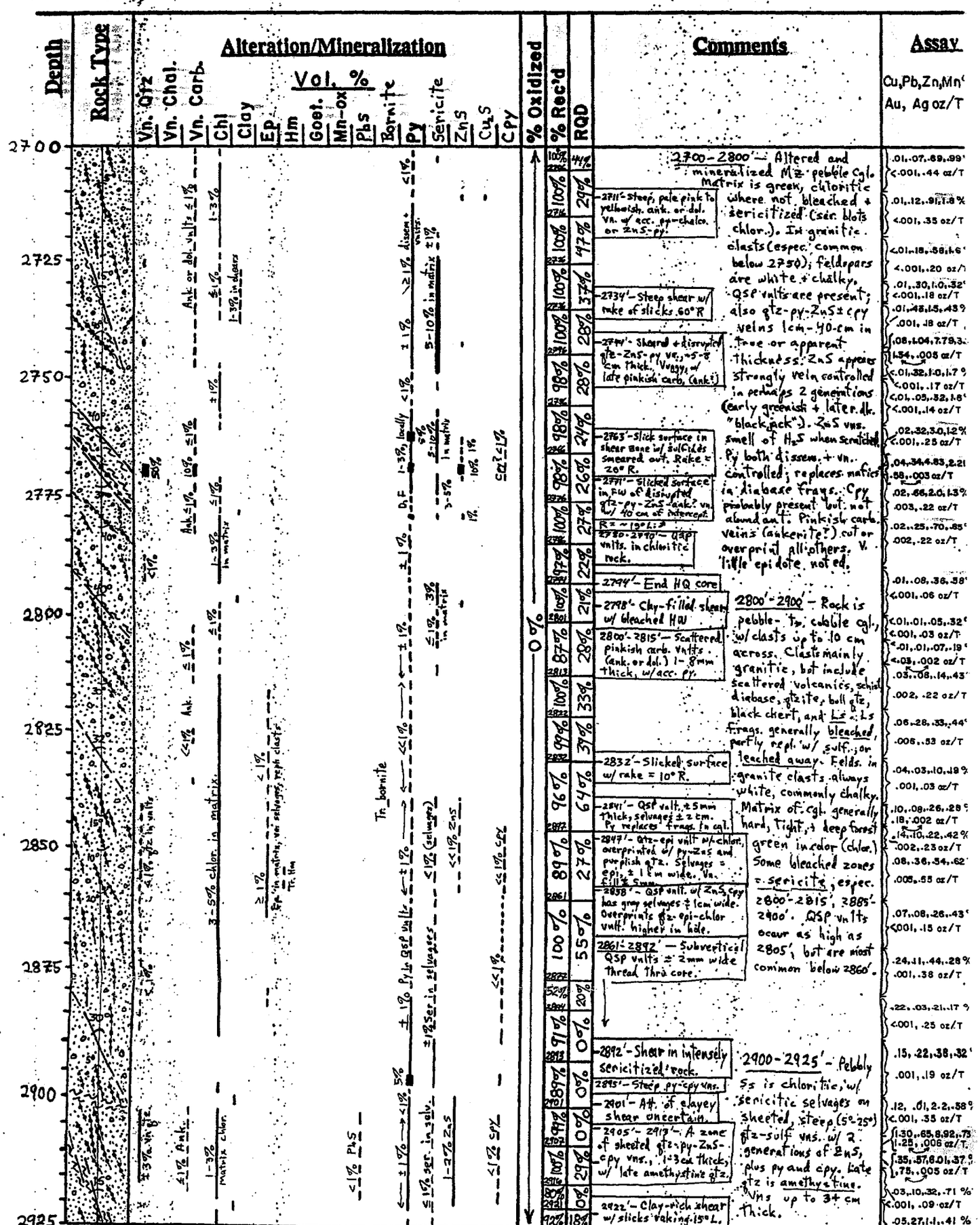
Division: _____ **Drill Hole:** _____ **Location:** _____

Coordinates: _____ **Collar Elev:** _____ **Total Depth:** _____

Date Collared: _____ **Completed:** _____ **Angle:** _____

Bearing: _____ **Core Size:** HQ → NX **Logged By:** S.L. Manske, 2/29/92

Scale: 1: 300 **Page** 13 **of** 15



F = frac. controlled
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tr. = trace
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MAGMA COPPER COMPA

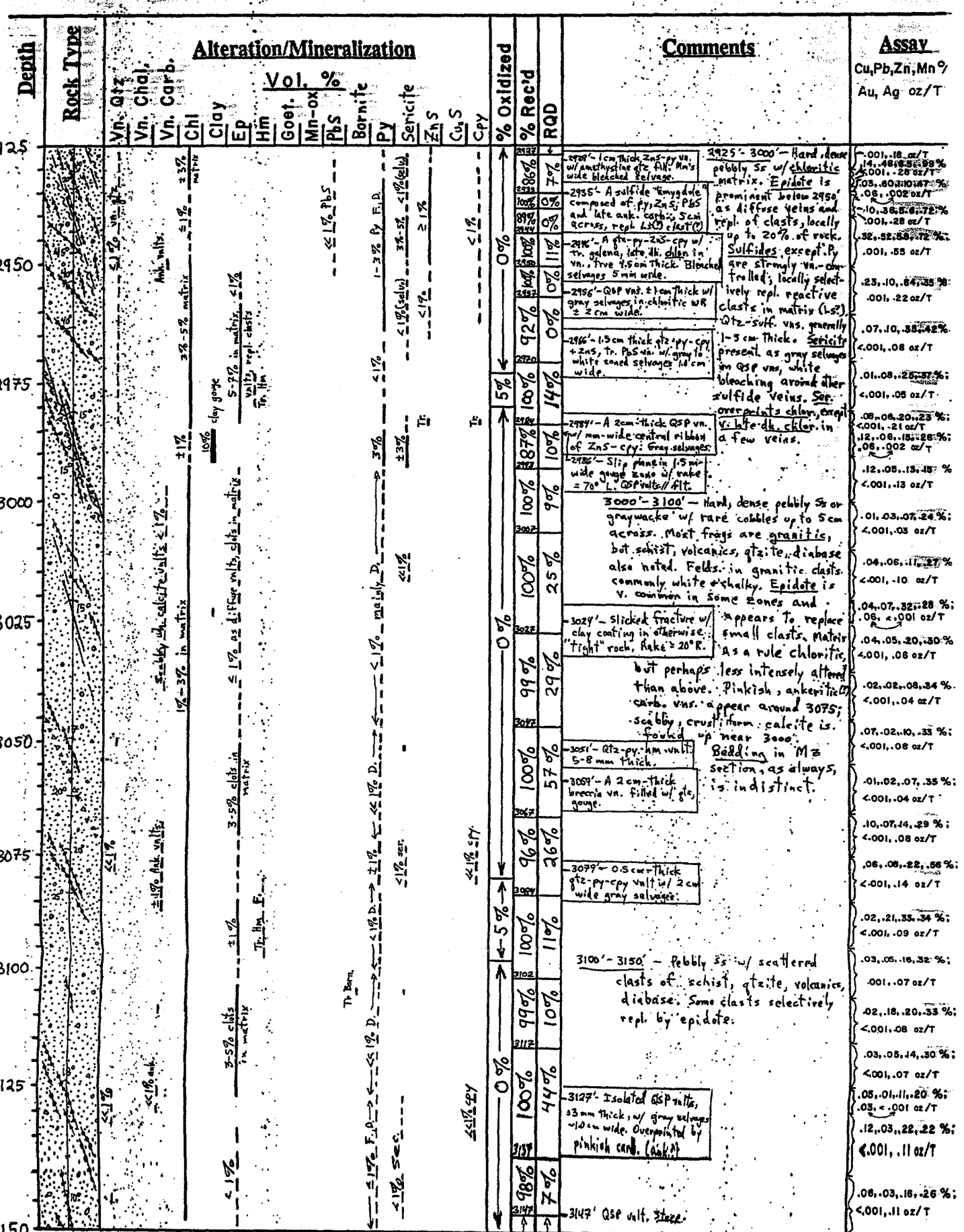
Division: _____ **Drill Hole:** _____ **Location:** _____

Coordinates: _____ **Collar Elev:** _____ **Total Depth:** _____

Date Collared: _____ **Completed:** _____ **Angle:** _____

Bearing: — **Core Size:** NX **Logged By:** S. L. Manske 3/4/92

Scale: 1:300 **Page** 14 **of** 15



F = frac. controlled
D = disseminated

tr. = trace
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MAGMA COPPER COMPANY

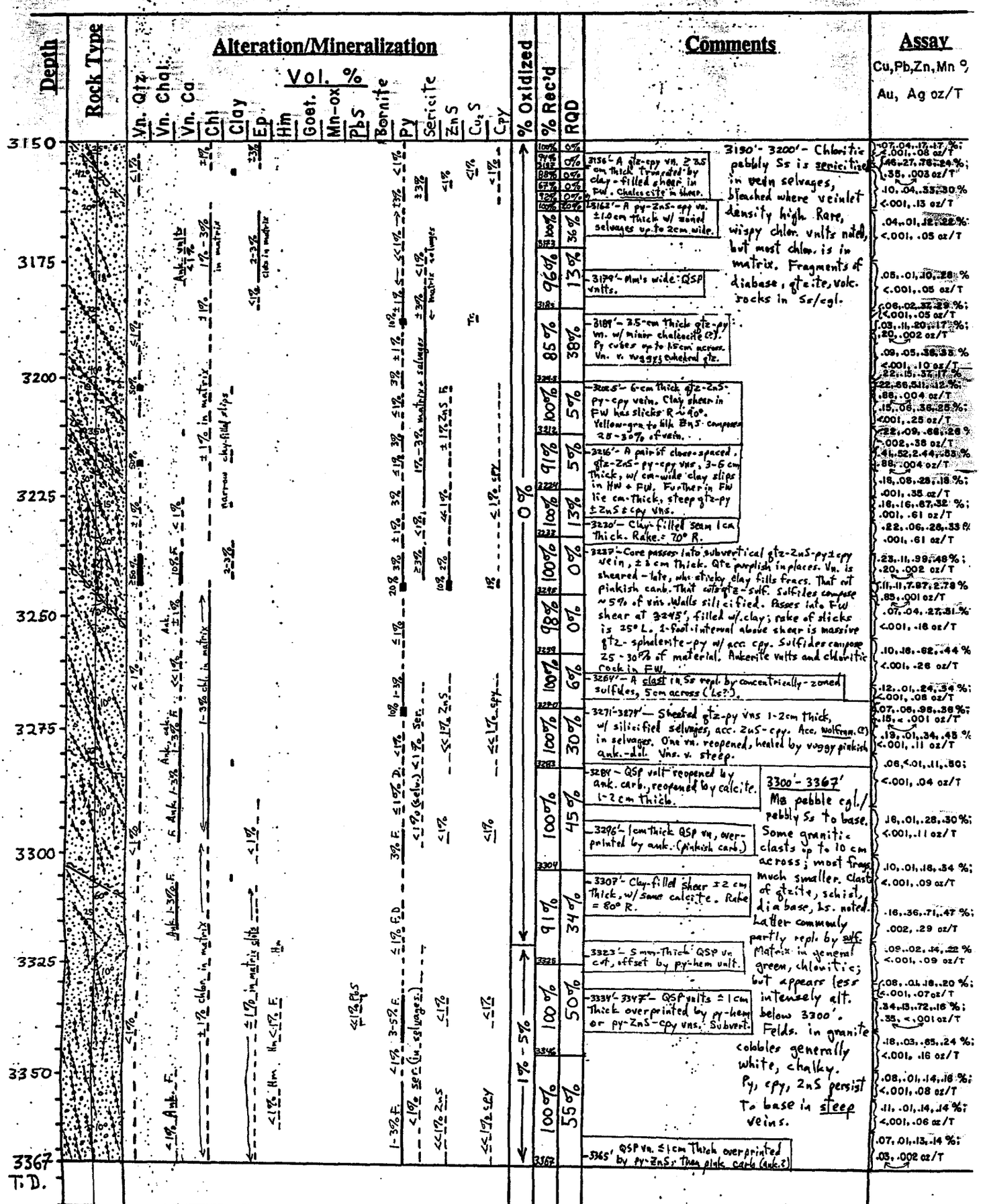
Division: _____ **Drill Hole:** MB-11 **Location:** _____

Coordinates: _____ **Collar Elev:** _____ **Total Depth:** 3,367'

Date Collared: _____ **Completed:** 3/6/92 **Angle:** -90°

Bearing: ——— **Core Size:** NX **Logged By:** S.L. Manske

Scale: 1:300 **Page** 15 **of** 15



MAGMA COPPER COMPA.

T2S, R13E, Sect. 6
SE¼, SW¼, NW¼

Division: SUPERIOR Drill Hole: MB-11A Location: S. Boundary

Coordinates: 97,809.6N, 15561.1E Collar Elev: 4,079.8' Total Depth: 4,667'

Date Collared: Dec. 15, 1992 Completed: April 4, 1993 Angle: -80°

Bearing: az. = 180° Core Size: HQ/NX Logged By: S. Manske

Scale: 1:300

Depth	Rock Type	Alteration/Mineralization Vol. % (Vn. Qtz, Vn. Chal., Vn. Calc., Chl, Clay, Ep, Hm, Goet., Mn-ox, Cu-ox, Mt, Py)	% Oxidized	% Rec'd	RQD	Comments	Assay (Cu, Pb, Zn, Mn %; Au, Ag oz/T)
0						0-12' — Overburden, fill.	
25							
50				100%	40%	47'-57' — Gray-pink to dull red-brn dacite tuff. Weakly to moderately welded; eutaxitic streakiness ~70° to core axis. Acc. bio., but no magnetite noted. Fractured, somewhat weathered.	
75							
100							
125							
150				100%	22%	147-157' — Red-gray weakly to moderately welded dacite tuff. Eutaxitic fabric at ~80° to core axis. A few qtz-lined lithophysae and scattered lithic frags ± 1cm across. Acc. bio. but no magnetite noted. Fractured.	
175							
200							
225							

F = frac. controlled
D = disseminated

tr. = trace
acc. = accessory

MAGMA COPPER COMPANY

Division: _____ Drill Hole: MB-11A Location: _____

Coordinates: _____ Collar Elev: _____ Total Depth: _____

Date Collared: _____ Completed: _____ Angle: -80°

Bearing: _____ Core Size: _____ Logged By: _____

Scale: 1:300 Page 2 of _____

Depth	Rock Type	Alteration/Mineralization Vol. % (Vn. Qtz, Vn. Chal., Vn. Calc., Chl, Clay, Ep, Hm, Goet., Mn-ox, Cu-ox, Mt, Py)	% Oxidized	% Rec'd	RQD	Comments	Assay (Cu, Pb, Zn, Mn %; Au, Ag oz/T)
225							
250	15°	±3% Vn. Calc.; tr. Mt		98%	26%	247-257' - Red-gray dacite tuff as above, w/ a breccia zone ~10 cm(?) thick at 250', incompletely healed w/ coarsely xtalline calcite; vuggy. Eutaxitic texture ~30° to core axis. Acc. bio, trace magnetite. Fractured and broken.	
275							
300							
325							
350		tr. Mt		100%	54%	347-357' - Moderately-welded red-gray tuff w/ eutaxitic texture ~75° to core axis. Acc. bio, magnetite.	
375							
400							
425							
450						447-457' - Red-brown moderately- to strongly-welded tuff w/ black, glassy eutaxitic	

F = frac. controlled
D = disseminated
tr. = trace
acc. = accessory

MAGMA COPPER COMPA..Y

Division:_____ Drill Hole:_____ Location:_____

Coordinates:_____ Collar Elev:_____ Total Depth:_____

Date Collared:_____ Completed:_____ Angle: - 80°

Bearing:_____ Core Size:_____ Logged By:_____

Scale: 1:300 Page 3 of _____

Depth	Rock Type	Alteration/Mineralization Vol. % (Vn. Qtz, Vn. Chal., Vn. Calc., Chl, Clay, Ep, Hm, Goet., Mn-ox, Cu-ox, Mt, Py)	% Oxidized	% Rec'd	RQD	Comments	Assay (Cu, Pb, Zn, Mn %; Au, Ag oz/T)
450		Tr.		100%	60%	streaks. Compaction foliation at ~75° to core axis. Acc. bio. and magnetite.	
475							
500							
525							
550				100%	33%	546-556' - Red-brown moderately- to strongly welded tuff. Eutaxitic streaks ~75° to core axis. Core broken by ragged fractures subparallel to core axis. Acc. bio. but magnetite not noted. Subhorizontal slicks on some fracs.	
575							
600							
625	5°						
650						647-657' - Red-brn moderately welded tuff w/ eutaxitic streaks ~75° to core axis. Sheared at top of interval by slip surface at ~5° to core axis. Slicks rake ~20° Right.	
675							

F = frac. controlled
D = disseminated

tr. = trace
acc. = accessory

MAGMA COPPER COMPANY

Division: _____ Drill Hole: _____ Location: _____

Coordinates: _____ Collar Elev: _____ Total Depth: _____

Date Collared: _____ Completed: _____ Angle: -80°

Bearing: _____ Core Size: _____ Logged By: _____

Scale: 1:300 Page 4 of _____

Depth	Rock Type	Alteration/Mineralization Vol. % (Vn. Qtz, Vn. Chal., Vn. Calc., Chl, Clay, Ep, Hm, Goet., Mn-ox, Cu-ox, Mt, Py)	% Oxidized	% Rec'd	RQD	Comments	Assay (Cu, Pb, Zn, Mn %; Au, Ag oz/T.)
675							
700							
725							
750				100%	69%	747'-757' - Red-brn moderately to strongly welded tuff. Eutaxitic texture ~ 80° to core axis. Core is tight, w/ few fracs. Acc. bio, but magnetite not noted.	
775							
800							
825							
850				100%	56%	847'-857' - Red-brn moderately to strongly welded tuff w/ a few slicked fracs. sporting subhorizontal rakes. Eutaxitic texture ~ 80° to core axis. Acc. bio, but magnetite not noted.	
875							
900							

F = frac. controlled
D = disseminated
tr. = trace
acc. = accessory

MAGMA COPPER COMPA..

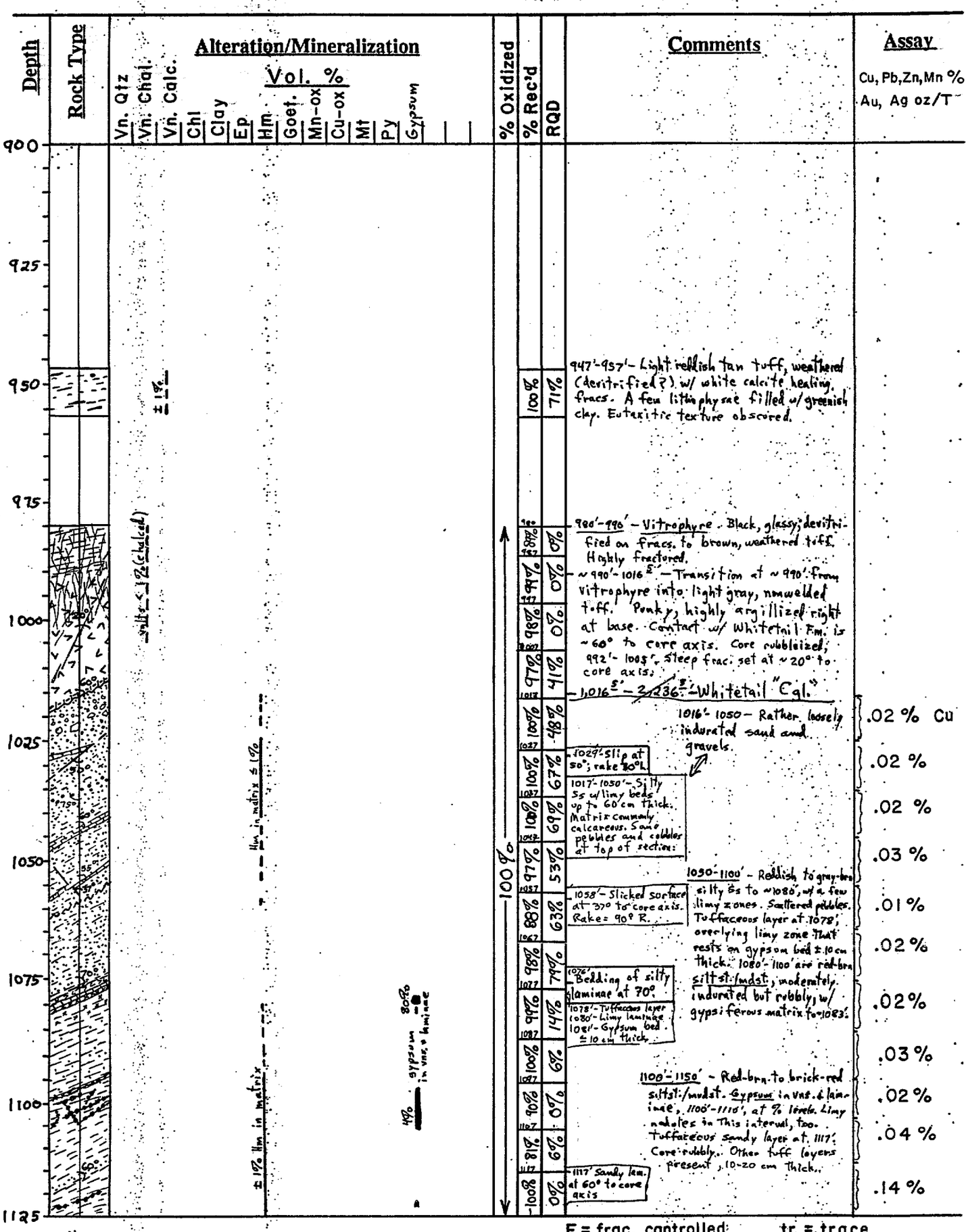
Division:_____ Drill Hole:_____ Location:_____

Coordinates:_____ Collar Elev:_____ Total Depth:_____

Date Collared:_____ Completed:_____ Angle:_____

Bearing:_____ Core Size:_____ Logged By:_____

Scale:_____ Page 5 of _____



F = frac. controlled
D = disseminated

tr. = trace
acc. = accessory

MAGMA COPPER COMPA

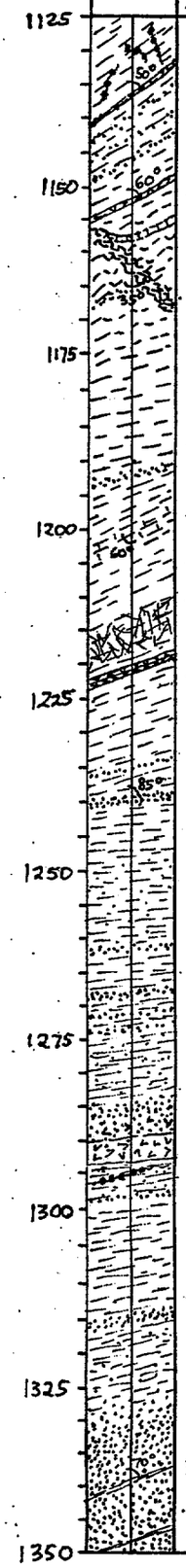
Division: _____ **Drill Hole:** _____ **Location:** _____

Coordinates: _____ **Collar Elev:** _____ **Total Depth:** _____

Date Collared: _____ **Completed:** _____ **Angle:** -80°

Bearing: _____ **Core Size:** HQ **Logged By:** _____

Scale: 1:300 **Page** 6 **of** _____



Depth	Rock Type	Alteration/Mineralization (Vol. %)	% Oxidized	% Rec'd	RQD	Comments	Assay (Cu, Pb, Zn, Mn %; Au, Ag oz/T)
1125		Vn. Qtz; Vn. Chal.; Vn. Calc.; Chl; Clay; Ep; Hm; Goet.; Mn-ox; Cu-ox; Mt; Py; Gypsum					
		±1% gypsum		1137			
1137				98%	27%	1137'-Tuff layer ~10 cm thick.	.19 % Cu
1147				100%	0%		.22 %
1157				95%	11%	1152'-Tuff layer ~25 cm thick. 1159'-Ls bed, ~20cm thick, steepened in HW of shear. 1150'-1200' - Red-brn to gray-brn to brick-red sltst and mudst. w/ some sandy laminae. Moderately indurated but commonly rubbly. Sheared zone ca. 1160' marked by a wetter of slicked surfaces at all angles. Tuff layers and lacustrine ls beds ± 20cm thick are present. "Caved" material drilled out, 1177'-1178'.	.24 %
1167				84%	6%		.22 %
1177				67%	0%		.25 %
1187				100%	0%		.08 %
1197				98%	14%		.02 %
1207				95%	0%	1194'-Tuffaceous, sandy zone.	.17 %
1216				87%	6%	1200'-1250' - Brick-red, gray, to gray-brn mudst./sltst., weakly to moderately indurated. Marly, 1200'-1207'. Some interlayers of sands, tuff, or gypsum a few cm's thick. Core v. rubbly, ~1215'-1240'; rot by a wetter of slicked surfaces at all orientations, 1216'-1220'.	.07 %
1228				100%	0%		.06 %
1238				100%	6%	1222'-20 cm of ash-fall tuff is directly 5 cm of gypsum.	.09 %
1247				99%	0%		.09 %
1257				67%	0%		.10 %
1268				100%	11%	1250'-1300' - Variegated siltst./mudst w/ sandy layers a few cm's thick, especially common below ca. 1285'. Finer-grained clastics reddish, coarser material gray and gray-brown. Tuff bed 1290-1293; argillic. Core weakly to moderately indurated and commonly segmented along bedding planes.	.11 %
1279				100%	0%		.09 %
1289				100%	9%		.09 %
1294				100%	7%		.11 %
1304				93%	8%	1285-1293'- Sandy zone grades into water-lain tuff at ~1290'	.05 %
1313				88%	24%	1300'-1350' - Section coarsens w/ depth from reddish mudst./sltst. at 1300' to poorly sorted, gray-brn lithic Ss at ca. 1330'. Ss has cm-thick reddish silty interlaminations. Sands are moderately indurated and form coherent core. Matrix in sands is v. weakly calcareous in spots.	.13 %
1323				100%	32%		.08 %
1333				73%	9%		.09 %
1343				100%	28%		.10 %
1353				100%	62%		.08 %
1363				100%	73%	1340' Bedding in silty interlayer.	.07 %

F = frac. controlled
D = disseminated

tr. = trace
acc. = accessory

MAGMA COPPER COMPA

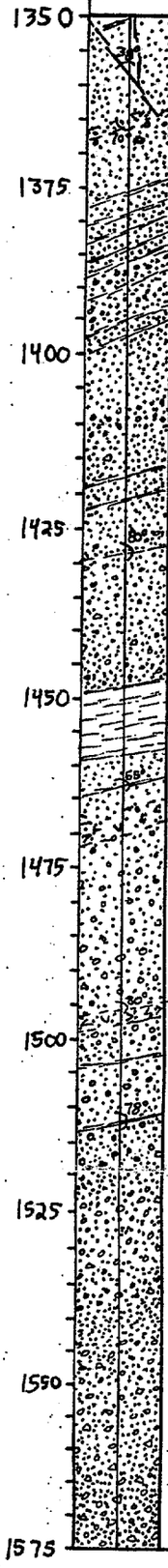
Division: Superior **Drill Hole:** MB-11A **Location:**

Coordinates: **Collar Elev:** **Total Depth:**

Date Collared: **Completed:** **Angle:** -80°

Bearing: due S. **Core Size:** HQ **Logged By:** SLM

Scale: 1:300



Alteration/Mineralization Vol. %: Vn. Qtz, Vn. Chal., Vn. Calc., Chl, Clay, Ep, Hm, Goet., Mn-ox, Cu-ox, Mt, Py, Native Cu°

% Oxidized	% Rec'd	RQD	Assay (Cu, Pb, Zn, Mn %; Au, Ag oz/T)
10% (1287)	75%		
75% (1347)	56%		.06 % Cu
99% (1375)	52%		.08 %
50% (1389)	39%		.08 %
100% (1398)	47%		.09 %
98% (1402)	70%		.07 %
100% (1412)	85%		.04 %
100% (1422)	75%		.07 %
100% (1432)	78%		.06 %
105% (1427)	48%		
95% (1447)	67%		.05 %
90% (1457)	56%		.17 %
98% (1469)	20%		.87 %
100% (1474)	42%		.02 %
100% (1489)	20%		
92% (1493)	15%		
100% (1503)	64%		
98% (1513)	55%		
100% (1523)	61%		
100% (1532)	52%		
98% (1543)	63%		
100% (1553)	60%		
88% (1563)	54%		
96% (1573)	32%		

Comments

1350'-1400' - Gray-brn to reddish Ss w/ cm-thick silty interlayers. Pebbly zones and the odd cobble or two appear by ~1370'. Mm-sized flecks of native Cu in matrix near bottom of interval. Ss is moderately indurated, poorly-sorted, lithic, w/ a v. weakly calcareous matrix in spots. Core fairly coherent.

1358' - Slicked surface w/ mkc ~30° R.

1365' - Bedding in Ss at ~70° to core axis

1400'-1450' - Gray-brn, poorly sorted lithic Ss w/ pebbly zones and scattered small cobbles of schist, qtzite, Ls, and granite. Some cm-thick reddish silty interlayers appear, as well as the top of a sandy siltst./mdst. bed some 10' thick, starting at 1448'. Matrix of Ss is v. weakly calcareous in upper ½ of interval. Silt laminae also tend to be marly. Ss is fairly well-indurated and coherent.

1428' - Bedding at 80° to core axis.

1450'-1500' - Mixed sequence of reddish siltstones and gray-brn, poorly sorted Ss + conglomerate. Congl. contains subround. to subang. clasts of: diabase, Ls., qtzite, and minor schist. Sandy zones at ~1470' and 1495' appear tuffaceous. Matrix weakly calcareous beginning about 1470'. A few flecks of native Cu on diabase frags.

1469' - Bedding ∡ of silty interlayer

1496' - Bedding of sandy tuff.

1500'-1550' - Poorly sorted gray-brn Ss and pebble conglomerate. Subang. to subround. clasts of diabase, Ls, qtzite, granitic + hypabyssal rocks. Schist present but not abundant. At least one cobble ~20 cm across, but most clasts ≤ 5 cm. Granitic frags. fairly common. Matrix weakly calcareous, 1500'-1530'.

1512' - Bedding ∡ of cm-thick silty interlayer

1550'-1600' - Cobble cgl. weakly to moderately indurated tan, sandy matrix that is mildly calcareous in spots. Subang. to subround. clasts ≤ 15 cm across (most 5-8 cm) comprising mainly diabase, schist, qtzite, w/ lesser Ls., granitic rocks. Some Vn. qtz. cobbles w/ Mn-ox or limonite present, ca. 1575'.

F = frac. controlled tr. = trace
D = disseminated acc. = accessory

MAGMA COPPER COMPA1

Division: _____ **Drill Hole:** MB-11A **Location:** _____

Coordinates: _____ **Collar Elev:** _____ **Total Depth:** _____

Date Collared: _____ **Completed:** _____ **Angle:** -80°

Bearing: _____ **Core Size:** HQ **Logged By:** SLM

Scale: 1:300

Depth	Rock Type	Alteration/Mineralization (Vol. %)	% Oxidized	% Rec'd	RQD	Comments	Assay (Cu, Pb, Zn, Mn %; Au, Ag oz/T)
1575		Vn. Qtz; Vn. Chal.; Vn. Calc.; Chl; Clay; Ep; Hm; Goet.; Mn-ox; Cu-ox; Mt; Py; Native Cu°					
			100% (1583)	100%	100%		
			80% (1587)	84%	84%		
			97% (1597)	97%	94%		
1600			98% (1607)	98%	26%	1599' - Bedding ∥ in sandy layer.	1600'-1650' - Pebble-to-cobble conglomerate in weakly indurated sand-silt matrix. Subround. to subang. clasts up to 10 cm across, but most 3-5 cm. Largely matrix-supported. Clasts mainly Pinal Schist, w/ lesser diabase, quartzite. Ls clasts present but not common. A biotite-bearing tuff bed at ~1636', about 60 cm thick.
			100% (1619)	100%	35%		
1625			98% (1627)	98%	34%		
			97% (1636)	97%	18%		
			100% (1645)	100%	36%	1627' - Base of tuff bedding at 80° to core axis	
1650			97% (1653)	97%	35%		1650'-1700' - Cobble cgl. w/ sub-round. to subang. clasts of schist, diabase, and lesser bull qtz., Ls., qtzite, and slate in a weakly to moderately indurated sandy matrix. Cgl. is clast-supported in part of section; matrix is weakly calcareous. Section largely rubbleized 1685'-1695'. A few small limonitic pebbles noted. Clasts up to 20 cm across, but most about 5 cm in diameter.
			92% (1665)	92%	38%		
			100% (1676)	100%	45%		
1675			89% (1676)	89%	22%		
			96% (1686)	96%	23%		
			83%	83%	0%	1685' - Shear at 90° to c.a., w/ rake of slicks ~10° R.	
			71%	71%	0%		
			87%	87%	0%	1695' - Bedding in sandy layer at ~80° to core axis.	
1700			87% (1700)	87%	12%		1700'-1750' - Pebble to cobble cgl. in tan, sandy matrix. Weakly to moderately indurated. Subang. to subround. clasts range up to 27 cm across, but most are ± 5 cm in diameter. Clasts mostly qtzite, diabase, and schist, but Ls. and slate also fairly common. A granitic pebble and a specularite-rich clast also noted. Cgl. partly clast-supported, but some sandy lenses present.
			98% (1707)	98%	0%		
			88%	88%	22%	core rubbleized	
			83% (1716)	83%	0%		
1725			98% (1728)	98%	57%	Bedding in sandy layer ~1724'	
			100% (1738)	100%	5%	core rubbleized	
			100% (1748)	100%	13%		
			56%	56%	0%		
1750			43% (1752)	43%	36%		1750-1800' - Pebble to cobble cgl. w/ tan, sandy matrix. Subang. to subrounded clasts up to 20 cm across; most are 5-8 cm in size. Largely matrix-supported; graded bedding evident. Clasts mainly schist, diabase, + qtzite, but bull qtz., slate, Ls., older cgl., granitic frags, specularite pebbles also noted. A cobble at 1793' is amethystine vein qtz. Matrix is distinctly calcareous below 1780'. Mm-sized blebs of Cu° present, 1780'-1783'.
			100% (1762)	100%	0%		
			100% (1764)	100%	33%		
1775			82% (1776)	82%	25%		
			100% (1788)	100%	53%	Graded beds	
			100% (1798)	100%	50%		
1800							

Cu in matrix ±1%

±1% Hm in matrix

Tr. Cu°

<1% Cu°

F = frac. controlled
D = disseminated

tr. = trace
acc. = accessory

MAGMA COPPER COMPAI

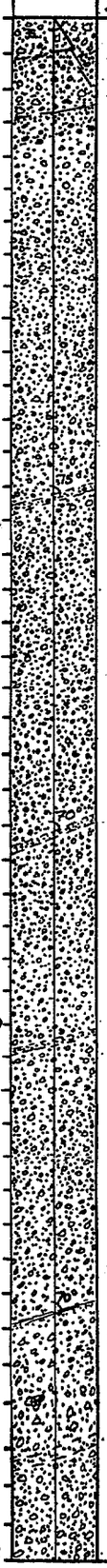
Division: _____ **Drill Hole:** MB-11A **Location:** _____

Coordinates: _____ **Collar Elev:** _____ **Total Depth:** _____

Date Collared: _____ **Completed:** _____ **Angle:** -80°

Bearing: due S **Core Size:** HQ **Logged By:** SLM

Scale: 1:300 **Page** 9 **of** _____

Depth	Rock Type	Alteration/Mineralization (Vol. %)	% Oxidized	% Rec'd	RQD	Comments	Assay (Cu, Pb, Zn, Mn %; Au, Ag oz/T)
1800–2025		Vn. Qtz; Vn. Chal.; Vn. Calc.; Chl; Clay; Ep; Hm; Goet.; Mn-ox; Cu-ox; Mt; Py; Native Cu°					

Vn. Calc.: ±1% Calc. in matrix; ±1% Calc. in matrix; 3% ±1% Calc. in matrix; ±1% Calc. in matrix

Native Cu°: Traces Cu°; Cu° << 1%; << 1%; ≤1%; Tr; ≤1% Cu°; ≤1% Cu° in mm-size blebs

Hm: <<1% Hm on fracs; <1% Lim. in matrix, on fracs; <<1% Hm

Depth	% Oxidized	% Rec'd	RQD
1800	90%	54%	
1808			
1814	98%	20%	
1824	97%	39%	
1834	100%	15%	
1844	98%	22%	
1854	92%	24%	
1857	93%	50%	
1867	100%	43%	
1877	96%	39%	
1886	93%	41%	
1896	100%	35%	
1906	100%	32%	
1916	100%	47%	
1926	100%	44%	
1936	97%	56%	
1946	92%	34%	
1955	100%	60%	
1965	100%	41%	
1977	93%	28%	
1987	100%	18%	
1997	99%	43%	
2007	93%	35%	
2018	100%	35%	
2028	69%	45%	
2038	100%	31%	
2048	92%	0%	
2058	100%	21%	

Comments

1800' Slicked surface w/ rake = 90° R

1800'-1850' – Polymictic cobble cgl. w/ subang. to subround. clasts of schist, diabase, ls., and lesser bull qtz., slate in a calcareous sandy matrix. A clast of specularite also noted as well as intensely limonite-stained frags. Graded bedding near top of interval. Cgl. by & large matrix-supported. Clasts up to 15 cm across but most ±5 cm in size.

1850'-1900' – Polymictic cobble or pebble cgl. w/ subround. to subang. clasts of schist, diabase, ls., qtzite, and lesser bull qtz., slate in a tan, sandy matrix. Matrix generally calcareous. Cgl. is framework supported in part; matrix-supported in sandier zones. Cobbles up to 20 cm across but most ±5 cm. Mm-sized blebs of Cu° are present, and matrix near 1885' is v. green as if other exotic Cu minerals might be disseminated w/in it.

1871' – Bedding in pebbly Ss. at 75° to core axis.

1900-1950' – Polymictic pebble- to cobble cgl., w/ rounded to subang. clasts of diabase, schist, qtzite, and lesser ls., bull qtz, slate set in a calcareous, sandy matrix. Section by & large framework-supported, moderately indurated. A few pebbles of red jasperoid noted, also aplite, hypabyssal rocks. Clasts generally <10 cm across; many <5 cm.

1922' – Bedding in Sand/silt layer at 70° to core axis.

1942' – A small vug lined w/ transparent calcite encloses Cu° blobs several mm's across.

1950'-2000' – Cobble cgl. w/ subang. to subround. clasts in a calcareous, gray-tan sandy matrix. Clasts up to 20 cm across (but most <10 cm), mainly diabase, schist, qtzite, ls., w/ lesser granitic, aplitic, or hypabyssal fragments. Bedding generally indistinct. Some limonite or hematite stain begins to appear on clasts or partings in core. 2 or 3 andesite(?) pebbles noted, also a tiny clast of specularite. Native Cu° is present & displays affinity for diabase frags. Cgl. generally framework-supported.

Core rubbly

1995' – Bedding in cm-thick silty lamina.

2000'-2050' – Polymictic, poorly sorted cobble cgl. w/ subround. to angular frags. of diabase, qtzite, ls., chert, qtz-eye porphyry, aplite in a reddish, sand/silt matrix. Schist present but not common. A breccia cobble at 2005' cemented w/ yel.-orange limonite.

F = frac. controlled
D = disseminated
tr. = trace
acc. = accessory

MAGMA COPPER COMPA

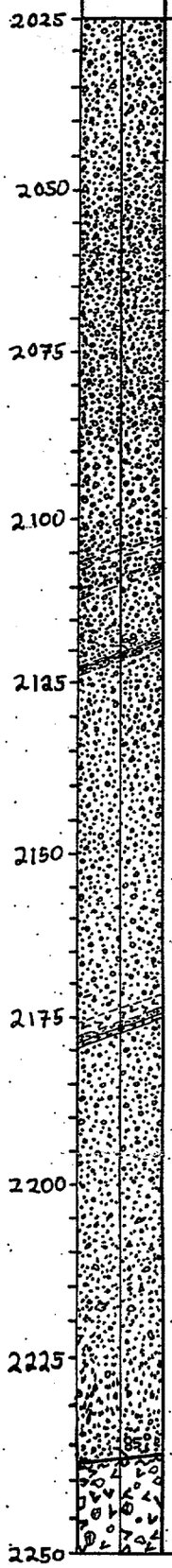
Division: _____ **Drill Hole:** MB-11A **Location:** _____

Coordinates: _____ **Collar Elev:** _____ **Total Depth:** _____

Date Collared: _____ **Completed:** _____ **Angle:** -80°

Bearing: due S **Core Size:** HQ **Logged By:** SLM

Scale: _____ **Page** 10 **of** _____



Depth	Alteration/Mineralization (Vol. %)	% Oxidized	% Rec'd	RQD	Comments	Assay (Cu, Pb, Zn, Mn %; Au, Ag oz/T)
2025			100%	39%	...Cgl. largely framework-supported. Scattered pebbles of black slate, talc, epidotitic rock noted. Mm-sized blebs of Cu° up & down section.	
	Vn. Calc. ±1% Calc. in matrix; Vn. Chal. <1% Cu°; Hm <1% in fracs, in matrix; Goet. <1% lim. in matrix		99%	42%	Core rubbly	
2050			87%	0%	2050'-2106' - Polymictic Cgl. w/ subang. to subround clasts of diabase, qtzite, aplite, Ls., qtz-eye porphyry in a yellowish to reddish-tan sand-silt matrix. Schist fragments uncommon. Cgl. is generally framework-supported; matrix commonly calcareous. Clasts up to 12 cm across but large majority 5-8 cm in diameter. Small talcose pebbles present near 2,075'. Bedding is obscure. Rock weakly indurated.	
			92%	15%		
			99%	23%		
2075	Vn. Calc. ±1% Calc. in matrix; Tr. Cu° <1%		100%	19%		
			96%	22%		
			95%	18%		
2100	Tr. Cu°		100%	26%	2100'-2150' - Polymictic pebble to cobble cgl. in a yellowish-tan sand/silt matrix. Subang. to rounded clasts are generally 3-5 cm across, less commonly up to 8 cm in diameter, and by large matrix-supported. Matrix is weakly calcareous in some zones. Sandy, silty interlayers appear. Clast population comprise mainly diabase, qtzite, aplitic or hypabyssal rocks, and lesser Ls. Schist frags. are uncommon. Rather weakly indurated.	
			100%	35%	2121' - Bedding in sand/silt layer	
2125	Vn. Calc. ±1% Calc. in matrix; ±1% limonite in matrix		100%	21%		
			98%	13%	Core largely rubbleized	
			94%	0%		
2150	Vn. Calc. ±1% lim.; Tr. Cu°		93%	19%	2190'-2200' - Weakly indurated pebble cgl. w/ a few cobbles. Subround to ang. clasts mainly of diabase, qtzite, and granite/aplite. The latter dominate especially below ca. 2180'. Matrix is weakly calcareous in spots, commonly highly colored yellow-tan, red-brown or brown-blk by Fe- and Mn-ox. A spherulite pebble at 2157'. Paired tuff horizons appear at 2175'. Much of section rubbleized and bedding x's thus obscured.	.11 % Cu
			85%	0%		
			94%	12%		.16 %
2175	<1% Hm on clasts, in matrix; <1% lim. in matrix; ≤1%		98%	17%	2175' - Tuff layers, ~35 cm thick, and 10 cm thick.	.15 %
			96%	0%	Core rubbly	.08 %
			90%	7%		.08 %
2200	≤1%		88%	8%	2200'-2236.5' - Pebble cgl. w/ a few cobbles. Subround. to angular clasts mainly of aplitic or felsic hypabyssal rocks in an arkosic matrix. Matrix highly stained red-orange to brn-blk by Fe- and Mn-oxides. Contact w/ underlying Mesozoic(?) volcaniclastic section is a flat slickensided surface at 85° to core. Bedding obscure.	.12 %
			94%	0%		.09 %
	±1% Hm in matrix; <1% lim. in matrix; ±1% Mn-ox in matrix, on clasts.		100%	5%		.13 %
2225			100%	17%		.08 %
	±3% clay (weathered); <1% Mn-ox on fracs.	~100%	99%	0%	2236.5'-2667' - Mz Cgl. Weathered, crumbly. 2236'-2250' Volcaniclastic conglomerate or mudflow. Pebbles, cobbles, & blocks of diabase, qtzite, and slate in a porphyritic volcanic matrix.	.03, <.01, .86, 1.65 %; <.001, .06 oz/T; <.01, <.01, .74, 1.05 %;
2250	Tr. Mt.					

F = frac. controlled tr. = trace
D = disseminated acc. = accessory

MAGMA COPPER COMPA. I

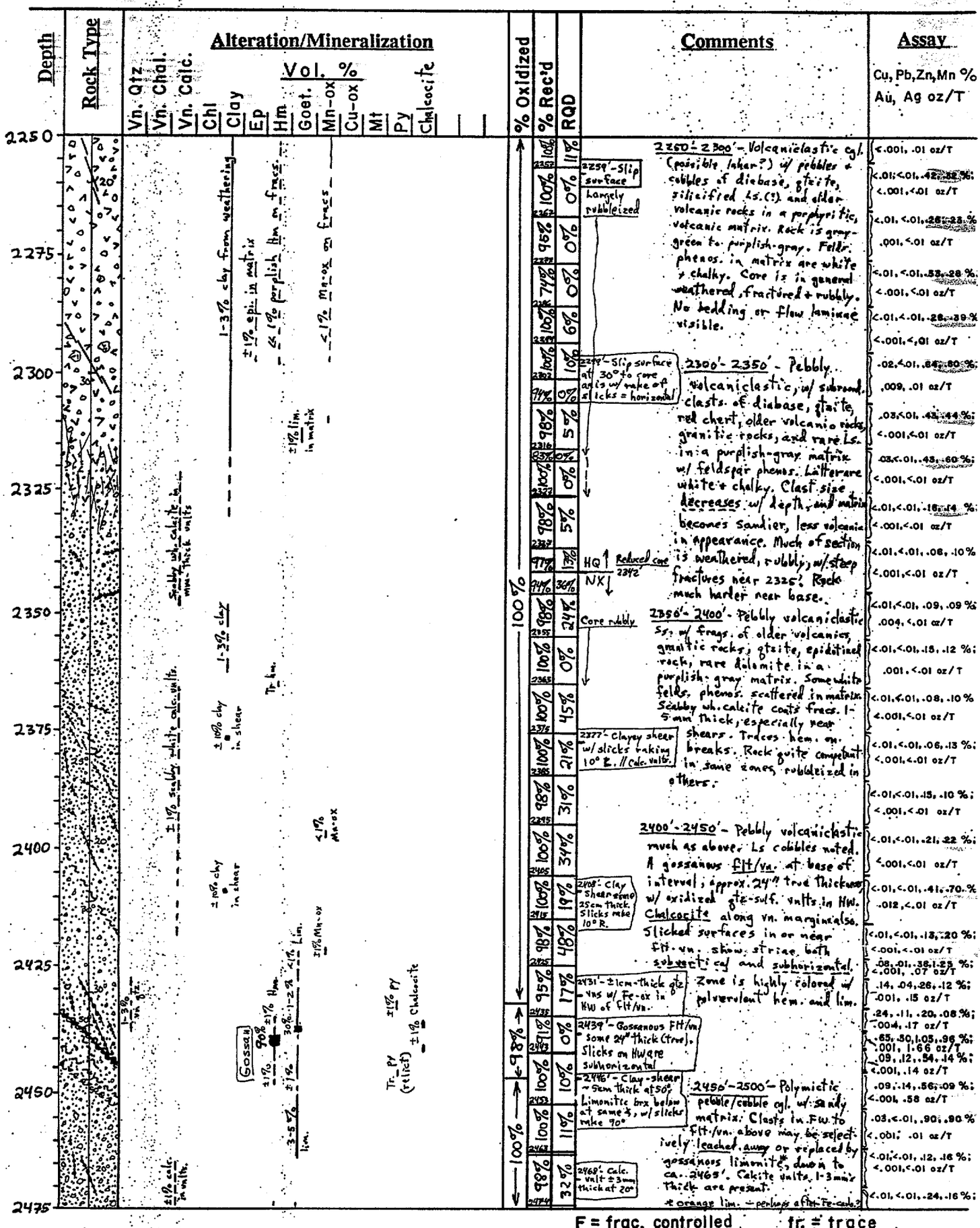
Division: _____ **Drill Hole:** MB-11A **Location:** _____

Coordinates: _____ **Collar Elev:** _____ **Total Depth:** _____

Date Collared: _____ **Completed:** _____ **Angle:** -80°

Bearing: due S. **Core Size:** HQ/NX **Logged By:** SLM

Scale: 1:300



F = frac. controlled
D = disseminated
tr. = trace
acc. = accessory

MAGMA COPPER COMPA. I

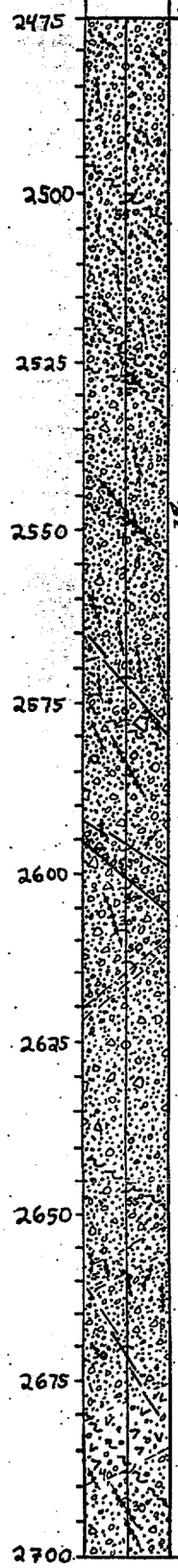
Division: SUPERIOR **Drill Hole:** MB-11A **Location:** _____

Coordinates: _____ **Collar Elev:** _____ **Total Depth:** _____

Date Collared: _____ **Completed:** _____ **Angle:** -80°

Bearing: due S (magnetic) **Core Size:** NX **Logged By:** S.L.M.

Scale: 1:300 **Page** 12 **of** _____



Alteration/Mineralization — Vol. %: Vn. Qtz; Vn. Chal.; Vn. Calc.; Chl; Clay; Ep; Hm; Goet.; Mn-ox; Cu-ox; Mt; Py; ZnS; Talc

% Oxidized / **% Rec'd** / **RQD**

Comments

2500'-2550' - Polymictic cobble cgl. w/ well-rounded to subang. clasts up to 30 cm across, comprising gteite, Ls., diabase and less common schist, volcanic rocks. Generally matrix-supported in sandy material. Well-indurated + v. tight if not sheared or faulted. Section rubbleized, though, ~2517'-2519' and 2529'-2540'. Weakly pyritic below ~2540'. Matrix is greenish where unox. and probably chloritic.

2550'-2600' - Cgl. as above w/ coarse cobbles, even. boulders up to 60cm across. Matrix sandy + green, probably chloritic. Irreg. calcite veinlets common; some pyritic zones. Talcose frac. selvages noted in a Ls. block at ~2577'. Rock is firmly indurated, but rubbleized near shears. A breccia zone right at base contains blackjack sphal., about 75% oxidized. Traces older green sphal, too.

2600'-2650' - Conglomerate w/ cobble- to boulder-sized clasts up to 45 cm across, comprising mainly gteite, Ls./dolomite, diabase in a sandy matrix. Carb. clasts commonly bleached, marbleized. A sandy zone near 2617' shows normal grading. Irregular, white calcite veinlets ≤1cm thick scattered up + down in section. Mafics in diabase frags. are chloritic. Section broken, commonly rubbly.

2650'-2700' - Conglomerate much as above w/ cobbles of diabase, gteite, Ls./dol., and a few pebbles of red jasperoid. Matrix gteite tuffaceous ~2680'-2688'. Some sandy intervals also. Ls./dol. clasts commonly have bleached rims. Minor py and a little sphalerite (blackjack) is present. Section fairly tight and conglom. is well-indurated.

Assay — Cu, Pb, Zn, Mn % / Au, Ag oz/T

F = frac. controlled; D = disseminated; tr. = trace; acc. = accessory

MAGMA COPPER COMPA. I

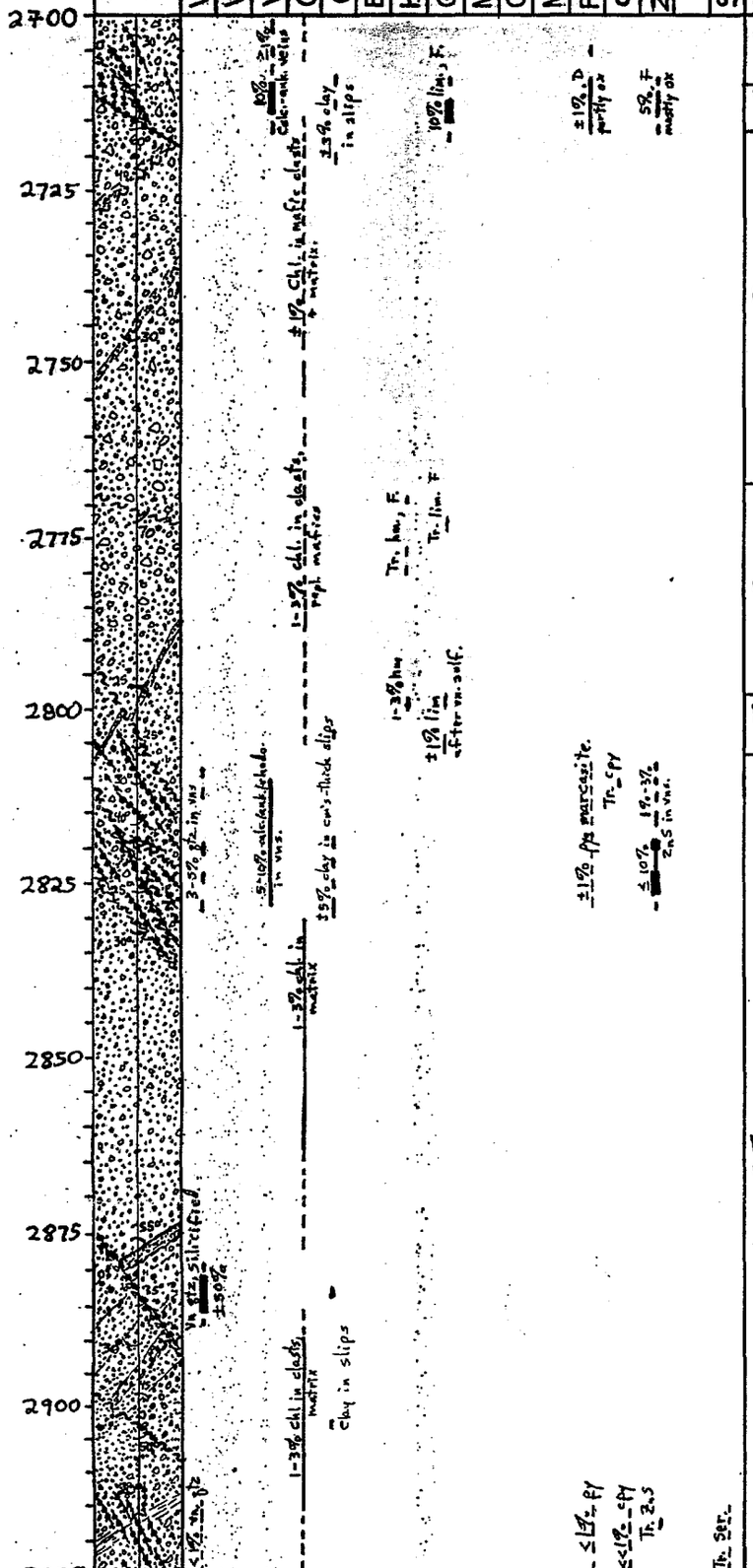
Division: SUPERIOR **Drill Hole:** MB-11A **Location:** _____

Coordinates: _____ **Collar Elev:** _____ **Total Depth:** _____

Date Collared: _____ **Completed:** _____ **Angle:** -80°

Bearing: due S **Core Size:** NX **Logged By:** SLM

Scale: 1:300 **Page** 13 **of** _____



Depth	% Rec'd	RQD
2700	97%	34%
2711	80%	0%
2714	98%	0%
2724	100%	34%
2734	100%	47%
2744	100%	58%
2754	100%	82%
2764	100%	42%
2774	100%	32%
2784	100%	78%
2794	97%	45%
2804	97%	24%
2814	96%	5%
2824	98%	9%
2834	100%	47%
2844	100%	54%
2854	100%	63%
2864	100%	47%
2874	100%	28%
2884	100%	42%
2894	98%	53%
2904	100%	41%
2914	100%	23%
2924		

Comments

2700-2750' - Cobble Cgl. much as above, w/ a few 10-20 cm thick sandy or tuffaceous layers. Bedding at acute ∡'s to core axis. A complicated zone of sheared Zn-S-carb. veins ±2 cm thick in interval 2710'-2715', largely oxidized. Rock qzite hard, tight, little fractured below about 2725'.

2712' - Carb-ZnS vein ~3 cm thick, sheared & clayey.

2725' - Slip at ~40°, clay-filled, ~1 cm thick. In sandy tuffaceous layer nearly // to bedding.

2745' - Sandy bed a few cm's thick at 30° to c.a.

2750-2800' - Framework-supported cobble- to boulder-cgl. w/ clasts of diabase, qzite, marble, fossiliferous Ls., rare volcanic or granitic rocks in a firmly indurated sandy matrix. Ls. clasts are commonly well-rounded. Some red chert present; qzite also commonly pink to red in color. Narrow bleached rinds on Ls. fragments toward bottom.

2771' - Clay-filled slip ~2 cm thick.

2800' - 10-cm-thick layer of hematitic Ss/sltst. at 25° to core axis.

2800-2850' - Cobble to pebble cgl., finer towards base. Broad zone of clay slips & shears and sheeted qz-carb-sulfide vns. 5-20 cm thick, ~2810'-2830'. 15 cm of aphanitic qtz at 2812 possibly vn., or replaced cobble. Sulfides mainly "blackjack" w/ subordinate py and/or marcasite. Traces cpy. Carbonate distinctly pink in many places and may be rhodochrosite. Uns. sheared, rubbleized. Slicks on clay slips generally steep. Ls/dol. clasts in wall rocks commonly have cm-wide bleached rinds.

2824' - Clay-filled shears break up sphal-carb. vn. Slicks rake 60° R.

2830' - Clay-filled slips 25°-30° from core axis. Rake of slicks ~75° L.

2850-2900' - Pebble to cobble cgl. w/ sandy matrix. Tight, thoroughly indurated. Clasts mainly diabase, Ls., lesser qzite. Carbonate clasts generally have bleached rims. Matrix green, probably chloritic, except for intensely silicified zone ~2880-2886'. Intercalated pebble beds & sandy layers appear at ~2875'. Facing indicators (load casts) show bedding is upright.

Also red chert

2877' - Bedding in a sandy zone.

2883' - A brecciated qtz vn., ±5 cm thick.

2889' - Bedding of a gravel layer.

2900-2925' - Rock much as above. Sheeted, mm's-thick QSP vnlts appear. They bleach red qzite cobbles in selvages. Cpy, tr. ZnS noted in the QSP vnlts, which are planar, ~20° to core axis to subvertical (// to core)

2902' - Slip surface truncates bedding.

2917' - Vnlts at 20° to c.a.

Assay

Cu, Pb, Zn, Mn %
Au, Ag oz/T

<.01, <.01, .04, .32 %
.022, .01 oz/T
<.01, .15, .69, 6.6 %
.001, .08 oz/T
<.01, <.01, .08, .48 %
<.001, .02 oz/T
<.01, <.01, .06, .29 %
<.001, <.01 oz/T
<.01, <.01, .01, .09 %
<.001, <.01 oz/T
<.01, <.01, <.01, .09 %
<.001, <.01 oz/T
<.01, <.01, <.01, .09 %
<.001, <.01 oz/T
<.01, <.01, .01, .11 %
<.001, <.01 oz/T
<.01, <.01, .01, .10 %
<.001, <.01 oz/T
<.01, <.01, <.01, .09 %
<.001, <.01 oz/T
<.01, <.01, .01, .11 %
<.001, <.01 oz/T
<.01, .01, .08, .38 %
<.001, <.01 oz/T
<.01, .08, .16, 1.65 %
.003, .44 oz/T
.05, 1.01, 1.8, 5.2 %
.009, 1.81 oz/T
.02, .54, 1.2, 6.4 %
.004, .32 oz/T
.01, .5, 3.7, 15.2 %
.001, .41 oz/T
<.01, .05, .30, 1.2 %
<.001, .41 oz/T
<.01, .03, .07, .31 %
<.001, <.01 oz/T
<.01, <.01, .01, .11 %
<.001, <.01 oz/T
<.01, <.01, .02, .11 %
<.001, <.01 oz/T
<.01, <.01, .01, .14 %
<.001, <.01 oz/T
<.01, <.01, .03, .24 %
<.001, <.01 oz/T
<.01, <.01, .02, .18 %
<.001, <.01 oz/T
<.01, <.01, .03, .15 %
<.001, <.01 oz/T
<.01, <.01, .01, .16 %
<.001, .01 oz/T
.02, .02, .06, .15 %
.001, .06 oz/T

F = frac. controlled
D = disseminated
tr. = trace
acc. = accessory

MAGMA COPPER COMPA. I.

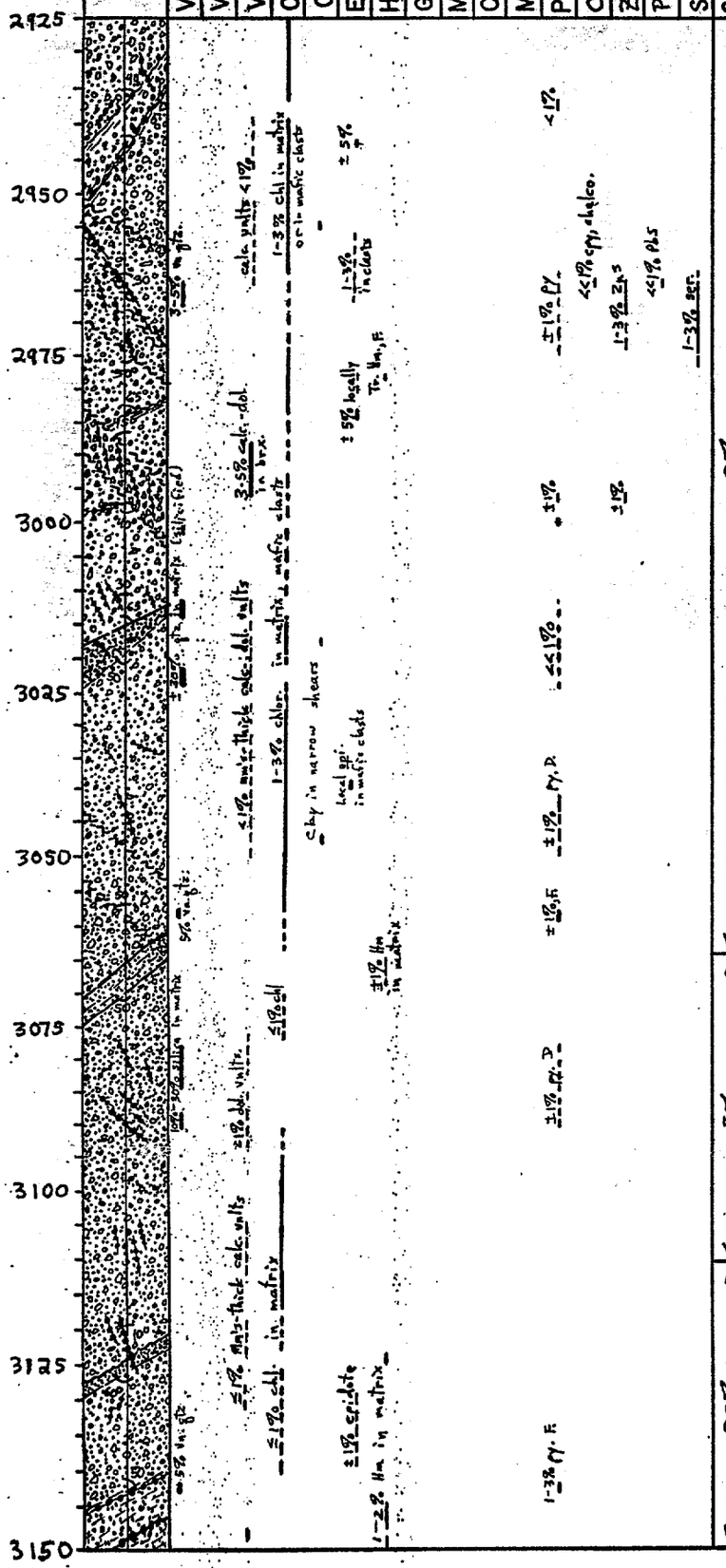
Division: SUPERIOR **Drill Hole:** MB-11A **Location:**

Coordinates: **Collar Elev:** **Total Depth:**

Date Collared: **Completed:** **Angle:** -80°

Bearing: nominal due S **Core Size:** NX **Logged By:** SLM

Scale: 1:300 **Page** 14 **of**



% Rec'd	RQD
100%	22%
98%	47%
100%	19%
97%	19%
100%	11%
97%	0%
100%	6%
95%	20%
99%	31%
100%	14%
92%	0%
100%	37%
93%	19%
99%	40%
99%	18%
99%	22%
100%	12%
92%	0%
100%	76%
100%	62%
61%	0%
100%	13%
100%	80%
99%	53%
100%	19%

Comments

2925'-2950' - Indurated cobble cgl. w/ clasts of diabase, Ls., lesser qtzite and schist. Some reddish Ss/sltst. layers, w/ load casts indicating that bedding (at 35°; 40° to c.a.) is upright. A few hairline bleached vnlts cut reddish sltsts.

2950'-3000' - Pebble cgl. w/ a few cobbles, some Ss/sltst layers. Generally quite broken. Matrix is green, chloritic, w/ epidote prominent locally. Qtz-sulf vns w/ py, ZnS, minor cpy + chalcocite appear. These commonly have bleached (sericitic?) selvages. Bleaching affects chl. and leached cavities apparent in bleached areas, too. At 2990', a few hairline QSP vnlts nearly ⊥ to core axis.

2955'-Clay-matrix brx ~2' thick, at 60° to core axis.

2968'-Sheared qtz-sulf. vn. ±5 cm thick

2986'-A brx. zone. Some 10' Thick w/ steep calc.-dol. gash(?) vns. partly healing broken rock. Slicks on upper surface rake ~40° R. Rock flour zone.

3000'-3050' - Indurated cobble cgl w/ a few sandy interlayers. Clasts mainly diabase, Ls./dol. w/ lesser qtzite + chert. Qtzite, chert frags. commonly red. Bleached, partly silicified zones at 3012'-15' and 3023'-25'; otherwise core is quite green from chlor. in matrix and mafic clasts. Ls. clasts in silic. zones tend to be leached, vuggy, partly replaced w/ silica.

3013'-Rm's Thick py-dol vnlts at ~30° to core axis.

3016'-A slip surface at top of sandy zone w/ rake at 30° R. Bedding at 3019' is at ~30° to core axis; Appears upright.

3019'-A clay-filled shear 5-8 cm thick at 50° to core axis.

3028'-Shear w/ ±20cm of gouge, brecciated qtz-sulf. vn.

3030'-Bedding ⊥ in red-purple sand/silt interlayer.

3040'-A dolomitic vnlt ±1cm Thick at ~50° to core axis.

3050'-3100' - Cobble cgl. much as above - Clasts mainly Ls./dol. w/ lesser qtzite, diabase, chert. Bleached, silicified zone ~3074'-90', where carb. clasts leached + replaced w/ vuggy silica. Core broken, rubbly. Carb. clasts outside silicified zone commonly have bleached rims.

3100'-3150' - Pebble- to cobble cgl. w/ interbeds of maroon-colored sandst. + sltst. Clasts mainly Ls. w/ subordinate red chert. Bedding appears upright from load casts. Parts of maroon sands are reduced to lt. green color where sulfide vnlts are present.

3123'-A 1cm-Thick, reagent calc. vn at ~10° to c.a.

3124'-Bedding at ~60° to core axis and is upright.

3149'-±1cm-Thick qtz-py vnlts ⊥ to bedding at top of Ss/sltst. beds.

Assay

Cu, Pb, Zn, Mn %
Au, Ag oz/T

<.01, <.01, .02, .14 %; <.001, <.01 oz/T
<.01, <.01, .02, .14 %; <.001, <.01 oz/T
<.01, <.01, .01, .22 %; <.001, <.01 oz/T
<.01, <.01, .02, .22 %; <.001, <.01 oz/T
.01, .21, .38, 1.6 %; .001, .14 oz/T
<.01, .01, .03, .50 %; <.001, .02 oz/T
<.01, .01, .03, .76 %; <.001, .01 oz/T
<.01, .11, .20, 1.8 %; <.001, .04 oz/T
<.01, <.01, .01, .38 %; <.001, <.01 oz/T
<.01, <.01, .02, .18 %; <.001, <.01 oz/T
<.01, <.01, .02, .28 %; <.001, <.01 oz/T
<.01, <.01, .04, .50 %; <.001, <.01 oz/T
<.01, <.01, .02, .34 %; <.001, <.01 oz/T
.01, .03, .06, .34 %; <.001, .01 oz/T
<.01, <.01, .01, .22 %; <.001, <.01 oz/T
<.01, <.01, .04, .42 %; <.001, .01 oz/T
<.01, <.01, .01, .23 %; <.001, <.01 oz/T
<.01, <.01, .04, .37 %; <.001, <.01 oz/T
<.01, <.01, <.01, .13 %; <.001, <.01 oz/T
<.01, <.01, <.01, .06 %; <.001, <.01 oz/T
<.01, <.01, <.01, .07 %; <.001, <.01 oz/T
<.01, <.01, .14 %; <.001, <.01 oz/T
<.01, <.01, <.01, .07 %; <.001, <.01 oz/T
<.01, <.01, .01, .09 %; <.001, <.01 oz/T
<.01, <.01, .02, .16 %; <.001, <.01 oz/T
<.01, <.01, <.01, .09 %; <.001, <.01 oz/T

F = frac. controlled
D = disseminated
tr. = trace
acc. = accessory

MAGMA COPPER COMPA. /

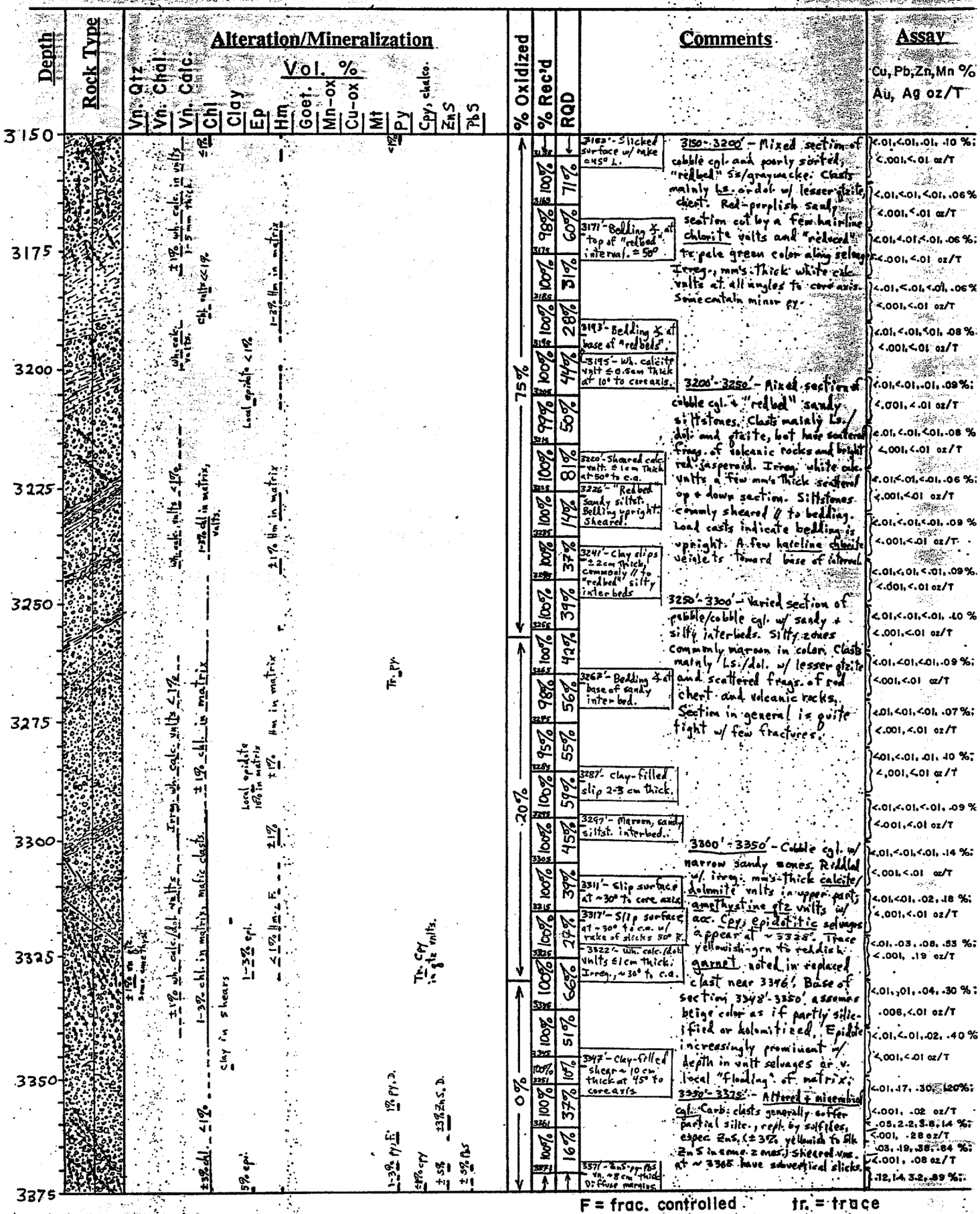
Division: Superior **Drill Hole:** MB-11A **Location:**

Coordinates: **Collar Elev:** **Total Depth:**

Date Collared: **Completed:** **Angle:** -80°

Bearing: Nominal due S **Core Size:** NX **Logged By:** SLM

Scale: 1:300 **Page** 15 **of**



MAGMA COPPER COMPANY

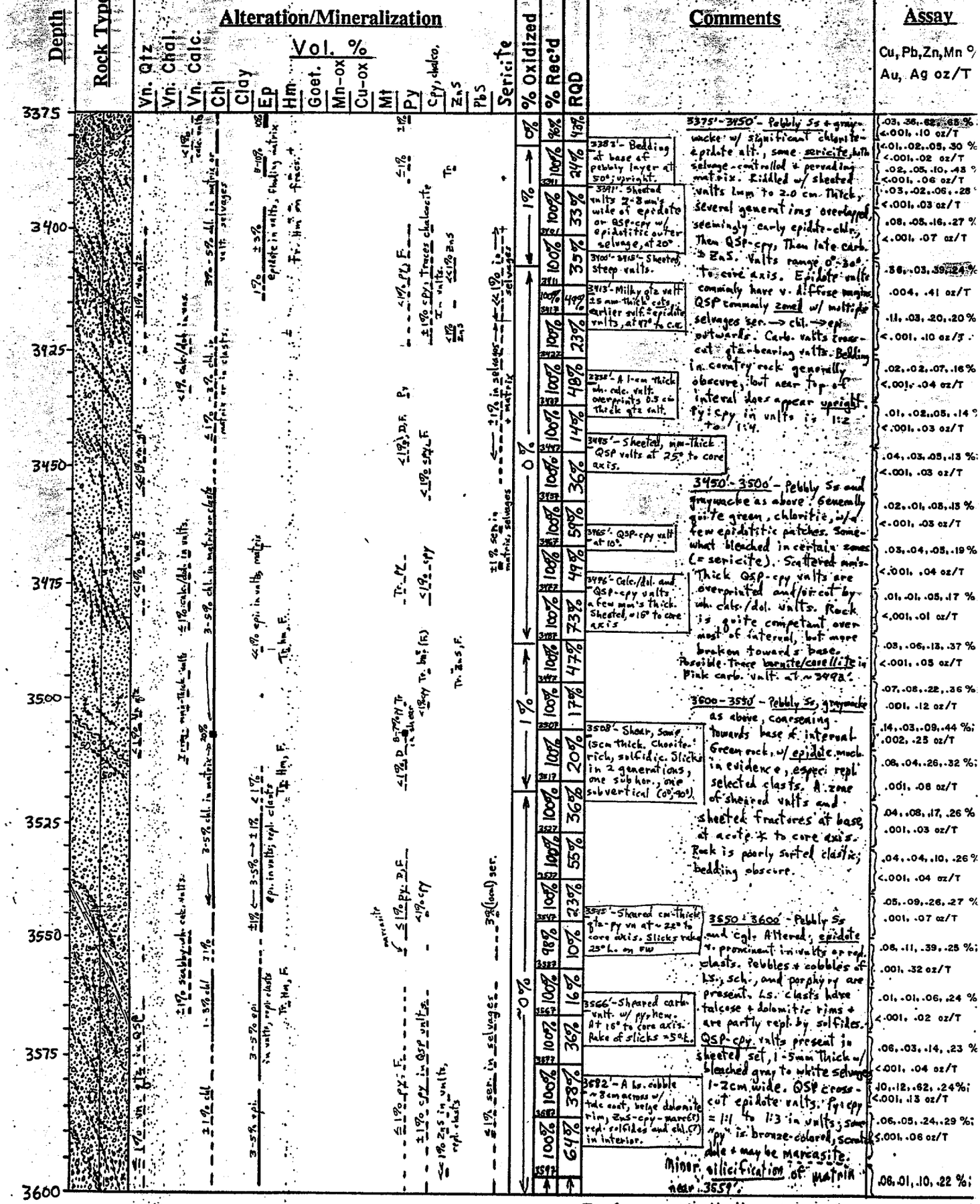
Division: Superior **Drill Hole:** MB-11A **Location:**

Coordinates: **Collar Elev:** **Total Depth:**

Date Collared: **Completed:** **Angle:** -80°

Bearing: **Core Size:** NX **Logged By:** SLM

Scale: 1:300 **Page** 16 **of**



MAGMA COPPER COMPA. /

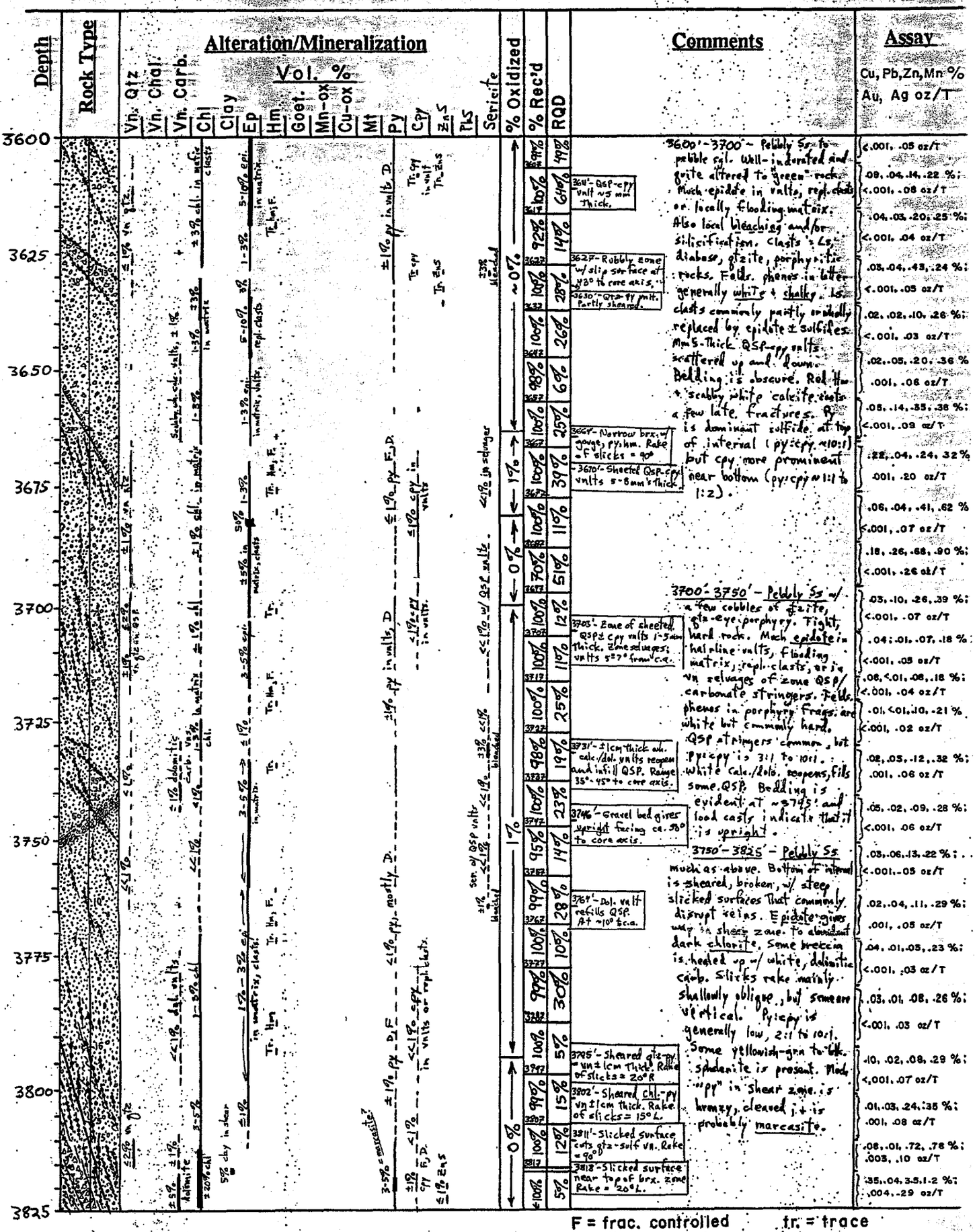
Division: _____ **Drill Hole:** MB-11A **Location:** _____

Coordinates: _____ **Collar Elev:** _____ **Total Depth:** _____

Date Collared: _____ **Completed:** _____ **Angle:** -80° (nominal)

Bearing: due S **Core Size:** NX **Logged By:** S.L. Manske

Scale: 1:300 **Page** 7 **of** _____



MAGMA COPPER COMPANY

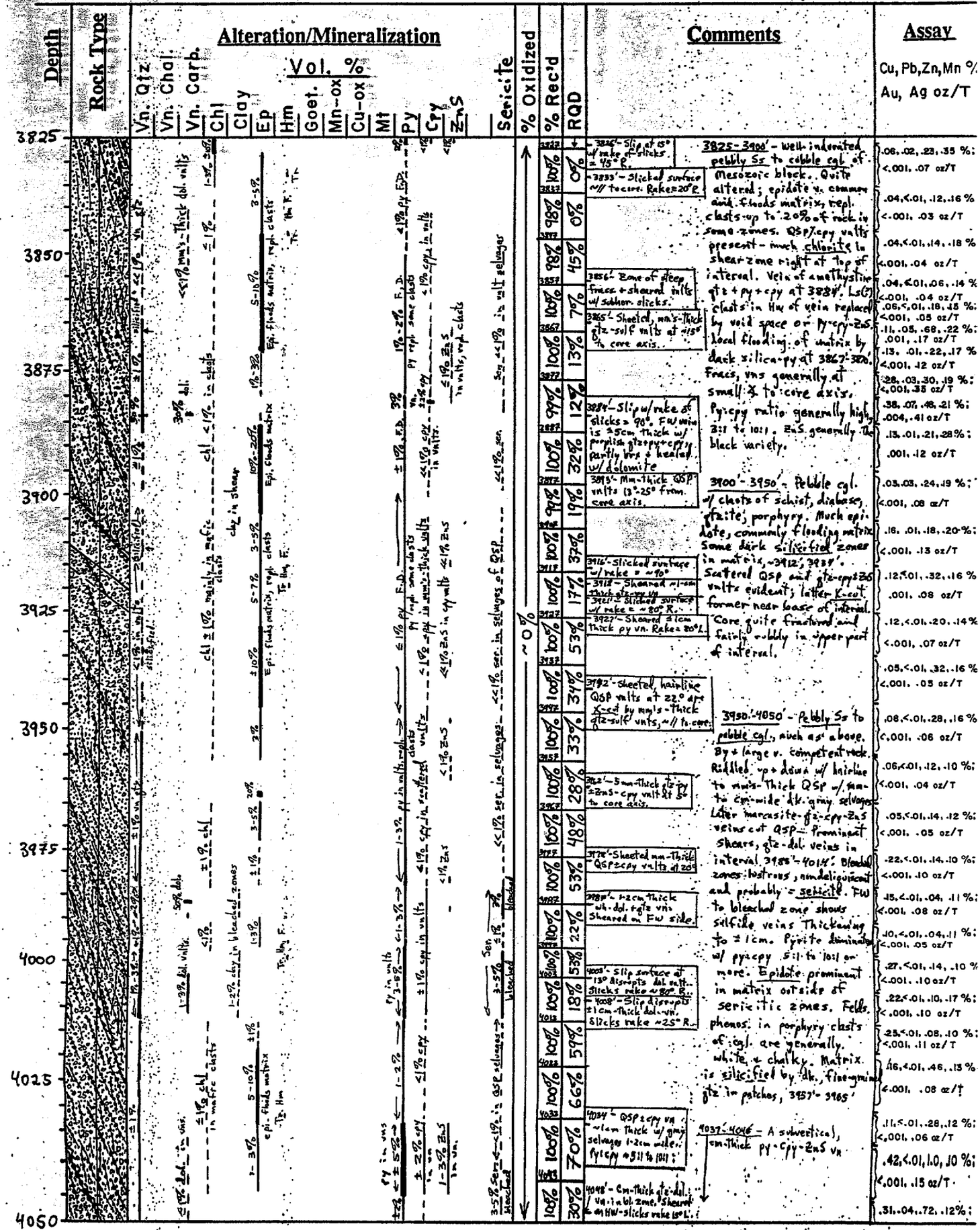
Division: SUPERIOR **Drill Hole:** MB-11A **Location:** _____

Coordinates: _____ **Collar Elev:** _____ **Total Depth:** _____

Date Collared: _____ **Completed:** _____ **Angle:** -80° (nominal)

Bearing: due S **Core Size:** NX **Logged By:** SCM

Scale: 1:300 **Page** 18 **of** _____



F = frac. controlled
D = disseminated
tr. = trace
acc. = accessory

MAGMA COPPER COMPA[illegible]

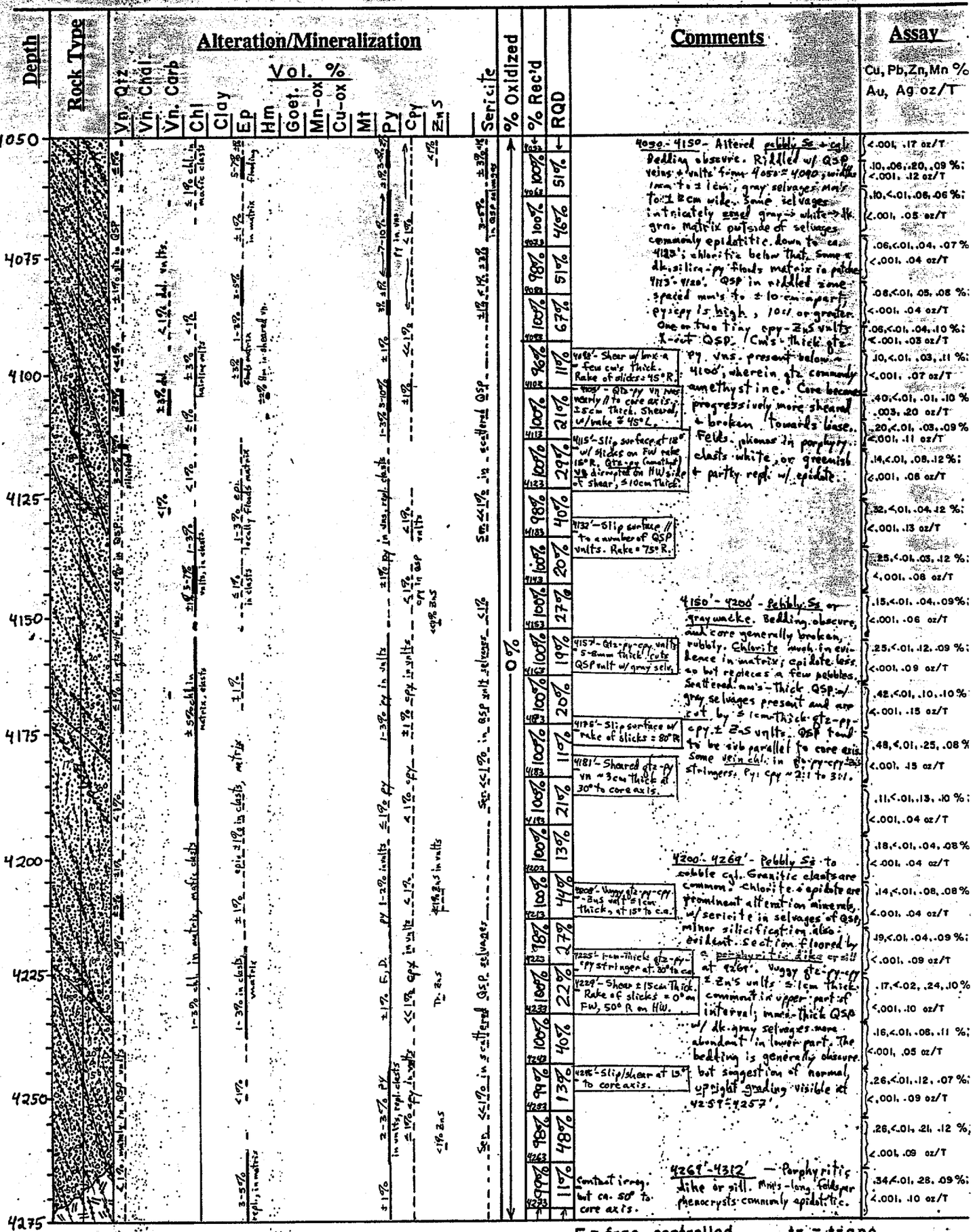
Division: Superior **Drill Hole:** MB-11A **Location:** South Boundary

Coordinates: _____ **Collar Elev:** _____ **Total Depth:** _____

Date Collared: _____ **Completed:** _____ **Angle:** -80° (nominal)

Bearing: due S. **Core Size:** NX **Logged By:** SLM

Scale: 1:300 **Page** 19 **of** _____



F = frac. controlled tr. = trace
D = disseminated acc. = accessory

MAGMA COPPER COMPA

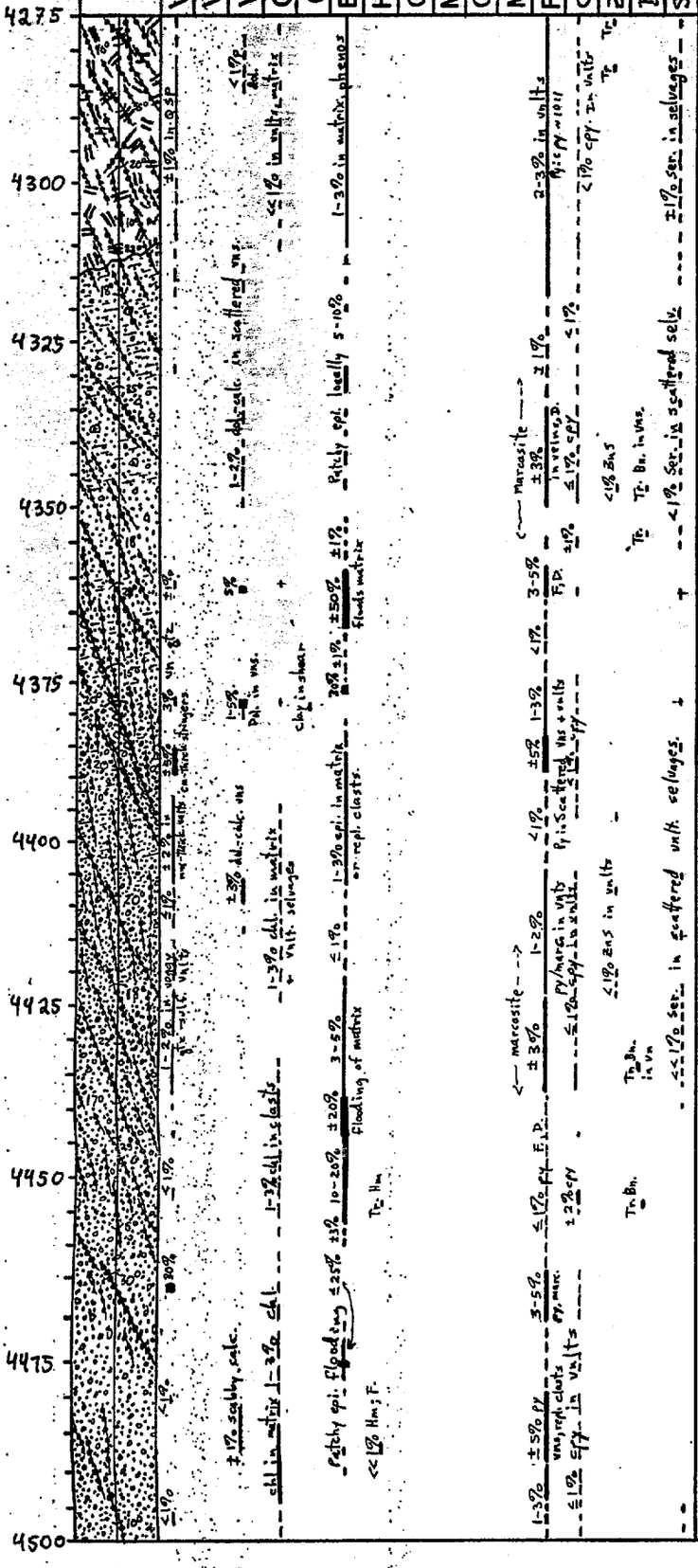
Division: Superior **Drill Hole:** MB-11A **Location:**

Coordinates: **Collar Elev:** **Total Depth:**

Date Collared: **Completed:** **Angle:** -80° (nominal)

Bearing: due S **Core Size:** NX **Logged By:**

Scale: 1:300 **Page** 2 **of**



% Rec'd	RQD
100%	12%
100%	0%
100%	7%
100%	15%
100%	0%
100%	12%
100%	42%
100%	20%
100%	29%
100%	15%
100%	0%
100%	7%
100%	0%
100%	5%
100%	17%
100%	5%
100%	0%
100%	7%
100%	13%
100%	24%
100%	11%
99%	18%
98%	5%
100%	19%

Comments

Porphyry sill, has pervasive epidotitic alt. in matrix + phenos, then cut by several generations of vnlts; ~12%, early irreg. hairline chlorite, then sheeted QSP w/ gray or in some cases zoned white→gray selvages. Then late cpy ± ZnS-carb. vnlts w/out selvages. QSP & later vnlts generally 1-5 cm thick; selvages ± 1 cm. QSP spaced a few cm's apart. Vnlts cut cleanly across contact.

4312' - Irreg., ignneous contact at about 70° to core axis

4312'-4430' - Fine-grained graywacke w/ scattered pebbles + cobbles. Generally dk. gray to nearly black in color. Epidotitic patches occur, also QSP vnlts w/ bleached selvages ± 1cm wide. QSP cut epidote, later sulf. vnlts w/ marcasite - cpy ± ZnS overprint QSP. Pyr:cpy ranges 5:1 to 10:1 or greater; later vnlts have more cpy. Volcanic frags appear in graywacke, esper. below ~4330'. Rock transitional into full-blown cgl. by about 4430'.

4362' - 3 cm Thick py-cpy-dol vn.

4374' - Dol. vn. in shear zone. Vn is sheared, ± 2cm thick.

4386' - 5-cm Thick qtz-marcasite vn. at 20° to core axis.

4411' - ±2cm-Thick pinkish carb. vn at 20° to core axis.

4422' - Py vnlt ±5mm Thick w/ zoned white→dk. gray selvages a few mm's wide.

4430' - 4509' - Polymictic pebble cgl. w/ a few cobbles. Clasts comprise qtzite, schist, diabase, hypabyssal, volcanic + plutonic rocks. Carb. clasts not evident, but epidote "eyes" suggest that many had ox. or dol. fragments have been replaced. Epidote "flooding" of matrix is common. Bedding obscure. Section is quite fractured. Below ~4480', % sulfide increases and many clasts are partly replaced w/ py/marcasite. Patchy silicification ~4460', 4480-65'.

4437' - A vuggy qtz-py-cpy-born. ± chl vn. ≤ 1cm thick, w/ zoned lt. gray to dk. grn selvages.

4455' - 4mm-Thick qtz-cpy-chl ± ZnS vnlts at 5° to core axis.

4466' - 3 cm Thick qtz-marc.-cpy vn at 30°. Epi. in wallrx not highly attacked.

4482' - A scabby calc. vnlt ∥ to core axis for ~7', w/ some hem. sticks, make subhorz. zones.

Assay

Cu, Pb, Zn, Mn %
Au, Ag oz/T

.07, <.01, .03, .09 %; <.001, .02 oz/T
.07, <.01, .04, .10 %; <.001, .04 oz/T
.06, <.01, .03, .09 %; <.001, .04 oz/T
.10, .05, .12, .09 %; <.001, .05 oz/T
.19, <.01, .03, .14 %; <.001, .06 oz/T
.12, <.01, .04, .12 %; <.001, .04 oz/T
.09, <.01, .02, .10 %; <.001, .04 oz/T
.30, <.01, .10, .10 %; <.001, .08 oz/T
.14, <.01, .04, .12 %; <.001, .04 oz/T
.17, <.01, .02, .12 %; <.001, .06 oz/T
.06, <.01, .02, .14 %; <.001, .01 oz/T
.12, .02, .07, .15 %; <.001, .09 oz/T
.16, <.01, .12, .10 %; <.001, .11 oz/T
.19, <.01, .28, .13 %; <.001, .10 oz/T
.08, <.01, .07, .14 %; <.001, .10 oz/T
.12, <.01, .07, .14 %; <.001, .10 oz/T
.07, <.01, .06, .12 %; <.001, .03 oz/T
.21, <.01, .05, .12 %; <.001, .06 oz/T
.11, <.01, .02, .10 %; <.001, .03 oz/T
.11, <.01, .06, .11 %; <.001, .06 oz/T
.14, <.01, .05, .12 %; <.001, .05 oz/T
.20, <.01, .10, .12 %; <.001, .10 oz/T
.01, <.01, .26, .17 %; <.001, .05 oz/T
.22, .02, .50, .20 %; <.001, .12 oz/T
.24, <.01, .20, .17 %; <.001, .15 oz/T

F = frac. controlled
D = disseminated
tr. = trace
acc. = accessory

MAGMA COPPER COMPANY

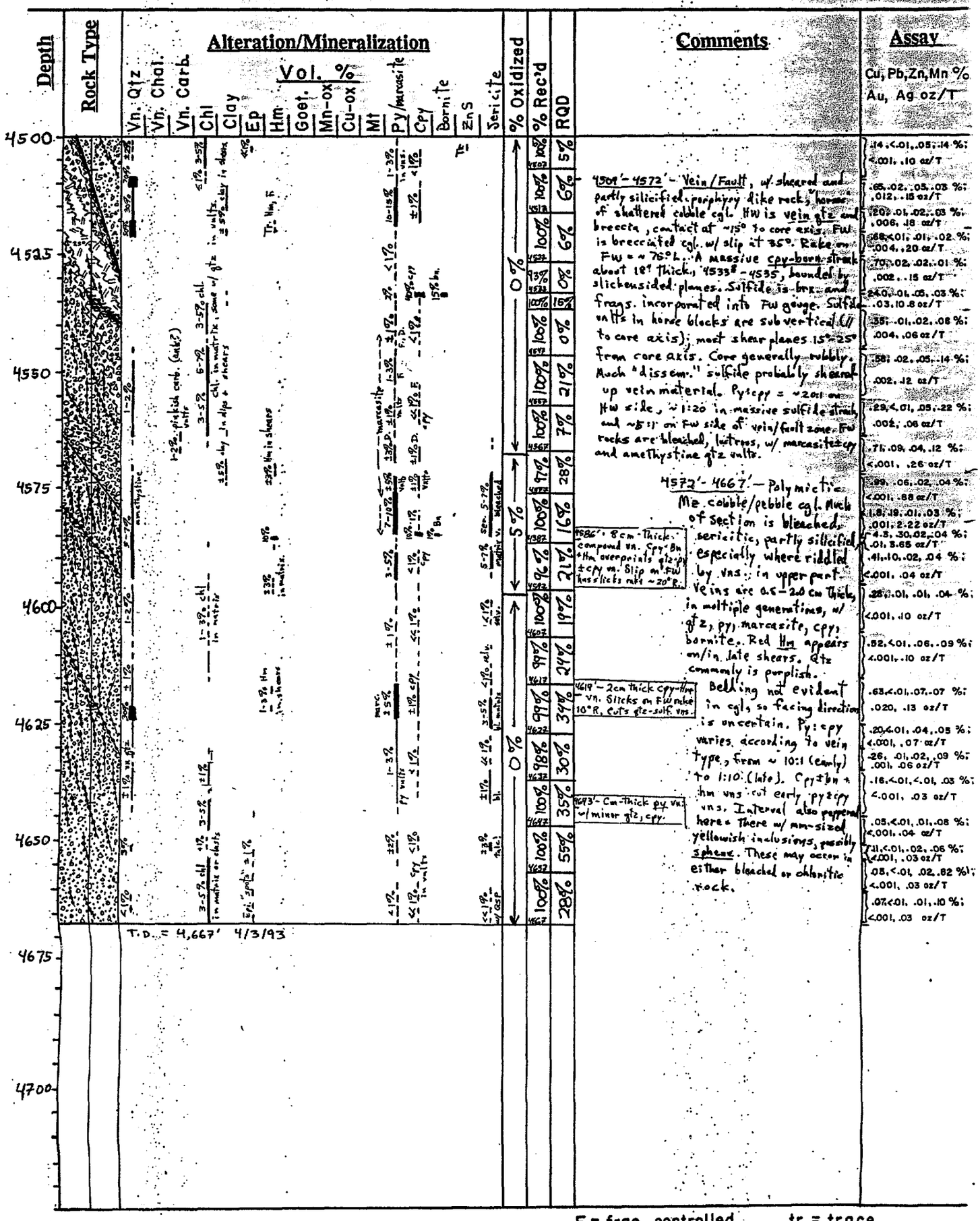
Division: SUPERIOR **Drill Hole:** MB-11 A **Location:** _____

Coordinates: _____ **Collar Elev:** _____ **Total Depth:** 4,667'

Date Collared: _____ **Completed:** 4/3/93 **Angle:** -80° (nominal)

Bearing: Ave S **Core Size:** NX **Logged By:** _____

Scale: 1:300



MAGMA COPPER COMPANY

T2S R13E
SE¼ SW¼ NW¼ Sect. 6

Division: SUPERIOR **Drill Hole:** MB-11B **Location:** S. Boundary

Coordinates: 97,809.6N, 15561.1E **Collar Elev:** 4,079.8' **Total Depth:** 4,349'

Date Collared: April 20, 1993 **Completed:** June 9, 1993 **Angle:** -65° (nominal)

Bearing: 180° (nominal) **Core Size:** NX **Logged By:** S. L. Manske

Scale: 1:300

Depth	Rock Type	Alteration/Mineralization (Vol. %)	% Oxidized	% Rec'd	RQD	Comments	Assay (Cu, Pb, Zn, Mn %; Au, Ag oz/T)
2775							
		in Tbx				-2792'- NX wedge set in bore of MB-11A to deviate "navi" bit. 2792'-3160' "Navi"-drill deviation w/ plug bit — no core. Attitude of bore changed from S1W, -82° to ~S1°W, -63°.	
2800							
2825							
3175		±2% epi veins, rept. clasts		100% 3164	20%	3163-Bedding at 25°	<.01, <.01, .03, .38 %; <.001, .03 oz/T
				100% 3169	20%	3165-Low-Thick dol. vn. at 40°	<.01, <.01, .03, .28 %; <.001, <.01 oz/T
				85% 3174	0%		
				96% 3178	0%		<.01, <.01, .02, .24 %; <.001, <.01 oz/T
				100% 3181	24%		
				98% 3196	53%	3159'-3250'- NX core retrieved in angle hole = Mz pebble/cobble conglomerate. Some sandy/silty interbeds at top of interval, where graded bedding, load casts indicate that section is upright. Cobbles dominantly limestone, commonly well-rounded, w/ subordinate red chert and volcanic frags. Cgl. generally framework-supported. Ls. frags may be bleached on rims. Matrix + silty beds are maroon in places but mostly pale greenish. Section cut by white calc./dol. veins + vnlts and scattered, hairline chlor. vnlts. Some py in clay shears c.a. 3210'.	<.01, <.01, .02, .24 %; <.001, <.01 oz/T
3200		Tr. py		100% 3206	18%		<.01, <.01, .02, .29 %; <.001, <.01 oz/T
				99% 3216	7%	3209'-Clay-filled shear ± 3 cm thick.	<.01, <.01, .03, .35 %; <.001, <.01 oz/T
			~1%	100% 3226	48%	3217-Clay-filled slip 6 cm Thick at 50° to core axis.	<.01, <.01, .02, .10 %; <.001, <.01 oz/T
3225				98% 3236	42%		<.01, <01, .05, .42 %; <.001, .01 oz/T
				100% 3246	40%		<.01, <.01, .01, .13 %; <.001, <.01 oz/T
				99% 3256	58%	3245'-±2 cm-Thick shear w/ // calc. vnlts.	
3250				100% 3266	51%	3256'-±1 cm-Thick dolomite vein at 10° to core axis	<.01, <.01, <.01, .10 %; <.001, <.01 oz/T
			5%	98% 3276	29%	3265-Silty interbeds, mottled maroon and green, at 70° to c.a.	<.01, <.01, <.01, .14 %; <.001, <.01 oz/T
beds upright 3275				99% 3286	0%	3274'-Bleached, rubbly breccia zone w/ disrupted qtz-carb-sat vein(s). Slicks rake 60° R on HW side.	<.01, <.01, <.01, .14 %; <.001, <.01 oz/T
			0%	100% 3296	35%	3293'-Maroon-colored sand/silt interbeds at 75°. Upright, by load casts.	<.01, .07, .38, 1.35 %; <.001, .11 oz/T
3300				100% 3306	52%		<.01, <.01, .02, .17 %; <.001, <.01 oz/T
				98% 3316	0%	3310'-Shear, healed w/ epidote in large part. Slicks rake 25° L.	<.01, <.01, <.01, .10 %; <.001, .01 oz/T
				100% 3326	11%		<.01, <.01, .02, .24 %; <,001, <.01 oz/T
			2%				<.01, .05, .18, 1.2 %; <.001, <.01 oz/T
3325							<.01, .03, .05, .70 %;

3250'-3325'- Pebble- to cobble cgl. w/ a few silty or sandy interlayers. Framework-supported. Subang. to well-rounded clasts of ls. dominate, w/ lesser chert, volcanic rocks, minor diabase. Core bleached, sheared and rubbly, 3277' to 3283'. Sandy, silty interlayers give bedding x's, show that section is upright by load casts, scours.

F = frac. controlled
D = disseminated
tr. = trace
acc. = accessory

LAGMA COPPER COMPANY

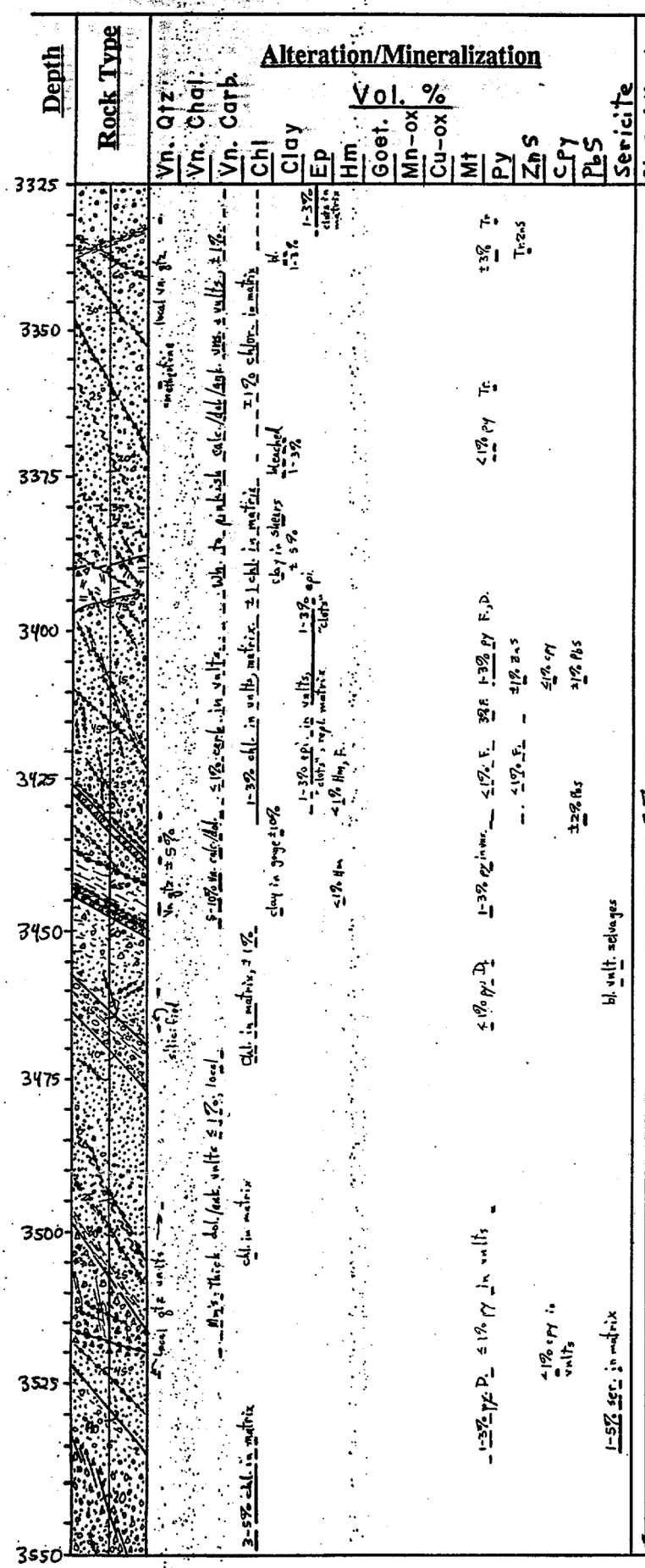
Division: _____ **Drill Hole:** MB-11B **Location:** _____

Coordinates: _____ **Collar Elev:** _____ **Total Depth:** _____

Date Collared: _____ **Completed:** _____ **Angle:** _____

Bearing: _____ **Core Size:** _____ **Logged By:** _____

Scale: 1:300



% Rec'd	RQD % Rec'd ≥ 6" lgths
100%	38%
100%	54%
100%	44%
100%	59%
100%	39%
96%	27%
100%	25%
92%	17%
100%	20%
97%	20%
100%	10%
97%	5%
93%	6%
100%	13%
98%	25%
100%	11%
100%	42%
100%	13%
63%	0%
100%	5%
97%	0%
100%	6%
100%	0%
100%	13%

Comments

3325'-3432.5' – Pebble cgl. w/ a few cobbles, sand/silt interlayers. Subang. to well-rounded. Ls. clasts predominate to ~3360', where gneiss, slate and volc. frags. become more common. A porphyry sill w/ scattered qtz eyes & chloritic biotite books occurs at ~3340-3345'. Bounded on HW by mottled intrusion brx., on FW by slip. Ls. frags. not evident below sill. Rock commonly bleached, argillic for several cm's around veins & veinlets. Matrix is v. dark, shaly near 3390'. A few granitic clasts in cgl. ca. 3385'. Vein/fault zone at 3432.5 forms FW of Mesozoic block.

3309' – Bedding in silty layer = 70°. Upright.

3345' – ≤1cm-thick dol. vn. w/ bleached selv. at 30° to core axis.

3359' – Vuggy, pinkish dol./ank. vn. 3-4 cm thick, at 25°

Bleached

3390' – Porph. sill (?) ≥1 m thick. Cut by slip at 60°. Contacts at ~75° to core axis

3408' – Sheeted sulfide vnlts, mm's thick, some w/ qtz gangue & bl. selvages, others w/ chlorite gangue. X-cutting not observed, timing uncertain.

3425' – 5mm-Thick qtz-carb-ZnS-cpy-& PbS vnlt, ± chl ± ser; cut by wk. carb. vnlt.

3432.5'-3447.5' – Vein/Fault w/ clayey gouge, partly disrupted qtz-carb.-sulfide veins, blocks of FW rocks (= Bolsa cgl. and Ss/silt stones). FW vein ~2" thick.

3447.5'-3528' yes = Bolsa Qtzite

A fault wedge composed of arkosic Ss, pebble cgl., siltstone, and black shale/graywacke. Clast population in pebbly zones dominated by schist & granite porphyry, w/ lesser vn. qtz, chert, qtzite – carbonate frags are rare. Shaly or silty zones commonly show a "foliation" or intraformational brx. texture. Much of sat'n is v. rubbly, broken. Rock is lt. gray to pale greenish-gray in color; darker gray-grn towards base of interval. Feldspar phenos. in granitic clasts are white and chalky. Matrix of pebbly zone 3528'-3555' is bleached, lustrous, sericitic. Py rims or partly replaces some pebbles of diabase & schist. 2 or 3 tiny Ls. pebbles noted near 3543'. Matrix below ca. 3535' is dark gray-grn, chloritic.

3463' – Intra-Formational Brx + slip at 45°. Slicks Rake 0°

3470' – Slip at 40° to core axis.

or absent altogether

3498' – Py-carb vnlt at 30°

3507' – Core v. rubbly, even brx. to ~3718'.

3524' – Qtz-py vn ≥2cm thick.

matrix bleached, sericitic

3528'-3550' – Mesozoic Cgl.(?)

Assay

Cu, Pb, Zn, Mn %
Au, Ag oz/T

<.001, <.01 oz/T
<.01, .12, .11, 0.75 %
<.001, .02 oz/T
<.01, .36, .65, 0.82 %
<.001, .01 oz/T
<.01, <.01, .01, 0.16 %
<.001, .02 oz/T
<.01, .01, .06, 0.49 %
<.001, <.01 oz/T
<.01, .04, .10, 0.47 %
<.001, .02 oz/T
<.01, <.01, .06, .48 %
<.001, <.01 oz/T
<.01, <.01, .04, 0.20 %
<.001, <.01 oz/T
<.01, <.01, .02, 0.25 %
<.001, <.01 oz/T
<.01, <.01, .02, 0.39 %
<.001, <.01 oz/T
.04, .36, .52, 0.67 %
.001, .16 oz/T
<.01, .03, .06, 0.44 %
<.001, .01 oz/T
.02, .12, .09, 0.35 %
<.001, .04 oz/T
.02, .42, .98, 0.42 %
<.001, .08 oz/T
.02, .14
<.001, .06 oz/T
<.01, .03, .22, 0.43 %
<.001, .01 oz/T
.04, .02, .0.36 %
.001, .27 oz/T
<.01, <.01, .03, 0.10 %
<.001, .01 oz/T
<.01, .01, .04, 0.23 %
<.001, .01 oz/T
<.01, <.01, .02, 0.24 %
<.001, <.01 oz/T
<.01, <.01, <.01, .06 %
<.001, <.01 oz/T
<.01, <.01, <.01, .08 %
<.001, <.01 oz/T
<.01, <.01, .03, .08 %
<.001, <.01 oz/T
<.01, .02, .06, 0.15 %
<.001, .01 oz/T
<.01, <.01, .01, 0.10 %
<.001, <.01 oz/T
<.01, <.01, .02, 0.18 %
.007, .029 oz/T
<.01, <.01, .05, 0.18 %
<.001 <.01 oz/T
.01, .06, .10, 0.32 %
<.001, .06 oz/T

F = frac. controlled
D = disseminated
tr. = trace
acc. = accessory

MAGMA COPPER COMPANY

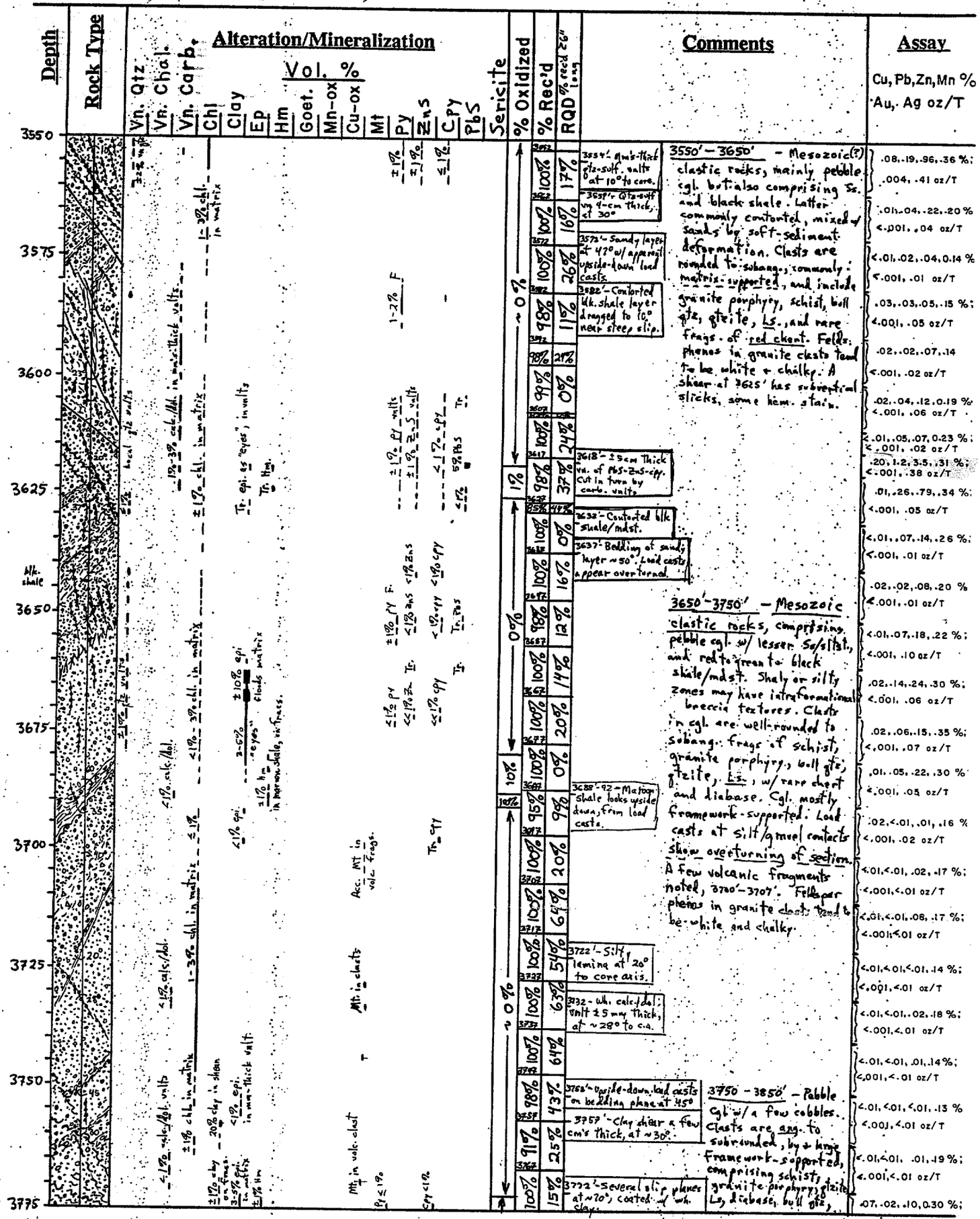
Division: Superior **Drill Hole:** MB-11B **Location:**

Coordinates: **Collar Elev:** **Total Depth:**

Date Collared: **Completed:** **Angle:**

Bearing: **Core Size:** NX **Logged By:**

Scale: 1:300



MAGMA COPPER COMPANY

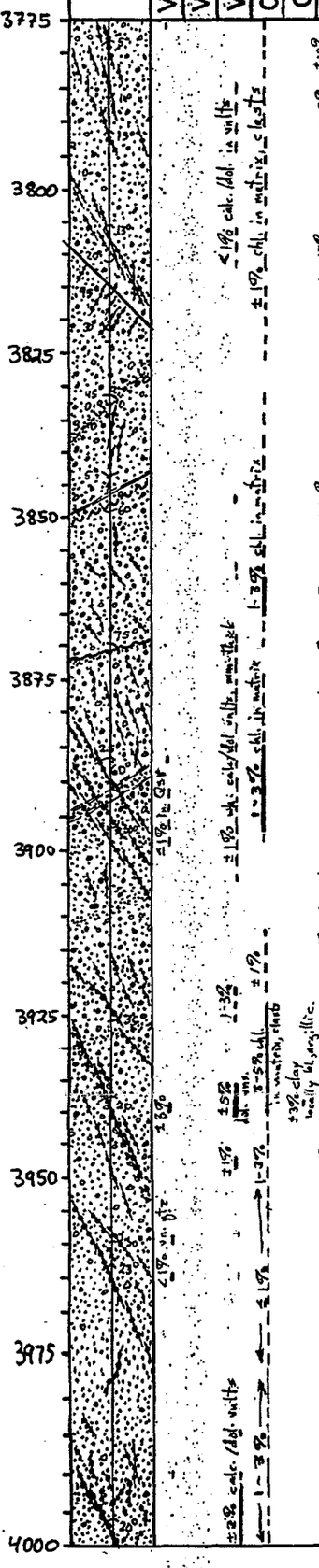
Division: _____ **Drill Hole:** MB-11B **Location:** _____

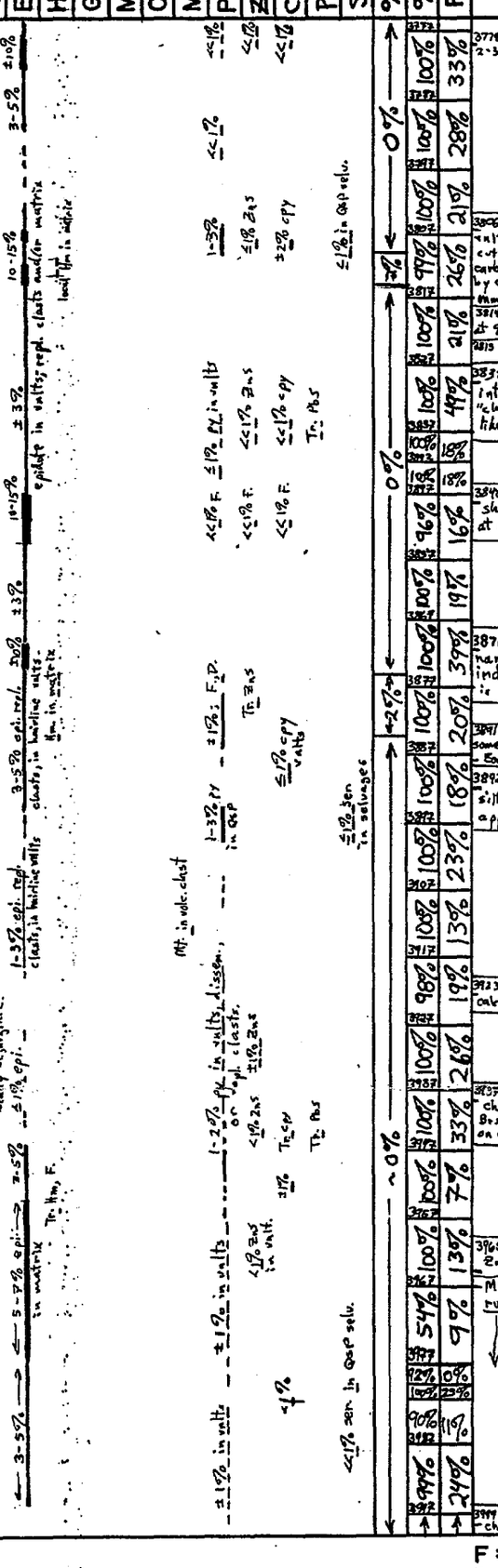
Coordinates: _____ **Collar Elev:** _____ **Total Depth:** _____

Date Collared: _____ **Completed:** _____ **Angle:** _____

Bearing: _____ **Core Size:** _____ **Logged By:** _____

Scale: 1:300 **Page** 4 **of** 6





Comments

hypabyssal rocks, and rare frags. of red chert. Some clasts selectively replaced by sulfides near 3875' and 3805'. Epidote is common, replacing small clasts, as veins w/ diffuse margins, or flooding matrix. cpy-ZnS veins near 3805' cut carb. veins that cut QSP veins in complex little zone. Some cpy veins have dark selvages (= chlor.? bio?) A few sandy or silty interlayers in rock near top of interval have interformational brx. texture. Matrix looks "volcanic" near 3760'. An upright silt lamina noted near 3850'.

3850'-3950' – Cgl., pebbly Ss and greywacke. Bedding plane indicators are generally upright. Volcaniclastic debris appears near 3900'. Clasts comprise Ls, granite, volcanics, qtzite, diabase, schist, chert – commonly matrix-supported. Chlor and epidote common alteration products in matrix and veinlets. Ls. clasts below ca. 3930' commonly silicified and/or recrystallized, partly replaced by sulfides.

3950'-4000' – Pebble cgl./pebbly Ss, w/ rounded to subang. clasts of qtzite, diabase, granite, volcanic rocks, slate. Ls. frags are not common; sulfide-replaced clasts probably former carbonate frags. Epidote prominent as alteration of matrix & some clasts; mafic clasts commonly v. chloritic. Material is by & large matrix-supported; bedding obscure. Feldspar phenos in granite clasts are white to pinkish and generally fairly hard.

3776'- Qtz-solf vlt 2-3 mm thick, at 50°

3806'- Zone w/ QSP veins ± 5 mm thick, cut by 2-3 mm wk. carb. veins, cut in turn by cpy±ZnS veins ≤5 mm thick

3814'- Slip plane w/ rake at 70° on 45° surface.

3815 - Epi veins at 30°

3832'- Sand/silt interlayer has "clay drops" on bottom like in vorted grading

3848'- Silt interlayer shows upright bedding at 60°, by load casts.

3871'- Load casts on narrow sandy layer indicate that bedding is upright.

3891'- Zone of silicified veins, some QSP, others cpy-py-ZnS. - Bound gray to tech. selvages.

3892'- Bedding in sandy, silty layers at 60° and apparently upright.

3923'- Cm-thick calc./dol vein at 35°

3937'- ±5 cm thick chl-carb-py vn. Brx textured, slicks on walls subhorizontal

3965'- Banded qtz-py-ZnS-cpy vein ±8 mm thick

Mistatch: Core rubbleized

3999'- ±2cm-thick chl-carb-py vein

Assay

Cu, Pb, Zn, Mn %
Au, Ag oz/T

<.001, .10 oz/T
.03, .01, .12, .28 %
<.001, .10 oz/T
.02, <.01, .04, .24 %
<.001, .02 oz/T
.05, .01, .03, .38 %
<.001, .06 oz/T
1.75, .04, .96, .20 %
<.001, .73 oz/T
.06, .05, .11, .26 %
<.001, .11 oz/T
.02, .04, .10, .28 %
<.001, .08 oz/T
.01, .04, .08, .24 %
<.001, .08 oz/T
.01, .03, .08, .31 %
<.001, .05 oz/T
<.01, .02, .04, .26 %
<.001, .02 oz/T
<.01, .01, .06, .20 %
<.001, .01 oz/T
.03, .10, .16, .34 %
.001, .13 oz/T
.03, .05, .14, .32 %
<.001, .13 oz/T
.14, .01, .03, .34 %
.001, .26 oz/T
.19, .01, .03, .27 %
<.001, .15 oz/T
.12, .03, .10, .23 %
<.001, .09 oz/T
.04, .01, .04, .28 %
<.001, .04 oz/T
.04, .14, .43, .51 %
.003, .18 oz/T
.04, .21, .99, .64 %
.004, .35 oz/T
.02, .03, .40, .62 %
.001, .13 oz/T
.06, .06, .15, .60 %
.003, .21 oz/T
.04, .06, .20, .38 %
<.001, .09 oz/T
.05, .03, .19, .36 %
<.001, .09 oz/T
.05, .01, .06, .28 %
<.001, .05 oz/T
.04, .02, .06, .32 %
<.001, .06 oz/T
.26, .03, .10, .28 %

F = frac. controlled
D = disseminated
tr. = trace
acc. = accessory

MAGMA COPPER COMPANY

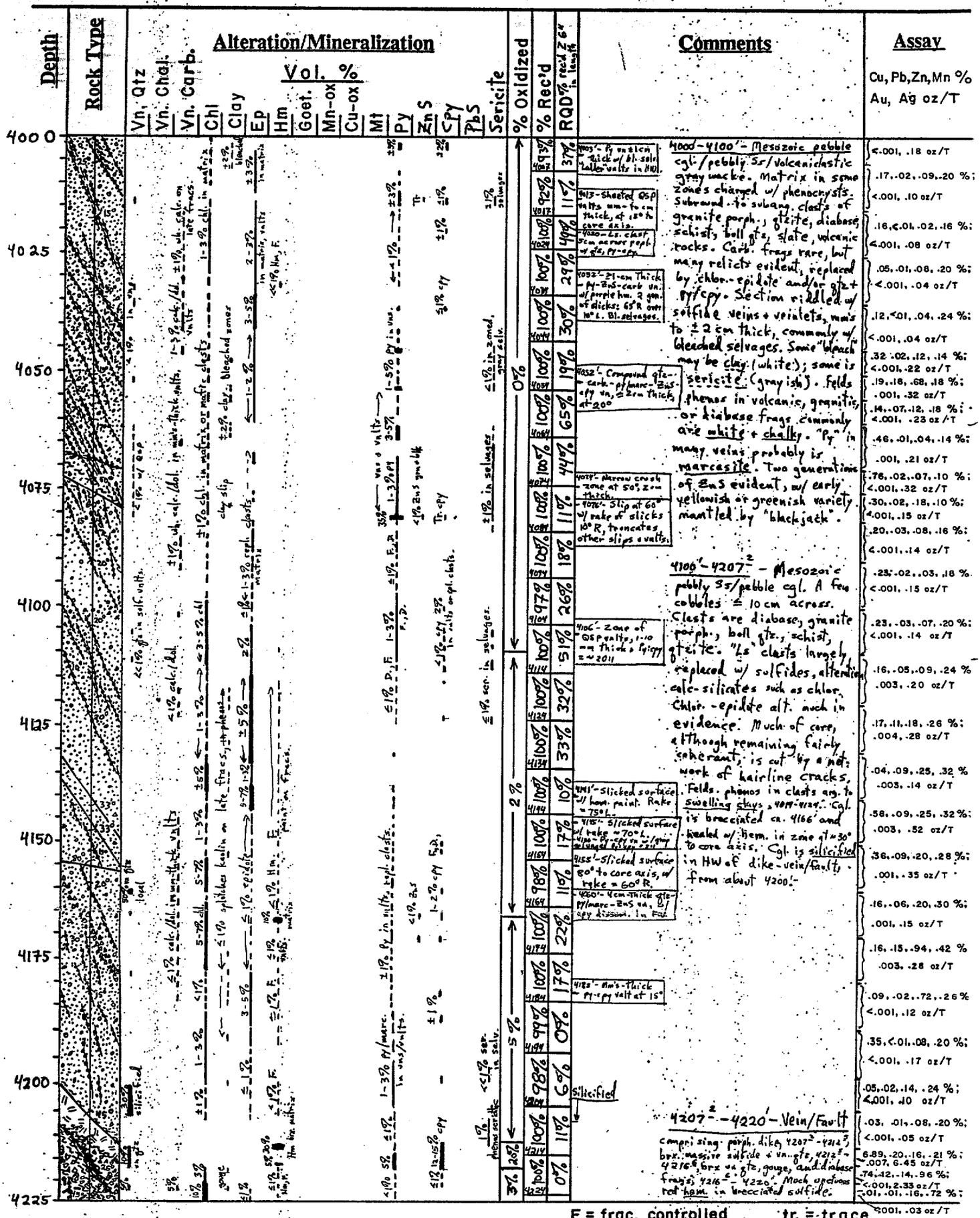
Division: SUPERIOR **Drill Hole:** MB-11B **Location:** _____

Coordinates: _____ **Collar Elev:** _____ **Total Depth:** _____

Date Collared: _____ **Completed:** _____ **Angle:** -65° (nominal)

Bearing: 180° (nominal) **Core Size:** NX **Logged By:** S.L. Manske

Scale: 1:300



AGMA COPPER COMPANY

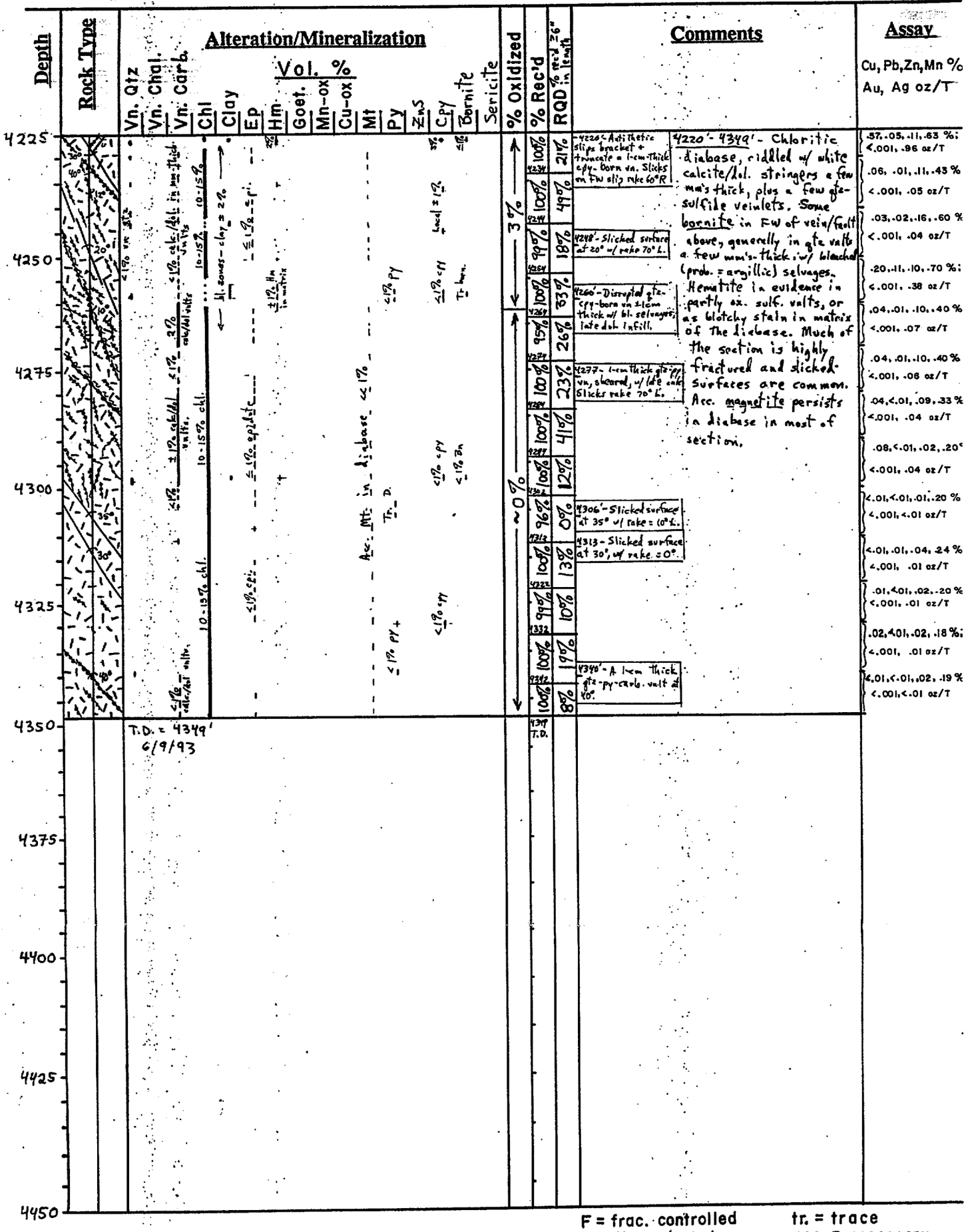
Division: SUPERIOR **Drill Hole:** MB-11B **Location:** _____

Coordinates: _____ **Collar Elev:** _____ **Total Depth:** 4,349'

Date Collared: _____ **Completed:** 6/9/93 **Angle:** -65° (nominal)

Bearing: 180° (nominal) **Core Size:** NX **Logged By:** S.L. Manske

Scale: 1:300 **Page** 6 **of** 6



MAGMA COPPER COMPANY

Division: Superior **Drill Hole:** MB-12 **Location:** T 2 S R 13 E NE¼SW¼SW¼ S. 6

Coordinates: 96769.8 N, 15563.3 E **Collar Elev:** 4,105.8' **Total Depth:** 4,008'

Date Collared: April 23, 1992 **Completed:** 7/18/92 **Angle:** -90°

Bearing: — **Core Size:** HQ **Logged By:** S. L. Manske

Scale: 1:300

Depth	Rock Type	Alteration/Mineralization Vol. % (Vn. Qtz, Vn. Chal., Vn. Calc., Chl, Clay, Ep, Hm, Goet., Mn-ox, Cu-ox, Mt, Py)	% Oxidized	% Rec'd	RQD	Comments	Assay (Cu, Pb, Zn, Mo; Ag, Au oz/)
0						0'-3' – Rubble and Fill 3'-1,052.5'-Dacite Tuff.	
25		Chl: ±1%; Cu-ox: <<1%		12' 94%	37%	12-22' Reddish gray moderately welded tuff, weathered, w/ acc. Mt and scattered lithophysae filled w/ clays, zeolites(?) Flattening laminae at ~ 75° to core axis.	
50							
75							
100							
125		Chl: <<1%; Cu-ox: <<1%		112' 94% 122'	76%	112'-122' – Red-gray poorly to mod. welded tuff w/ acc. Mt. Spidery cracks filled w/ wh. calcite. Flattening laminae at ~ 80°. A few xenoliths of dk. basement rocks (qtzite, slate, db?).	
150							
175							
200							
225		Cu-ox: <<1%		212 97% 222	11%	212'-222' – Reddish gray bio-bearing tuff as above, w/ acc. Mt. Flattening laminae ~ 80° to core axis. Core rubbleized by steep fracs.	

F = frac. controlled
D = disseminated
tr. = trace
acc. = accessory

MAGMA COPPER COMP NY

Division: _____ Drill Hole: MB-12 Location: _____

Coordinates: _____ Collar Elev: _____ Total Depth: _____

Date Collared: _____ Completed: _____ Angle: -90°

Bearing: — Core Size: HQ Logged By: S.L. Manske

Scale: 1:300

Depth	Rock Type	Alteration/Mineralization Vol. % (Vn. Qtz, Vn. Chal., Vn. Calc., Chl, Clay, Ep, Hm, Goet., Mn-ox, Cu-ox, Mt, Py)	% Oxidized	% Rec'd	RQD	Comments	Assay Cu, Au, Ag
225							
250							
275							
300							
		<<1% (acc.)		312–322: 99%	32%	312'-322'- Reddish to grayish brn bio-bearing welded tuff, acc. Mt., w/ flattening laminae at 85+° to core axis.	
325							
350							
375							
400							
		<<1% (acc.)		415–425: 96%	63%	415'-425'- Reddish to gray-brn. mod. welded tuff w/ acc. bio, mt. Flattening laminae nearly 90° to core axis.	
425							
450							

F = frac. controlled
D = disseminated

tr. = trace
acc. = accessory

MAGMA COPPER COMPANY

Division: _____ Drill Hole: MB-12 Location: _____

Coordinates: _____ Collar Elev: _____ Total Depth: _____

Date Collared: _____ Completed: _____ Angle: ~90°

Bearing: — Core Size: HQ Logged By: S.L. Manska

Scale: 1:300

Depth	Rock Type	Alteration/Mineralization Vol. % (Vn. Qtz, Vn. Chal., Vn. Calc., Chl, Clay, Ep, Hm, Goet., Mn-ox, Cu-ox, Mt, Py)	% Oxidized	% Rec'd	RQD	Comments	Assay Cu, Au, Ag.
450							
475							
500							
525		<<1% (acc.)	511–521 88%	24%		511'-521'- Reddish to gray-brn. moderately welded tuff w/ acc. bio, tr. mt. Flattening laminae at ~80° to core axis. Rock fractured, rubbly.	
550							
575							
600		Tr. <<1%	611–621 76%	0%		611'-621'- Reddish to gray-brn. mod. welded tuff w/ acc. bio, mt. Flattening laminae at ~80° to core axis. Rock broken, rubbleized by numerous steep fracs.	
625							
650							
675							

F = frac. controlled
D = disseminated

tr. = trace
acc. = accessory

MAGMA COPPER COMPANY

Division: _____ Drill Hole: MB-12 Location: _____

Coordinates: _____ Collar Elev: _____ Total Depth: _____

Date Collared: _____ Completed: _____ Angle: -90°

Bearing: — Core Size: HQ Logged By: S. L. Manske

Scale: 1:300

Depth	Rock Type	Alteration/Mineralization Vol. % (Vn. Qtz, Vn. Chal., Vn. Calc., Chl, Clay, Ep, Hm, Goet., Mn-ox, Cu-ox, Mt, Py)	% Oxidized	% Rec'd	RQD	Comments	Assay Cu, Au, Ag
675							
700	25°			707–717: 92%	0%	707'-717'—Reddish to gray-brn. moderately welded tuff. Slicks on break at 717' rake essentially 0° (subhor.) Core rubbleized, commonly crumbly.	
725							
750							
775							
800							
825		argillic		815–825: 87%	7%	Red-brn to reddish-gray xtal-vitric tuff, moderately welded, w/ scattered xenoliths of a dark slaty rock. Cut by steep fractures; vuggy, w/ some argillization/weathering.	
850							
875							
900							

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MAGMA COPPER COMPANY

Division: _____ **Drill Hole:** MB-12 **Location:** _____

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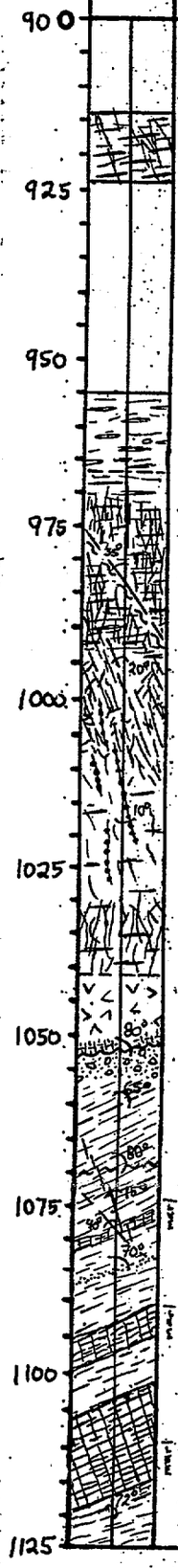
Date Collared: _____ **Completed:** _____ **Angle:** -90°

Bearing: — **Core Size:** HQ **Logged By:** S.L. Manske

Scale: 1:300



% Rec'd	RQD
89%	23%
92%	33%
88%	7%
93%	0%
100%	0%
98%	0%
85%	0%
90%	0%
100%	0%
100%	25%
100%	78%
98%	75%
81%	9%
100%	39%
91%	41%
92%	8%
85%	26%
98%	34%
93%	33%
98%	8%
100%	13%
100%	8%
97%	12%

Mottled reddish-tan to dk. gray xtal-vitric tuff. Densely welded, w/ lithophysae 2-3 cm in diameter; some calcite-filled, others w/ vapor-phase alteration minerals. Matrix begins to get increasingly glassy. Some irreg. calcite vns.

955'-967' — Mottled tan to dk. gray-brn densely welded xtal-vitric tuff. Grades downward into black vitrophyre. Lithophysae.

967-1,041' — Dense, blk. vitrophyre. Largely rubbleized by closely spaced, v. steep fractures and shears, 967'-997'. Sheared, devitrified and colored yel.-brn. to reddish brn. in zone w/ steep fracs. and mm's-wide chalcedony vnlts, ~997' to 1,008'.

1025'-1030' — Blk. vitrophyre mottled brown and partly devitrified.

1,041'-1052.5' — Reddish to yellow-gray to pinkish moderately to poorly welded tuff. Acc. bio, Arg: lliz'd right at base.

1,052.5'-1,894' — Whitetail "Cgl."

A thin layer of Ls. rubble overlies mod. to poorly indurated sltst. and claystones stained brick-red by hem. down to ~1225'. Marly zones, 1077-1080', 1095'-1099', 1105'-1120', 1135'-1141'. Distinct lacustrine Ls. bed not seen. Section turns sandy by ~1,225', pebbly and cobbly by ~1,350' and thence to base (fault contact at 1,894' w/ underlying Ls.)

1060' - Bedding laminae in sltst. at 65°

1070' - Slicked surface along shear plane w/ rake ~90° R.

1075'-1077' - Slick surfaces at 15°-40° from core axis; rakes oblique ~30° L.

Assay: .18% Cu; .67 %; .24 %; .04 %; .07 %; .06 %; .05 %; .11 %

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MAGMA COPPER COMPANY

Division: _____ **Drill Hole:** MB-12 **Location:** _____

Coordinates: _____ **Collar Elev:** _____ **Total Depth:** _____

Date Collared: _____ **Completed:** _____ **Angle:** -90°

Bearing: — **Core Size:** HQ **Logged By:** S. L. Manske

Scale: 1:300

Depth	Rock Type	Alteration/Mineralization Vol. % (Vn. Qtz, Vn. Chal., Vn. Calc., Chl, Clay, Ep, Hm, Goet., Mn-ox, Cu-ox, Mt, Py)	% Oxidized	% Rec'd	RQD	Comments	Assay (Cu, Pb, Zn, Mn; Au, Ag oz/)
1125			95%	95%	17%	1125'-1200' — Sequence of laminated siltsts. + mudsts., commonly marly and "redbed" in aspect, w/ interlayers a few cm's to a few 10's of cm's thick of lithic sands, water-lain ash. Siltstone and sandy units commonly calcareous.	.06 % C
		≤1%	99%	99%	22%	1135'— Bedding in marly siltst. "redbeds"	
1150			99%	99%	24%		.08 %
			100%	100%	57%		.08 %
			100%	100%	23%		.11 %
1175			95%	95%	39%	1173'- Bedding in siltst. / 1178'- Water-lain ash layer ~85 cm thick. Load casts at base.	.06 %
			100%	100%	74%		.09 %
1200		±1% hem.	96%	96%	51%	1200'-1250' — Section coarsens downward to interlaminated red-brn siltst./mudst. and poorly sorted f.g. to m.g. lithic Ss. Siltst. laminae are 1-2 cm. thick and generally marly; Ss are gray-brn and in some cases have calcareous matrix.	.07 %
			95%	95%	83%		.10 %
			95%	95%	39%		.11 %
1225			96%	96%	83%	1225'- Bedding in interlaminated Ss and siltsts.	.11 %
			100%	100%	53%	1243'- Undulating slicked surface at ~15° w/ rake about 5° L.	.08 %
			100%	100%	38%	1250'-1300' — Sandy section of poorly sorted, gray-brn wacke. Pebbles + scattered cobbles increasingly common below 1250'. Some thin (1-2 cm) red-brn siltst./mdst. laminae occur, plus minor gypsum. Section is only weakly calcareous in contrast to above.	.08 %
1250			100%	100%	76%	1251'- Slicked surface w/ rake = 70° L.	.08 %
			97%	97%	90%		.08 %
			100%	100%	91%		.08 %
1275			100%	100%	59%	1279'- 3 cm thick salmon-pink to yellowish variegated gypsum layer immed. under 8-cm thick horizon of water-lain tuff. Bedding @ ≈80°.	.05 %
			100%	100%	69%		.04 %
1300			100%	100%	74%	1300-1350' — Poorly sorted med.- to coarse-grained lithic Ss w/ some red-brn siltst. interlayers at ~1330'. Ss is gray-brn to reddish-brn. In contrast to above, none of section in this interval is very calcareous. Pebbly zones appear, w/ scattered cobble-sized clasts. / 1305'- Bedding of siltst. laminae at 60°	.06 %
			100%	100%	62%		.06 %
1325			100%	100%	50%		.10 %
			100%	100%	56%		.18 %
		1342 Tbx ?	100%	100%	55%	1337'- Bedding laminae in siltst. interlayer.	.03 %
1350			↑	↑			

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Division: _____ **Drill Hole:** MB-12 **Location:** _____

Coordinates: _____ **Collar Elev:** _____ **Total Depth:** _____

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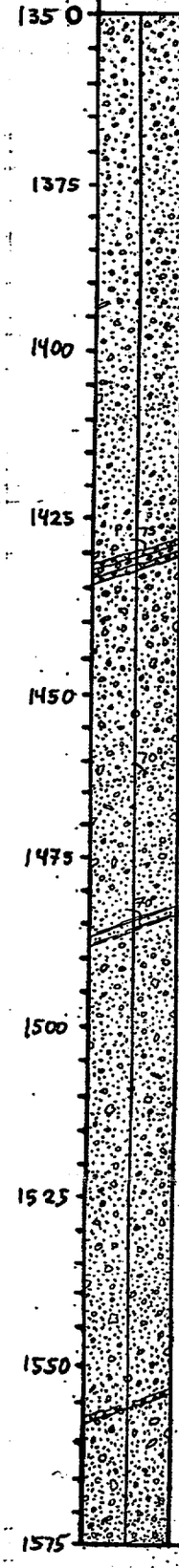
Bearing: — **Core Size:** HQ **Logged By:** _____

Scale: 1:300



Alteration/Mineralization — Vol. %: Vn. Qtz, Vn. Chal., Vn. Calc., Chl, Clay, Ep, Hm, Goet., Mn-ox, Cu-ox, Mt, Py

% Oxidized	% Rec'd	RQD
100% 1365	75%	
93% 1363	46%	
100% 1373	53%	
100% 1383	53%	
100% 1393	31%	
100% 1403	50%	
100% 1411	48%	
46% 1417	64%	
100% 1425	65%	
100% 1435	31%	
100% 1445	65%	
100% 1455	48%	
100% 1465	31%	
100% 1475	34%	
98% 1485	69%	
98% 1495	46%	
97% 1505	41%	
100% 1515	44%	
99% 1525	34%	
100% 1535	52%	
100% 1545	43%	
91% 1555	21%	
100% 1565	17%	
100% 1575	15%	

Comments

1350'-1400' — Pebble to cobble cgl., poorly sorted and matrix-supported by sandy interstitial material. Clasts are rounded to subang. mix about 40% diabase, 40% schist, 5% qtzite, 5% granitic rocks, and the remainder slate, bull qtz, black chert, and rare Ls. Clasts up to 9 cm across but most ≤ 5 cm. Bedding is obscure; matrix generally not calcareous.

1400'-1450 — Poorly sorted, polymictic pebble to cobble cgl. w/ sandy matrix. Matrix-supported subang. to subround clasts range up to 12 cm across, but most ≤ 5 cm. Sandy zone ~ 1410'-1425'; tuffaceous layers at 1430' and 1432'. Matrix weakly calcareous at ~1425' and 1443'; otherwise nonreactive. Clast population = ~35% diabase, 40% schist, 10% qtzite, 8% granite or aplite; remainder is mix of chert, slate, bull qtz, ferruginous clasts, bleached argillic rocks, and rare Ls.

-1430' — A pair of tuffaceous layers 20-30 cm thick. Bedding @ ~75°.

1450'-1500' - Poorly sorted, polymictic pebble to cobble cgl. w/ tan sandy matrix, generally noncalcareous. Matrix-supported; clasts up to 15 cm across but most are ≤ 5 cm in diameter, subrounded to subangular. Some sandy zones w/ cm-wide shaly interlayers. Clast population ~ 70% schist, 15% diabase, 3% qtzite, remainder granitic frags, vn. qtz, slate, bleached altered rocks, rare Ls.

-1463' - Bedding in sandy interlayer.

1500'-1550' - Poorly sorted polymictic pebble to cobble cgl. as above w/ tan sandy matrix. Subangular to subrounded clasts up to 15 cm across (most ≤ 5 cm) are generally matrix-supported. Matrix noncalcareous. Bedding is indistinct. Clast pop. = ~50% schist, 30% diabase, 10% qtzite. Remainder comprises granite/aplite, bull qtz, jasperoid, silica-hematite rock, limestone, slate.

1550'-1600' — Poorly sorted polymictic cgl. as above, w/ clasts up to 20 cm (but generally ≤ 5 cm) across. Clasts subrounded to subangular, matrix-supported. Matrix is yellowish-tan silt + sand, turning dark gray-grn at ~ 1590' as if charged w/ detrital chlorite.

Assay — Cu, Pb, Zn, Mn; Au, Ag oz/

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MAGMA COPPER COMPANY

Division: Superior **Drill Hole:** MB-12 **Location:**

Coordinates: **Collar Elev:** **Total Depth:**

Date Collared: **Completed:** **Angle:** -90°

Bearing: — **Core Size:** HQ **Logged By:** S.L. Manske

Scale: 1:300

Depth	Rock Type	Alteration/Mineralization Vol. % (Vn. Qtz, Vn. Chal., Vn. Calc., Chl, Clay, Ep, Hm, Goet., Mn-ox, Cu-ox, Mt, Py, Native Cu)	% Oxidized	% Rec'd	RQD	Comments	Assay (Cu, Pb, Zn, M. Au, Ag oz/)
1575				99% (1585)	41%	Matrix generally noncalcareous. Tuff horizons 5-20 cm Thick appear between 1580'-1590'. Clast population ~ 50% diabase, 25% schist, 15% qtzite, remainder granitic frags, shale/slate, uncommon Ls, vein qtz, volcanic rocks.	
				100% (1595)	25%		
1600				100% (1605)	21%	1600'-1650' - Polymictic, poorly-sorted cobble cgl. as above, w/ tan sandy matrix. Subrounded to subang. clasts range up to 22 cm across but most are 5-10 cm in diameter. Matrix is noncalcareous.	
				100% (1615)	5%		
1625				100% (1625)	34%	1615' - Argillized tuff layer ≥5 cm thick. Bedding at 80°. Clasts generally matrix supported, population about 45% diabase, 30% schist, 10% Ls, 10% qtzite, and the remainder granitic/aplite frags, volcanic or hypabyssal rocks, vein qtz, chert. A tuffaceous layer occurs at ~ 1615'.	
				99% (1635)	39%		
				100% (1645)	33%		
1650				100% (1655)	37%	1650'-1700' - Polymictic, poorly sorted and poorly indurated cobble cgl. as above, matrix-supported by gray-tan sands. Matrix weakly calcareous in some zones.	
				99% (1665)	45%	1663' - Bedding laminae in sandy, silty interlayers at 65°. Clasts are subang. to subround., up to 30 cm across altho.	
1675				100% (1675)	44%	most lie in range 5-8 cm. Clast pop. ~ 45% diabase, 15% schist, 15% qtzite, 10% Ls; remainder mix of granitic and hypabyssal rocks, volcanic frags, bull qtz, slate, black chert, and older breccia or conglomerate. Some frags. cut by qtz veins or bleached fracs.	
				100% (1685)	43%		
				100% (1695)	12%	1687' - Slicked surface w/ rake ~ 60° R.	
1700				98% (1705)	41%	1700'-1750' - Polymictic cgl. as above, w/ angular to subrounded clasts ≤ 15 cm across (most 5-8 cm.) in a gray-tan sandy/silty matrix.	
				100% (1715)	28%	1706' - A 3mm-wide specularite vnlt. cuts a bleached qtzite clast.	
1725		Tr. Cu° as blebs + flakes on ab frags.		100% (1725)	33%	Clasts packed more tightly hence cgl. more nearly framework-supported than generally so higher in section. Bedding: indistinct. Clast population ~ 50% diabase, 15% schist, 15% qtzite, 10% Ls, and remainder a varied mix of granitic + hypabyssal rocks, chert, slate, older cgl., shale, altered rocks, bull qtz.	
				100% (1735)	26%		
				99% (1745)	7%		
1750		Tr. Cu°		100% (1755)	56%	1750'-1800' - Poorly sorted, wk. to mod. indurated, polymictic pebble/cobble cgl. in weakly calcareous, tan sandy matrix. Sy + large framework-supported, clasts are subang. to rounded, ranging up to 20 cm across. (Most frags however ≤ 10 cm in diameter.) Bedding indistinct outside of ≥ 10 cm Thick sand/silt interlayer. Clast pop. ~ 50% diabase, 25% Ls, 15% qtzite, 7% schist; remainder = granitic frags, bull qtz, altered rocks (bleached, hornfelsed), jaspereid, epidotitic frags. Schist uncommon below ~ 1760', Ls especially common below ~ 1760'.	
				99% (1765)	45%		
1775		≤ 1%		100% (1775)	38%		
				100% (1785)	43%		
		Tr. Cu°		100% (1795)	42%	1793' - Sandy + silty laminae at 60°	
1800							

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MAGMA COPPER COMPANY

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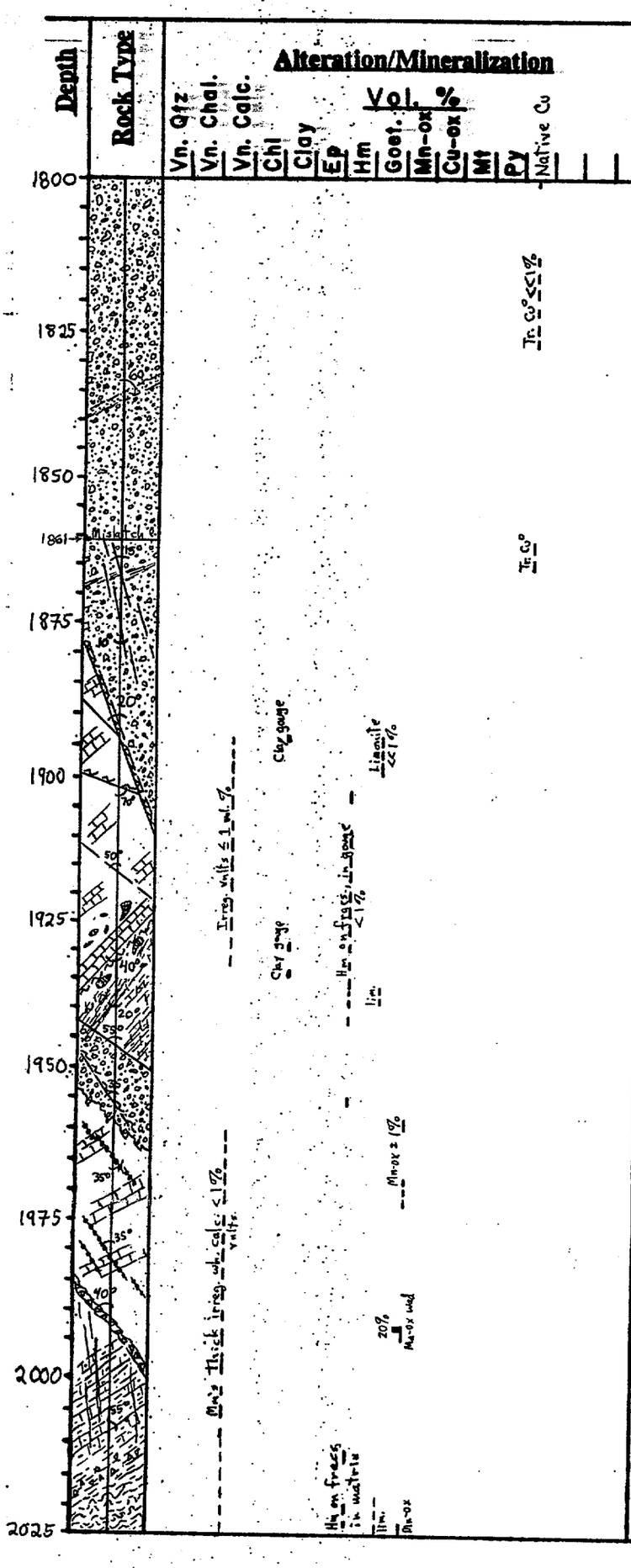
Bearing: ——— **Core Size:** HQ **Logged By:** S.L. Manske

Scale: 1:300



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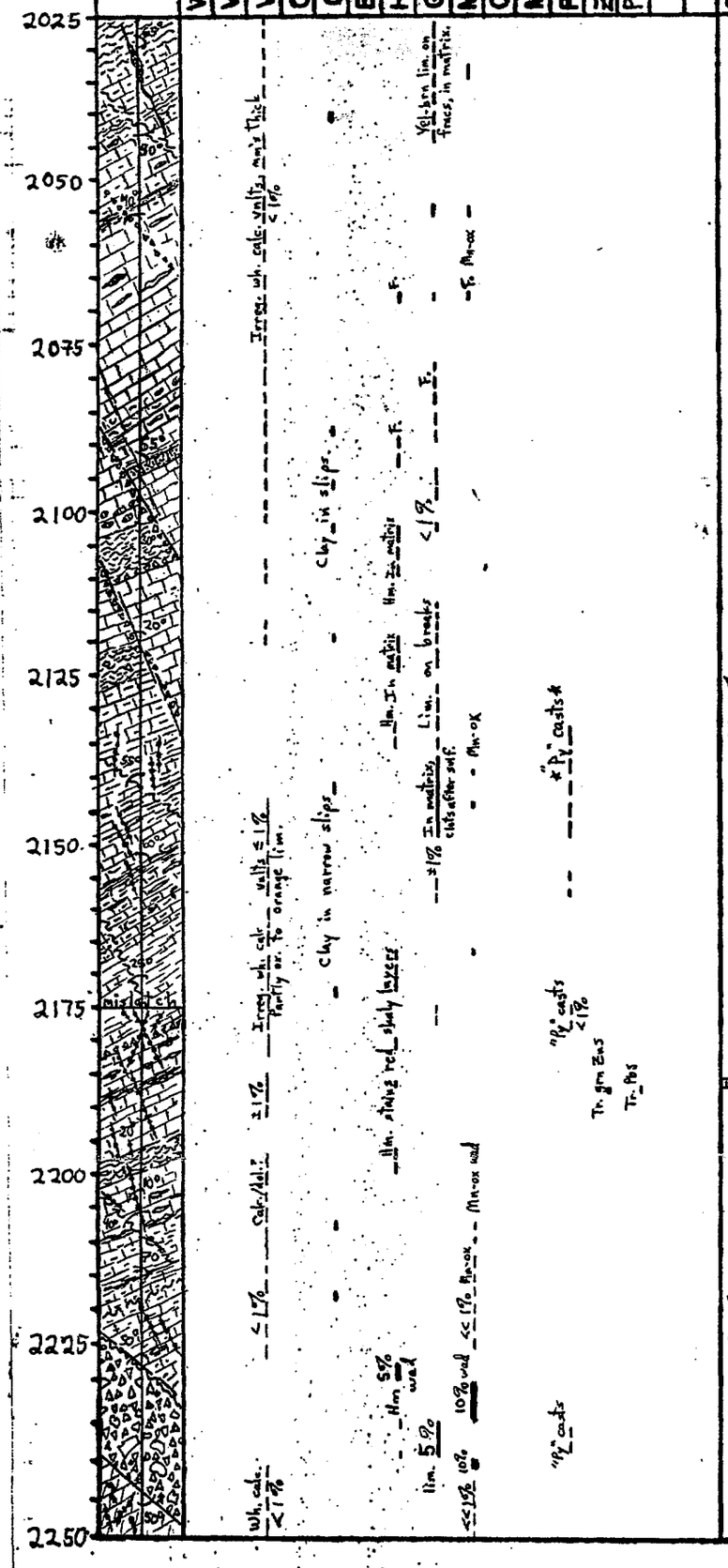

Depth	% Oxidized	% Rec'd	RQD	Comments	Assay Cu, Pb, Zn, Mn / Au, Ag oz/T
2025–2035	100%	100%	39%	2029'- Bedding laminae in limy siltstones. 2033'- Vuggy white calcite breccia zone at ~15°. Limy siltstones/mdstn. → Silty, fine-grained Ls. Lt. gray in color.	<.01, <.01, .12, .25 / .002, .02 oz/T
2035–2045	100%	100%	15%	2041 - Broken zone w/ clay gouge on slips. Some silty zones, a few chert nodules.	.01, .08, .24, .34 / .003, .03 oz/T
2045–2055	100%	92%	27%		<.01, .01, .05, .09 / <.001, .03 oz/T
2055–2065	100%	100%	36%	2057' - Narrow (±1cm) brx. seams healed w/ calcite. Lt. to med.-gray, fine to med.-grained Ls w/ chert ribbons + nodules.	<.01, <.01, .07, .09 / <.001, .02 oz/T
2065–2075	100%	100%	28%	Bedding commonly indistinct.	.03, <.01, .07, .12 / <.001, .02 oz/T
2075–2085	100%	92%	27%	Fossil "trash" in several zones.	<.01, <.01, .02, .0 / <.001, .01 oz/T
2085–2095	100%	97%	14%	2093' - Bedding in sandy Ls. lamina at 65°	<.01, <.01, .07, .0 / <.001, .03 oz/T
2095–2105	100%	92%	13%	2097' Breccia w/ clay gouge at ~30°.	<.01, <.01, .06, .07 / <.001, .03 oz/T
2105–2115	100%	97%	60%	2103'-2111' - Limy "redbed" siltstones w/ contorted bedding, floored by chert breccia.	<.01, <.01, .07, .04 / <.001, .01 oz/T
2115–2125	100%	100%	33%	Lt. gray, fine-grained Ls.	<.01, <.01, .06, .08 / <.001, .01 oz/T
2125–2135	100%	99%	28%	2120' - Rubbly slip at 20°. 2120'-2126' - Dk. brn. gray-gray to dk. purplish, limy siltstones w/ a few Ls. clasts.	<.01, <.01, .02, .06 / <.001, .01 oz/T
2135–2145	100%	100%	33%	2126'-2135' - Lt. bluish gray silty Ls.	<.01, <.01, .06, .12 % / <.001, .01 oz/T
2145–2155	100%	100%	33%	2137 - Sub vert. ox. - sulf. vnlts. 2141' - Clay-filled shear ~3cm thick. 2135'-2150' - Limy siltst. + silty Ls., laminated, w/ fine scour-fill textures, bioturbation. Oxidized to lt. yellow tan color. Fossil trash eg. brachiopods, corals, forams.	<.01, <.01, .04, .09 / <.001, .01 oz/T
2155–2165	100%	97%	61%	2153' - Bedding in limy siltstones. 2150'-2167' - Blue-gray to lt. gray to yellow-tan silty Ls. w/ thin shaly interlayers, some chert nodules/bands. Fossiliferous.	<.01, <.01, .02, .06 / <.001, .01 oz/T
2165–2175	100%	100%	13%		<.01, <.01, .03, .08 / <.001, .01 oz/T
2175–2185	100%	68%	37%	2167'-2183' - Brick-red to yel.-tan to gray limy siltstones. Brecciated at base. 2174' - Clay-filled slip, red-brn, ±2cm thick.	<.01, <.01, .03, .05 / <.001, <.01 oz/T
2185–2195	100%	98%	36%	2177 - Conjugate wh. carb. vnlts, w/ acc. ox. sulfides, at 18° and 27°. 2183'-2210' - Blue-gray to yellowish cherty Ls w/ silty zones and shaly interlayers; forams.	<.01, <.01, .12, .21 / <.001, .01 oz/T
2195–2205	100%	83%	29%	2187' - 1cm Thick wh. calc./dol. vn overprints irreg. green ZnS + PbS vnlt.	<.01, <.01, .06, .0 / <.001, .02 oz/T
2205–2215	100%	96%	37%	Shaly interlayers commonly highly sheared, a mass of slicked surf.	<.01, <.01, .16, .13 / <.001, .01 oz/T
2215–2225	100%	100%	33%	2209' - Shear disrupts dk. carb. - Vn. Fill of Mn-ox, @ 40°. 2210'-2229' - Blue-gy, yel.-tan to reddish limy siltst. + silty Ls. laminated. Mn-ox dendrites; fossil "trash", late wh. carb. vnlts.	.05, <.01, .32, .74 / <.001, .03 oz/T
2225–2235	100%	100%	47%	2215' - Bedding laminae in limy siltstones.	.03, <.01, .21, .42 / <.001, .03 oz/T
2235–2245	100%	98%	28%	2224' - Slip at top of breccia zone; rake of slicks ≅ 0° (subhor.) 2229'-2242' - Breccia highly stained w/ hem, Mn-ox, and goethite,	.06, <.01, .18, .44 / <.001, .02 oz/T
2245–2255	100%	100%	17%	2242'-2259' - Ls is a peculiar olive-drab to yel.-tan mottled color. Soft, fizzes. Recryst.?	.54, <.01, 3.15, 10.4 / <.001, .24 oz/T
2255–2260	100%	100%	58%	2242' - Slip at bottom of breccia zone; rake of slicks = 80° L.	.88, <.01, .74, 1.05 / <.001, .03 oz/T
					.32, .04, 1.97, 7.3 / <.001, .13 oz/T
					.02, .04, .20, 1.25

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MAGMA COPPER COMPANY

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Bearing: — **Core Size:** HQ **Logged By:** S.L. Manske

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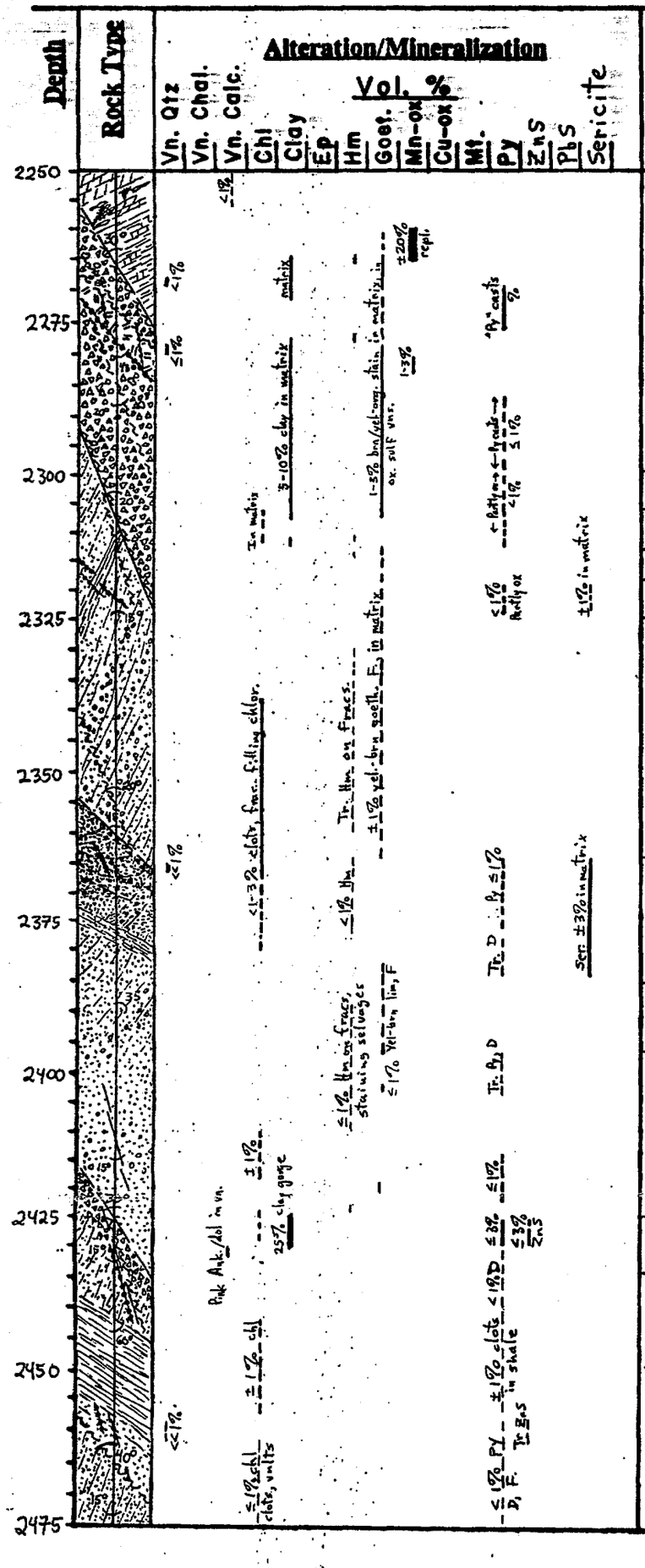


% Oxidized	% Rec'd	RQD	Comments	Assay (Cu, Pb, Zn, Mn / Au, Ag oz/T)
	2253		2250'-2255' - Olive-drab repl./recrystallized Ls.	<.001, .05 oz/T
100%	100%	26%	2255'-2261' - lt. gray Ls, w/ breccia, chert; partly repl. by olive-drab rock.	.02, .01, .10, .06
	2263		2261'-2266' - Yellow-tan limy siltst., 20% flooded/repl. by black Mn-oxides.	<.001, .03 oz/T
			2266'-2307' - Fault breccia, w/a qtz-eye "dp" dike, partly disrupted qtz vein. Frags. mainly siltst. high in section, arkosic towards base. Some chert, but also vein qtz clasts, the latter may encapsulate unox. sulfides. Matrix clayey, by+large highly stained w/ yellow-brn to red Fe-ox; lesser Mn-ox.	.32, .05, 1.21, 8.9
			2266'-Upper contact of wide fault breccia.	<.001, .03 oz/T
100%	100%	33%		.04, .04, .10, .08
	2279		2272'-Shear in breccia @ 35°, slicks rake 25° R; sheared contact w/ dike at 45°	<.001, .01 oz/T
	2283			.03, .06, .10, .18 %
98%	98%	36%		<.001, .03 oz/T
			2285'-Slicked surface in breccia, rake 10° R.	.03, .14, .10, .40 %
	2293			.001, .04 oz/T
99%	99%	8%		.05, .09, .11, .70 %
				.003, .05 oz/T
90%	90%	0%		
80%	99%	0%		.02, .11, .07, .05
				.002, .02 oz/T
	2305			.02, .08, .06, .05
				.001, .01 oz/T
5%	92%	8%	2307'-Base of breccia is slicked plane, rake = 30° R.	.10, .06, .02, .0
			2307'-2631' Arkose, Qtzite. Fine sands to coarse-grained pebbly layers. Laminated bedding in finer-grained zones w/ shaly interlayers; coarser material is cross-bedded in many cases. Unit is brittle, fractured.	<.001, .19 oz/T
10%	2315			
50%	97%	9%	2322'-Goethite veins at 45°, 1-2mm thick.	.03, .04, .04, .03
	2325			<.001, .05 oz/T
	93%	19%	2327 - Bedding laminae in silty Ss/arkose.	.01, .05, .02, .02
	2335			<.001, .08 oz/T
100%	100%	7%	2339'-2380' - Clots and irreg. void fillings of greasy, v. dk forest green chlorite.	.01, .08, .02, .02
	2345			.001, .05 oz/T
	100%	11%		.07, .05, .02, .02
	2355			<.001, .08 oz/T
	100%	0%	2356'-Thin seam filled w/ chlorite/clay @ 20°	.01, .06, .02, .03
			2361'-Slip plane w/ breccia. Slicks rake 70° R.	<.001, .11 oz/T
	2365			
20%	100%	48%	2364'-Core weakly to moderately bleached from this point + felds. appear sericitized.	.12, .02, <.01, .01
	2375			<.001, .04 oz/T
	100%	42%	2379'-X-bedding in arkose at 25° and 60°.	.11, .01, <.01, .01
	2385			<.001, .03 oz/T
95%	100%	33%	2391'-Faint bedding laminae at 35° - Unit becomes poorly sorted, massive to depth.	.07, .01, .01, .01
	2395			<.001, .04 oz/T
	100%	31%		.10, .01, <.01, .02
	2405			<.001, .04 oz/T
75%	98%	14%	2417'-Chlor.-filled slip w/ 2 generations slicks 40° L and 60° R.	.22, .02, <.01, .0
	2415			<.001, .09 oz/T
	99%	5%		.16, .03, .02, .02
				<.001, .08 oz/T
	2425		2426'-Slip at top of flt brx; rake of slicks 75° L.	.04, .56, 2.43, 6.0
5%	100%	17%	2431'-Slip plane at base of brx. @ 15° - subparallel vn. just below, 2-3 cm thick, w/ ZnS, PbS, py, chl. selv.	.003, 1.46 oz/T
	2435			.01, .21, .72, 1.1
				<.001, .23 oz/T
	97%	38%		<.01, <.01, .06, .2
	2445		2441'-Contact of dk. grn shale w/ x-bedded sands.	<.001, .02 oz/T
	98%	61%		<.01, <.01, .04, .26
	2455			<.001, .02 oz/T
0%	100%	37%	2460'-Mm's-thick milky qtz vnlts w/ py ± ZnS.	<.01, <.01, .01, .2
	2465		2465'-Clay-filled slip @ 40°	<.001, .01 oz/T
	100%	71%	2467'-Laminated arkose layers at 15°.	<.01, <.01, <.01, .12
	2475			<.001, .01 oz/T

Yellowish-grn ZnS overgrown by black ZnS in vein. Late pinkish ank./dol. carb.

F = frac. controlled
D = disseminated
tr. = trace
acc. = accessory

MAGMA COPPER COMPANY

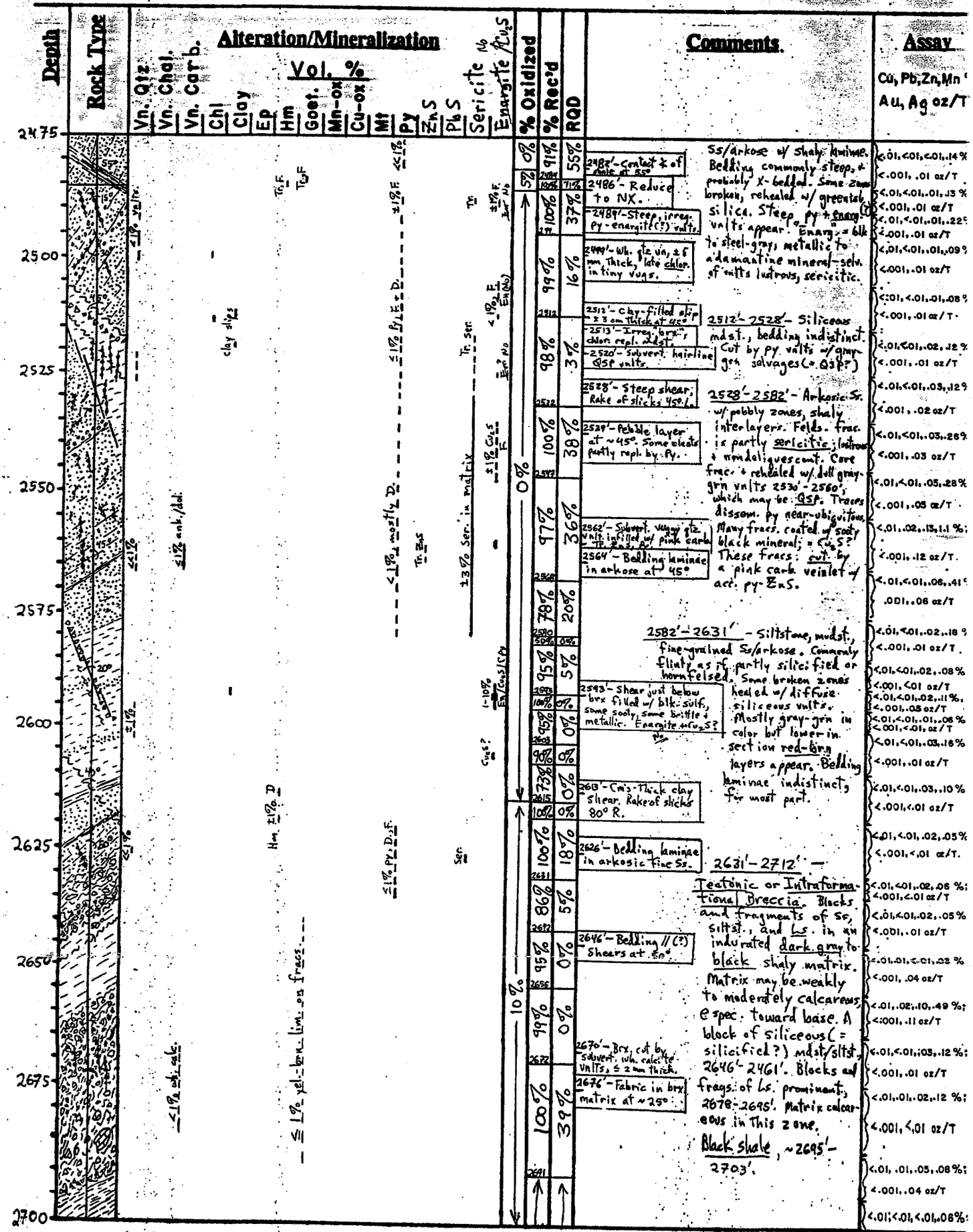
Division: _____ **Drill Hole:** MB-12 **Location:** _____

Coordinates: _____ **Collar Elev:** _____ **Total Depth:** _____

Date Collared: _____ **Completed:** _____ **Angle:** -90°

Bearing: — **Core Size:** HQ/NX **Logged By:** S. L. Manske

Scale: 1:300



F = frac. controlled
D = disseminated
tr. = trace
acc. = accessory

MAGMA COPPER COMPANY

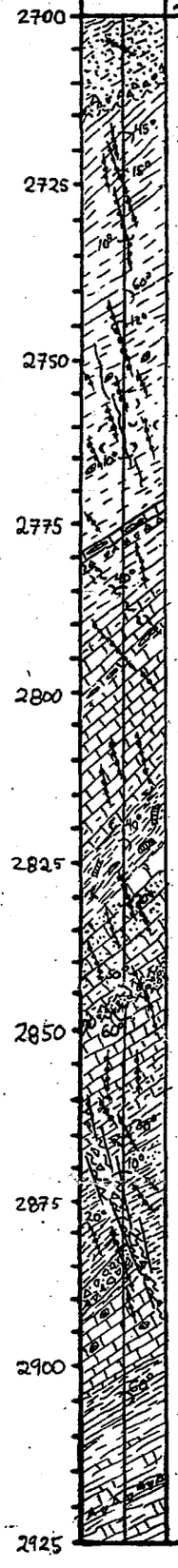
Division: _____ **Drill Hole:** MB-12 **Location:** _____

Coordinates: _____ **Collar Elev:** _____ **Total Depth:** _____

Date Collared: _____ **Completed:** _____ **Angle:** -90°

Bearing: ——— **Core Size:** NX **Logged By:** S.L. Manske

Scale: 1:300



Depth	Alteration/Mineralization (Vol. %)	% Oxidized	% Rec'd	RQD	Comments	Assay (Cu, Pb, Zn, Mn; Au, Ag oz/T)
2700	Vn. Qtz; Vn. Chal.; Vn. Carb.; Chl; Clay; Ep; Hm; Goet.; Mn-ox; Cu-ox; Mt; Py; Talc					
	Py: ±1%; F, D.	← 0% →	100%	62%	2701-2712' - Fine-grained limy. Ss. Pyritic; brx at base.	<.001, <.01 oz/T; .01, .01, .01, .09 %
	Hm: ≤1% on brecciated matrix.				2712'-2789' - Limy shale and siltstone. Medium-gray to mottled gray-green to black in color. Fossiliferous from ~2750', w/ fusulinids and brachs. Some narrow zones of intraformational brx. A ribbon of cherty Ls. at ~2779'.	<.001, <.01 oz/T
2725	≤1% calc./dol.				2717 - Bedding laminae @ 45°.	<.01, <.01, .01, .05 %
	Py casts				2723'-2731' - Calcite/dolomite (?) vns., steep, 0.5-1.5 cm thick. Some partly weathered to "orange lim."	<.001, <.01 oz/T
			100%	53%		<.01, <.01, .01, .07 %
						<.001, <.01 oz/T
			95%	66%	2742' - Bedding laminae @ ca. 60°.	<.01, <.01, .01, .03 %
						<.001, <.01 oz/T
2750	≤1% wh. calcite					<.01, <.01, .01, .04 %
						<.001, <.01 oz/T
	<<1% lim. F.		97%	71%	2763' - Undulating slip surface @ ~10°, w/ rake of slicks 60° R.	<.01, <.01, .01, .05 %
						<.001, <.01 oz/T
						<.01, <.01, .02, .05 %
						<.001, .09 oz/T
2775						<.01, <.01, .04, .04 %
						<.001, .02 oz/T
	<1% D.	50%	95%	31%	2789'-2817' - Medium blue-gray fine- to medium-grained Ls. w/ a few chert layers. Silty at top + bottom. Dk. gray talc spot or tale-chlor. alt., 2799'-2812'.	<.01, <.01, .01, .06 %
						<.001, <.01 oz/T
2800	<1% lim. F.					<.01, <.01, <.01, .10 %
						<.001, .02 oz/T
		90%	100%	60%		<.01, <.01, .01, .08 %
						<.001, .02 oz/T
					2817'-2829' - Dk. gray to blk. limy shale or shaly Lr. V. fossiliferous, w/ brachs, crinoid columns abundant.	<.01, <.01, .02, .04 %
						<.001, .01 oz/T
2825	Py casts				2824' - Bedding in fossiliferous, calcareous black shale.	
		50%	90%	47%	2829'-2846' - Gray-grn to dk. gray to brownish silty/sandy Ls. or calcareous Ss/sltst.	<.01, <.01, .02, .04 %
						<.001, <.01 oz/T
						<.01, <.01, .03, .03 %
						<.001, <.01 oz/T
		90%	100%	50%	2846' - Thin pebble dike bounded by slips above & below. Frags. of sch., diabase, vn. qtz., qtz-eye porph., volc. rx., etc.	<.01, <.01, .03, .06 %
					2846'-2847.5' - A polymictic cgl. or pebble dike. Sheared margins; pyritic.	<.001, .01 oz/T
2850	±1% D.					<.01, <.01, .02, .12 %
					2847.5'-2860' - Lt. gray medium-grained stylolitic Ls, grading downward into silty Ls./limy sltst.	<.001, <.01 oz/T
		95%	100%	45%	2854' - Compound blue-gy to wh. calcite vn., 5 cm thick.	<.01, <.01, .03, .04 %
						<.001, <.01 oz/T
					2860'-2880' - Limy siltsts, fault. Sandy zones in wall rocks.	<.01, <.01, .03, .07 %
2875	Lim. cast				2874' - Upper contact of steep shear. Slicks rake 10° R.	<.001, <.01 oz/T
		80%	96%	29%	2880'-2882' - Polymictic cgl or pebble dike at 40°. Frags of sch., diabase, qtzite, Ls, and qtz-eye porph.	<.01, <.01, .02, .05 %
						<.001, <.01 oz/T
	≤1% partly ox.					<.01, <.01, <.01, .06 %
					2882'-2885' - Limy shale.	<.001, <.01 oz/T
					2885'-2903' - Lt. gray, med.-grained Ls. Fossiliferous, stylolitic.	<.01, <.01, .02, .06 %
2900	Tr. Hm. F.; Tr. lim. F.	100%	99%	38%		<.001, <.01, oz/T
					2903'-2930' - Lt. gray to red-brn to dk.-gray-grn limy siltst./shale. Some rounded inclusions of lighter colored Ls. a few cm's across. Some intraformational brx., also.	<.01, <.01, .02, .08 %
					2905' - Bedding laminae in limy sltst./shale.	<.001, <.01 oz/T
	≤1%					<.01, <.01, <.01, .04 %
						<.001, <.01 oz/T
2925		50%	99%	64%		

F = frac. controlled
D = disseminated

tr. = trace
acc. = accessory

MAGMA COPPER COMPA[NY]

Division: ______ **Drill Hole:** ______ **Location:** ______

Coordinates: ______ **Collar Elev:** ______ **Total Depth:** ______

Date Collared: ______ **Completed:** ______ **Angle:** -90°

Bearing: ______ **Core Size:** NX **Logged By:** S. L. Manske

Scale: 1:300

Depth | **Rock Type** | **Alteration/Mineralization** (Vol. %: Vn. Qtz, Vn. Chal., Vn. Calc., Chl, Clay, Ep, Hm, Goet., Mn-ox, Cu-ox, Mt, Py, Talc) | **% Oxidized** | **% Rec'd** | **RQD** | **Comments** | **Assay** (Cu, Pb, Zn, Mn %; Au, Ag oz/T)

Depth marks: 2925, 2950, 2975, 3000, 3025, 3050, 3075, 3100, 3125, 3150

Alteration/Mineralization:

- Vn. Calc.: <1% (2925–2950); ±1% wh. calc. vnlts. (2950–3000); Mn's-thick irreg. wh. calc. vnlts. ≤1% (3025–3075); Irreg. wh. calcite vnlts <1% (3075–3125)
- Hm: Tr. Hm, F (3075–3100)
- Goet.: <1% lim. F (2925–2950); <1% lim. F (2975–3000); <1% lim. F (3025–3075); Lim, F ≤1% (3075–3110); Lim, F <1% (3125–3150)
- Py: Tr. py, D (2950–2975); Tr. py, D (3050–3075)
- Talc: 1-3% (2995–3000)

% Oxidized / % Rec'd / RQD:

Interval	% Oxidized	% Rec'd	RQD
2925–2932	↓	↓	↓
2932–2953	100%	100%	45%
2953–2974	10%	100%	45%
2974–2995	100%	100%	63%
2995–3015	100%	100%	48%
3015–3035	100%	97%	49%
3035–3055	100%	100%	28%
3055–3075	5%	96%	48%
3075–3095	100%	100%	45%
3095–3115	100%	100%	50%
3115–3136	100%	100%	29%
3136–3150	100%	100%	27%

Comments:

2930'–2953' – Light- to dk. gray fine- to med.-grained sparry Ls. Bedding indistinct, massive.

2953' – Bedding laminae in dk gray limy shale at ~60°.

2955'–2975' – Intercalated dk. gray, greenish, to black calcareous shales and some Ls. Some fragmental texture.

2958' – Mm's-thick wh. calcite vnlt. at 10°.

2969-2975' – Ovoid patches of lt. gray Ls. in shaly matrix, ± 1cm across.

2975'–2999' – Dk. greenish brn. to dk. gray-grn argillaceous Ls. and limy siltst./shale. Bedding indistinct, some fragmental texture.

2999'–3035' – Dk. blue-gy, massive, micritic or fine-grained sparry Ls. Stylolitic. Bedding indistinct. Some talcose alteration. A few shaly interlayers.

3000' – Some reddish brn alt. mineral w/ talc. Idocrase?

3036'–3039' – Intraformational brx. w/ olive-drab calcareous matrix.

3039'–3049' – Dk. gray silty Ls.

3043' – Bedding laminae in silty Ls./limy sltst. at 55°.

3049'–3065' – Blue-gy to dk. gray stylolitic micrite or fine-grained sparite. Massive; bedding indistinct.

3065' – Bedding laminae at 55°.

3065'–3077' – Limy black shales w/ a few cm's-thick tuffaceous or volcaniclastic layers.

3068' – Small slip at 20°

3077'–3117' – Greenish to blue-gray fine-grained sparite w/ cherty layers. Fossiliferous, bedding indistinct.

3084' – A slip surface w/ 1-2 cm of brx. Slicks rake 30° L.

3095' – Lim.-stained shear, 5-8 cm. thick, // to bedding (?)

3115' – Silty laminae appear ~ flat (90°)

3117'–3224' – Transition into cherty, fossiliferous med.-gray Ls., fine to med.-grained sparites. Silty zones.

3148' – Shaly laminae at 45°.

Assay:

- <.01,<.01,.02,.05 %; <.001,<.01 oz/T
- <.01,<.01,.02,.06 %; <.001,<.01 oz/T
- 2950
- <.01,<.01,.01,.05 %; <.001,<.01 oz/T
- <.01,<.01,.04,.06 %; <.001,<.01 oz/T
- <.01,.01,.04,.05 %; <.001,<.01 oz/T
- <.01,<.01,.03,.05 %; <.001,<.01 oz/T
- <.01,<.01,.04,.06 %; <.001,<.01 oz/T
- <.01,<.01,.02,.06 %; <.001,<.01 oz/T
- <.01,<.01,.01,.03 %; <.001,<.01 oz/T
- <.01,<.01,.04,.04 %; <.001,<.01 oz/T
- 3025
- <.01,<.01,.02,.04 %; <.001,<.01 oz/T
- <.01,<.01,.09,.04 %; <.001,<.01 oz/T
- <.01,<.01,.05,.05 %; <.001,<.01 oz/T
- <.01,.01,.02,.06 %; <.001,<.01 oz/T
- <.01,<.01,.05,.06 %; <.001,<.01 oz/T
- <.01,.01,.08,.10 %; <.001,<.01 oz/T
- <.01,<.01,.03,.09 %; <.001,<.01 oz/T
- <.01,.01,.03,.09 %; <.001,<.01 oz/T
- <.01,.01,.01,.07 %; <.001,<.01 oz/T
- <.01,.01,.02,.09 %; <.001,.01 oz/T
- 3125
- <.01,.01,.02,.08 %; <.001,<.01 oz/T
- <.01,<.01,.02,.05 %; <.001,<.01 oz/T
- <.01,.01,.06,.08 %;

F = frac. controlled tr. = trace
D = disseminated acc. = accessory

MAGMA COPPER COMPA Y

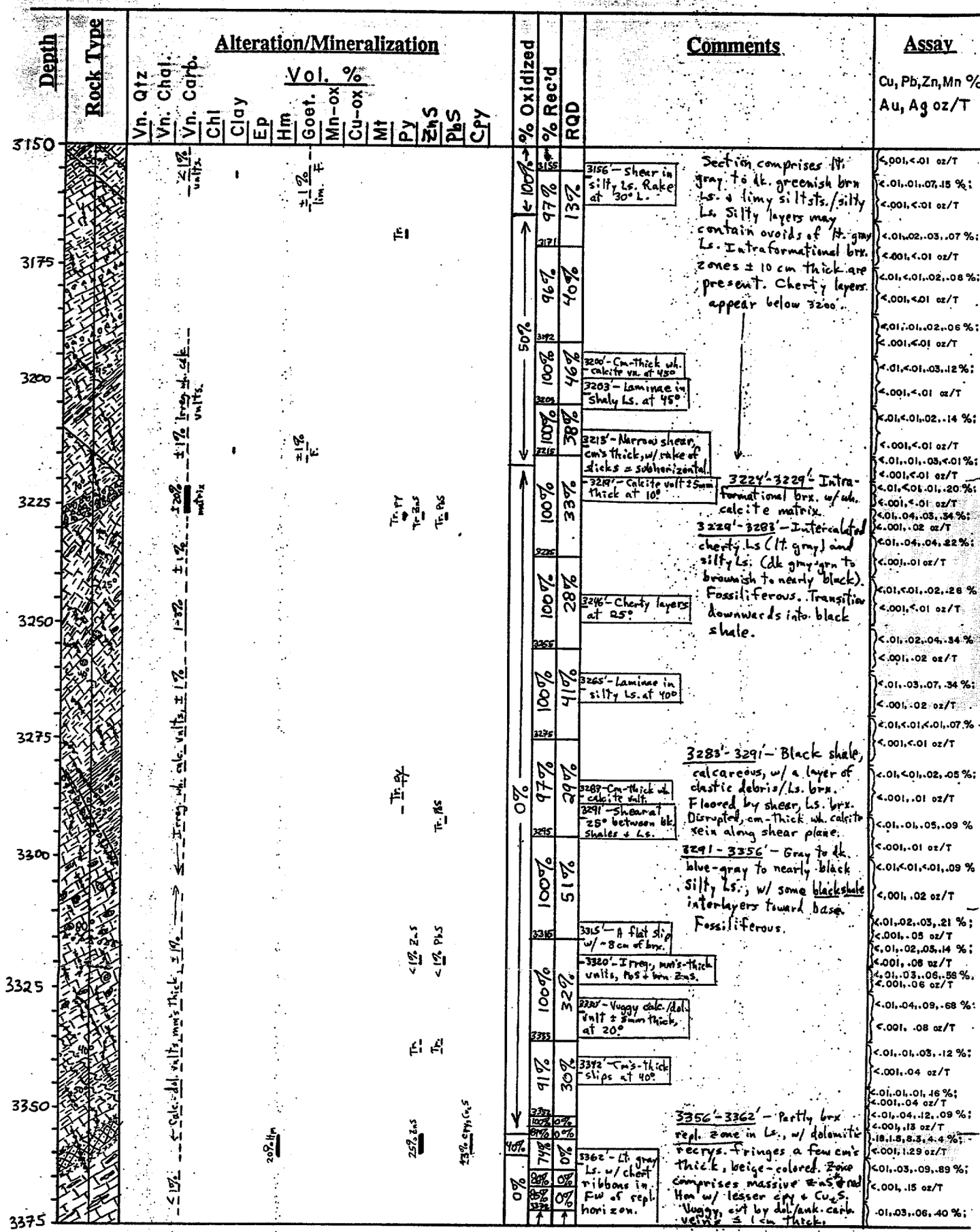
Division: _____ **Drill Hole:** MB-12 **Location:** _____

Coordinates: _____ **Collar Elev:** _____ **Total Depth:** _____

Date Collared: _____ **Completed:** _____ **Angle:** -90°

Bearing: — **Core Size:** NX **Logged By:** S.L. Manske

Scale: 1:300



MAGMA COPPER COMPA. I

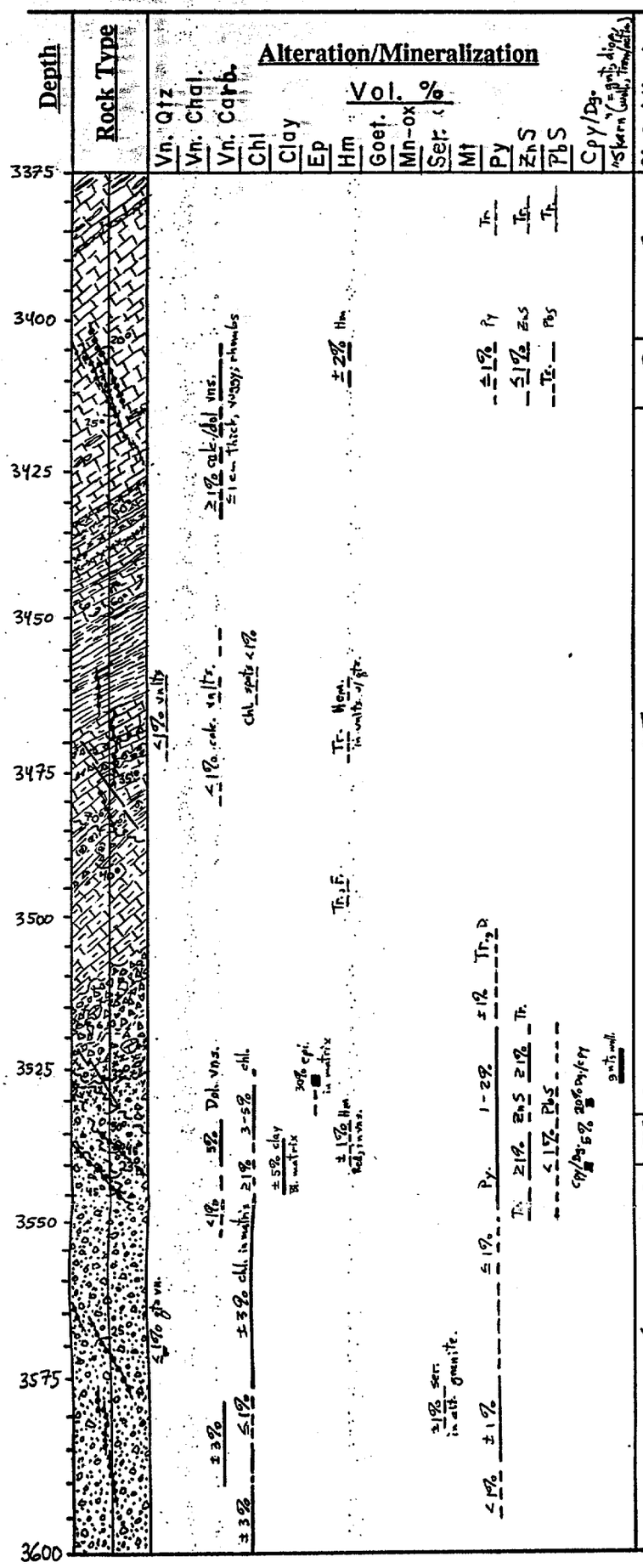
Division: _____ **Drill Hole:** MB-12 **Location:** _____

Coordinates: _____ **Collar Elev:** _____ **Total Depth:** _____

Date Collared: _____ **Completed:** _____ **Angle:** -90°

Bearing: — **Core Size:** NX **Logged By:** S.L. Manske

Scale: 1:300



Comments

Ls. commonly mottled (Pb hammer's "nodular" texture). Chert ribbons fairly common.

3385'-130 cm of repl. texture, beige dolomite. Qtz in vugs; Traces sulfides

3407'-1-2cm thick Py-Hm vn w/ yellowish recrys. selvages.

3413'-Cm's-Thick dol./py/ZnS vn. w/ beige recrys. selv.

3431'-3440'-Ls is pale, partly beige + recrys. (?) in this interval). Traces Py, ZnS, PbS.

3434'-Bedding laminae in silty, siliceous Ls. at 60°. Some beige colored repl. (?) texture.

3440'-Mottled, nodular Ls. Transitional into dk. greenish, weakly calcareous siltst./shale at ~3449'.

3449'-Bedding laminae in siltst. at 60°

3449'-3466'-Green shale w/ a few Ls. nodules.

3466'-3510'-Mottled, nodular Ls. w/ silty zones. Transitional into Ls. breccia at base. Cherty layers.

3471'-Red Chert Brx.

3477'-Narrow, clayey shear at 35°. Slicks rake 75° R.

3491'-Bedding laminae in silty Ls./limy siltst. at 40°

3510'-3526'-Ls. brx., w/ frags. of Ls. + dk. grn siltst. in silty matrix. At ~3522', metasomatized: garnet, wollastonite (?) or trem./actin. appear in matrix (± pyx?). Clast of Ls repl. by sulfides. Transitional into polymictic cgl. w/ qtz, sch., porphyry frags., much chlor. + epidote.

3529'-Shear zone w/ multiple slip planes. Main slip has unctuous green clay gouge; rakes of slicks oblique to sub-horizontal. Steeper slip has slicks rake 70° R.

3534'-Steep clayey shear, slicks rake 70°

3541'-3 cm Thick sulfide vn. w/ much chlor, sheared, HW slicks rake 65° L. Hematitic FW. Contains Py, ZnS, PbS, Cu_2S, cpy.

3571'-A 1cm-thick qtz-carb-sulf vn. w/ py, ZnS, PbS. No selvages.

3580'-A subvert. 4cm thick, vugsy dolomite vn.

3526'-3784'-Polymictic cgl. (prob. Kvs) w/ subrounded to ang. pebbles + cobbles of qtzite, sch., diabase, granite porph., Ls, and blk. shale in a sandy, chloritic matrix. Local bleaching = clays or sericite. Bl. matrix is deliquescent. Soft feldspars in granite cobbles are silky + lustrous.

Assay

Cu, Pb, Zn, Mn %
Au, Ag oz/T

<.001, .06 oz/T
<.01, .04, .08, .64 %;
<.001, .08 oz/T
<.01, .03, .08, .88 %;
<.001, .08 oz/T
<.01, .03, .07, .86 %;
<.001, .08 oz/T
.02, .03, .13, .88 %;
<.001, .55 oz/T
<.01, .02, .03, .20 %;
<.001, .05 oz/T
<.01, .05, .08, .52 %;
<.001, .11 oz/T
<.01, .03, .07, .61 %;
<.001, .05 oz/T
<.01, .01, .01, .46 %;
<.001, .04 oz/T
<.01, .02, .05, .10 %;
<.001, .04 oz/T
<.01, <.01, .01, .08 %;
<.001, .02 oz/T
<.01, .03, .06, .33 %;
<.001, .04 oz/T
<.01, .07, .10, .85 %;
<.001, .04 oz/T
<.01, .03, .03, .31 %;
.01, .02 oz/T
<.01, <.01, .01, .07 %;
<.001, .04 oz/T
<.01, .01, .01, .11 %;
<.001, .03 oz/T
.01, .56, .88, 4.2 %;
.01, .28 oz/T
.04, 4.1, 5.3, 2.6 %;
.02, .47 oz/T
.15, 4.2, 9.9, 3.7 %;
.01, 1.25 oz/T
.03, 1.7, 2.8, 3.5 %;
<.001, .29 oz/T
.07, 8.8, 5.7, 1.8 %;
.003, 1.1 oz/T
.08, 1.1, 1.4, .92 %;
.001, .24 oz/T
.01, .26, .18, .72 %;
<.001, .11 oz/T
<.01, .11, .10, .60 %;
<.001, .03 oz/T
<.01, .09, .14, .44 %;
<.001, .04 oz/T
<.01, .03, .05, .62 %;
<.001, .04 oz/T
<.01, .02, .03, .31 %;
<.001, <.01 oz/T

F = frac. controlled
D = disseminated

tr. = trace
acc. = accessory

MAGMA COPPER COMPA[NY]

Division: ______ **Drill Hole:** MB-12 **Location:** ______

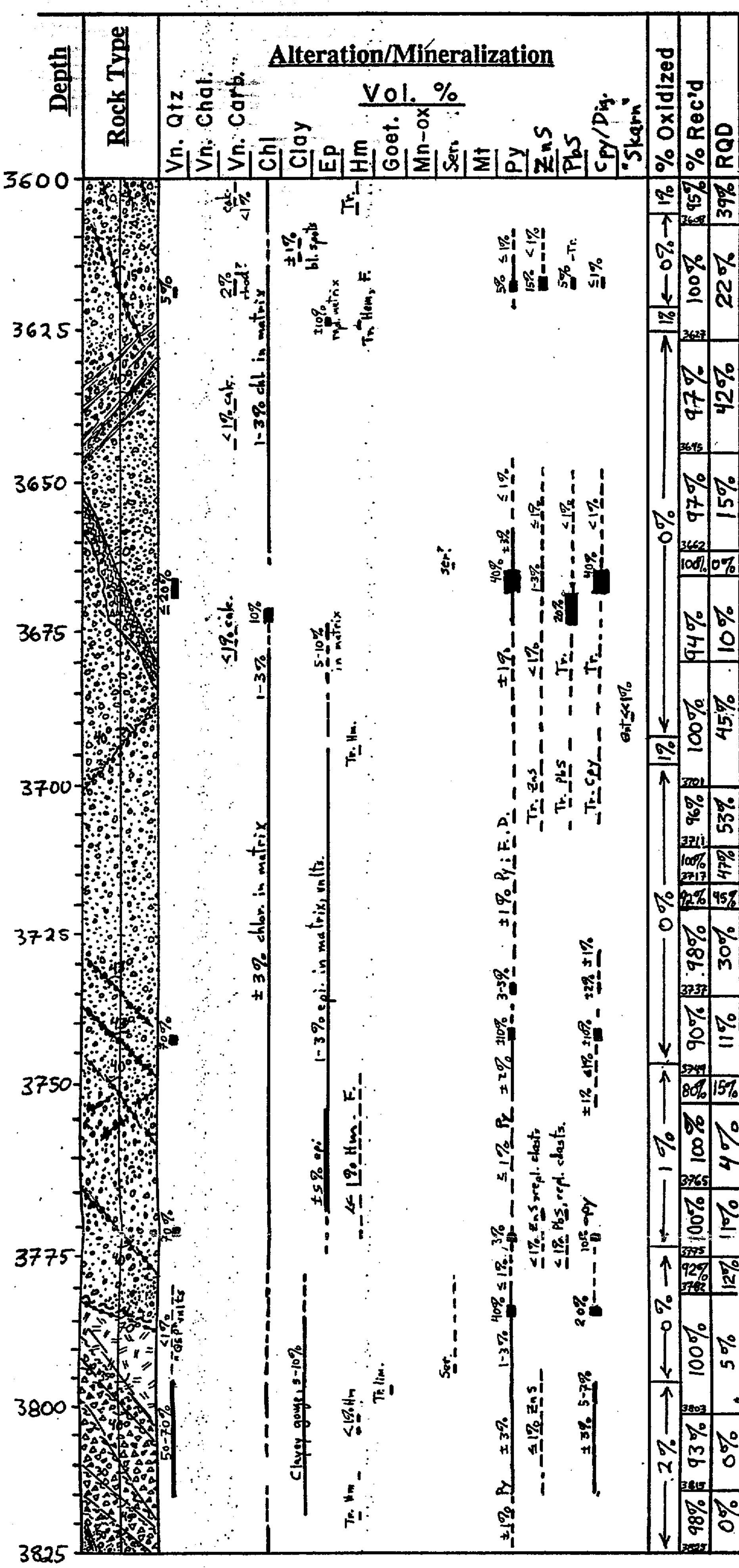
Coordinates: ______ **Collar Elev:** ______ **Total Depth:** 4008'

Date Collared: ______ **Completed:** 7/18/92 **Angle:** -90°

Bearing: ______ **Core Size:** ______ **Logged By:** S.L. Manske

Scale: 1:300

Depth | Rock Type | Alteration/Mineralization (Vol. %): Vn. Qtz, Vn. Chal., Vn. Carb., Chl, Clay, Ep, Hm, Goet., Mn-ox, Ser., Mt, Py, ZnS, PbS, Cpy/Dig., "Skarn" | % Oxidized | % Rec'd | RQD



Comments

3617'-3619' - A 5-7cm thick qtz-sulf vein at 15°. Amber ZnS, py, PbS. Euhedral purplish qtz in late vugs.

3630'-3645' - Silty layers intercalated w/ gravels provide facing directions for bedding. Section is over-turned.

3637' - Overturned bedding @ 40°, cgl. loadcasts in shale.

3666.5'-3675' - Qtz-sulfide Vein. HW contact at 20°, FW Brx @ ~50°. HW side dominated by Py-Cpy, FW side mostly PbS±ZnS. HW selvage bl. (argillic? ser.?) FW is epidotitic.
- Sulfides in FW rocks partly repl. Ls pebbles. Traces of silvery-gray sulfide present w/ a bronzy cast: = tetrahedrite?

3675 - Ls clasts in FW rimmed &/or repl. by chlor., sulfides, calc-silicates

3686' - A qtz-lined vug.

3689 - A rimmed Ls. clast w/ tiny yel-brn garnets, sulfides.

3694' - Overturned bedding in ss/cgl. at 40°

3675-3775' - Polymictic cgl. w/ angular to sub rounded pebbles + small cobbles of qtzite, sch., diabase, granitic or hypabyssal rocks, and Ls. Ls. frags. v. commonly are bleached, marbleized, and rimmed or partly replaced in concentric zones w/ calc-silicates and/or sulfides. A few sandy interlayers appear in cgl. Bedding appears upside-down.

3735' - ±2cm-Thick py ± cpy vn. w/ some red Hm.

3743' - A 15-20cm thick qtz-py-cpy vn. Greenish siliceous selv.; no bleaching.

3752' - A pyrite vein ±2cm thick. No discernible selvage.

3775'-3841' - Polymictic Cgl., sheared, altered, and mineralized over much of this interval. In fault contact at base w/ diabase. A major fault/vein zone from ca. 3785' to 3842'. Seds. on HW are bleached pale greenish (argillic, sericitic) and partly silicified in contact w/ 18"-thick massive sulfide vein. A bleached dike is present, w/ scattered qtz eyes + plentiful mm-sized chalky felds. phenos. Bleaching = mostly clay - deliquescent in main part, but some ser. "sheen" evident. 3796'-3817' = brecciated qtz-sulf. vn.

3771' - 8-10cm-thick qtz-cpy vn. at 40°

3789' - A 3cm-thick shear w/ sticky wh. clay gouge.

3795' - Shear at 35°. Rake of slicks 40° L. *traces bornite at 3798' *

Assay

Cu, Pb, Zn, Mn %
Au, Ag oz/T

<.01, .01, .02, .20 %; <.001, .02 oz/T
.02, .81, 1.58, .52 %; .001, .11 oz/T
.10, 2.1, 7.0, .40 %; .003, .55 oz/T
.02, 1.3, 2.9, .64 %; .01, .22 oz/T
<.01, .06, .06, .56 %; <.001, .01 oz/T
<.01, .03, .03, .26 %; <.001, .02 oz/T
.07, 3.0, 4.5, .90 %; .02, 1.6 oz/T
.08, 3.0, 4.5, .92 %; .02, 1.3 oz/T
.64, 2.8, 4.1, .77 %; .01, 1.9 oz/T
.48, 1.9, 2.5, .30 %; .01, 1.5 oz/T
2.7, 4.9, 7.0, .17 %; .01, 2.1 oz/T
.27, 9.5, 16.1, 1.2 %; .03, 6.0 oz/T
.08, .09, 1.6, 2.0 %; .01, .79 oz/T
.03, .60, .96, 2.8 %; .003, .44 oz/T
.02, .20, .27, .84 %; .003, .38 oz/T
.02, .13, .22, .83 %; .004, .35 oz/T
.03, .13, .20, .84 %; .01, .47 oz/T
.06, .02, .07, .72 %; .003, .21 oz/T
.28, .11, .28, .72 %; <.001, .82 oz/T
.84, .14, .29, .86 %; <.001, 1.0 oz/T
.12, .13, .21, .87 %; .002, .41 oz/T
.06, .12, .21, .81 %; .001, .18 oz/T
.03, .16, .26, .83 %; .001, .16 oz/T
1.2, .26, .58, .68 %; .01, 1.6 oz/T
.12, .04, .10, .24 %; .003, .20 oz/T
6.9, .13, .90, .11 %; .01, .88 oz/T
.14, .06, .04, .17 %; <.001, .17 oz/T
5.1, .55, 2.1, .09 %; .005, 7.9 oz/T
.95, .32, 2.0, 2.2 %; .01, 1.5 oz/T
.18, .65, 1.4, 2.0 %; .01, .70 oz/T
.05, .07, .41, .72 %;

F = frac. controlled tr. = trace
D = disseminated acc. = accessory

MAGMA COPPER COMPANY

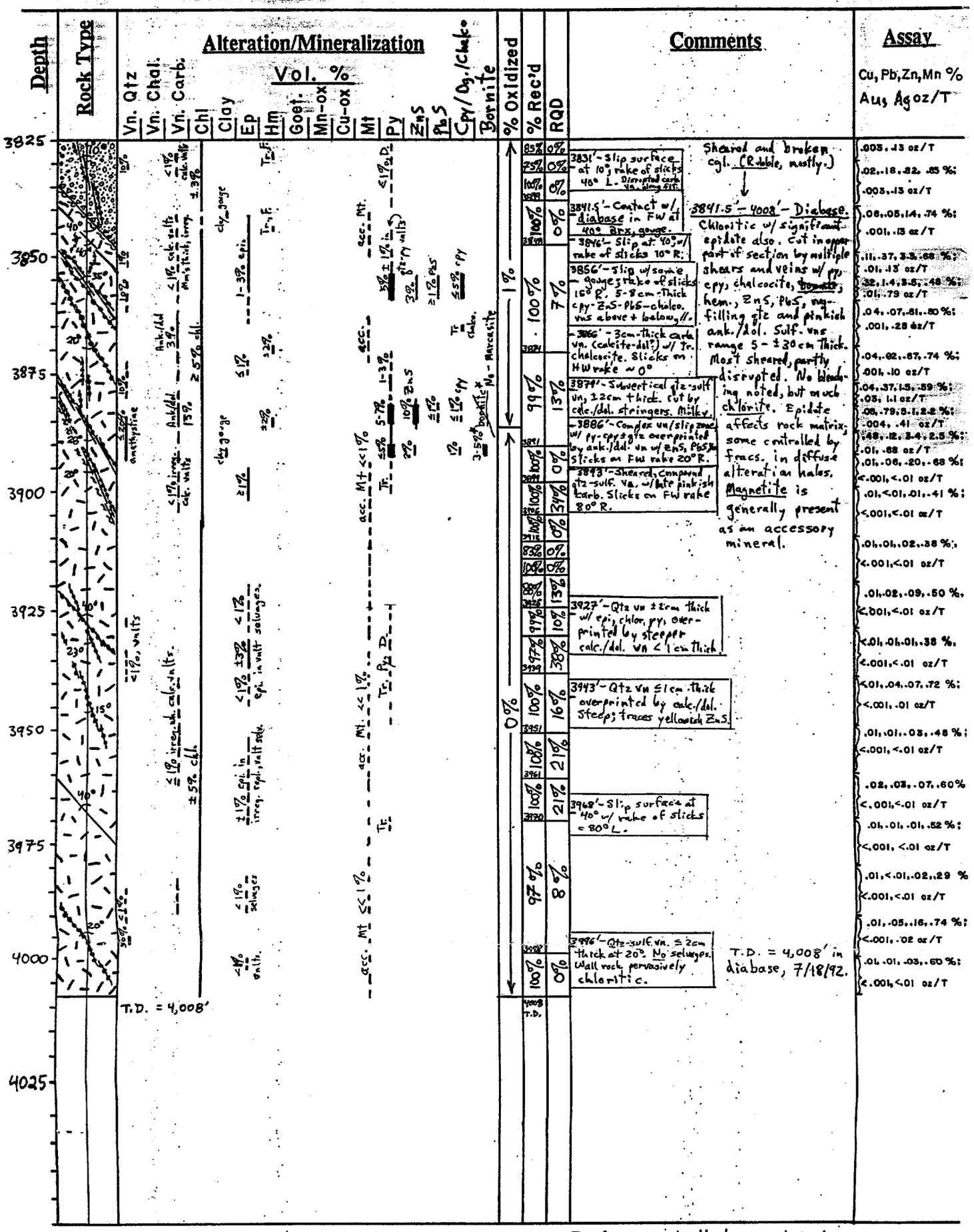
Division: _____ **Drill Hole:** MB-12 **Location:** _____

Coordinates: _____ **Collar Elev:** _____ **Total Depth:** 4,008'

Date Collared: _____ **Completed:** 7/18/92 **Angle:** -90°

Bearing: — **Core Size:** HQ/NX **Logged By:** S. L. Manske

Scale: 1:300 **Page** 18 **of** 18



F = frac. controlled
D = disseminated
tr. = trace
acc. = accessory

MAGMA COPPER COMPAI

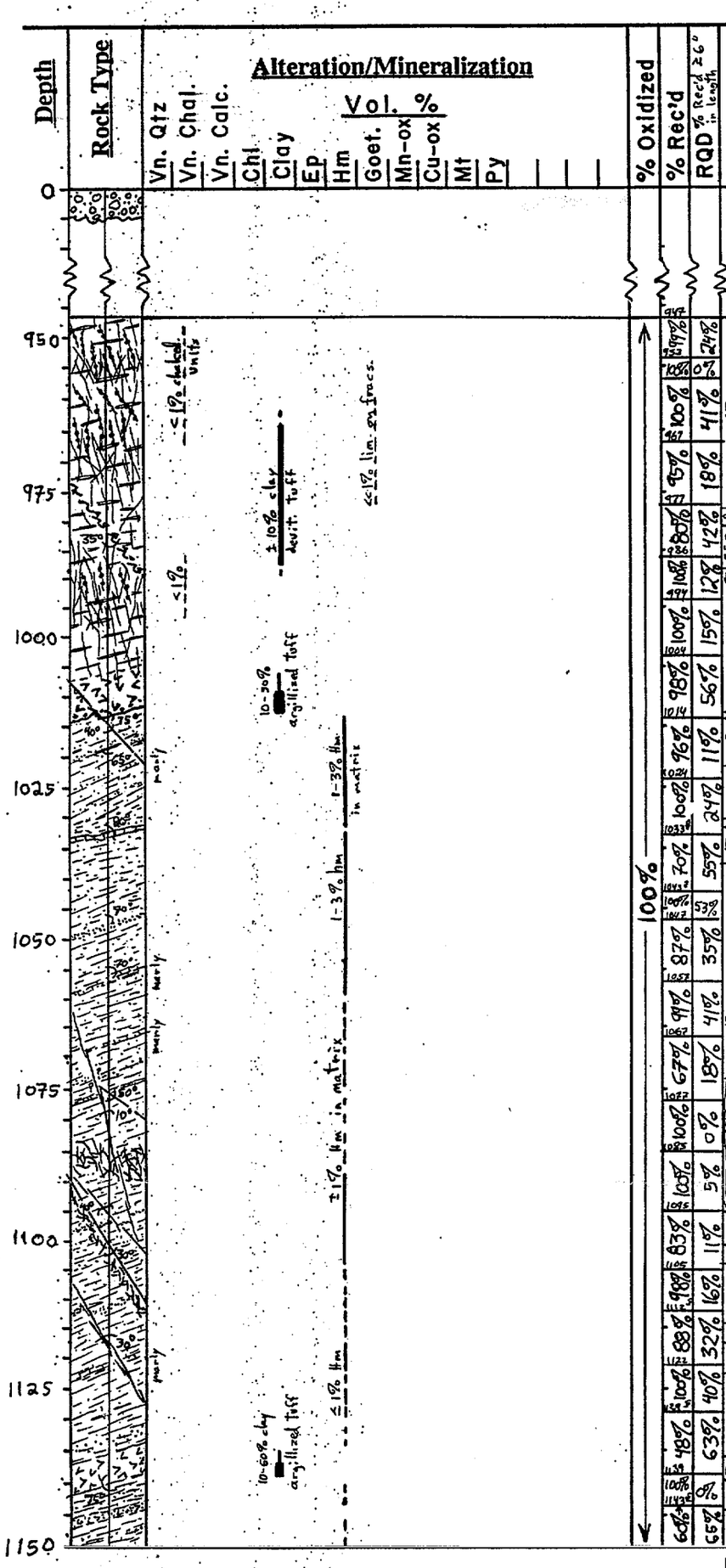
Division: SUPERIOR **Drill Hole:** MB-12A **Location:**

Coordinates: 96749.3N, 15548.9E **Collar Elev:** 4,105' **Total Depth:** 3,527'

Date Collared: 6/17/93 **Completed:** 9/14/93 **Angle:** -80° (nominal)

Bearing: S5W (nominal) **Core Size:** HQ **Logged By:** SLM

Scale: 1:300



Comments

0'-~5'- Rubble, 'dozer fill

5'-947'- Moderately to strongly welded, dacite tuff. No core saved

947-1,013.5'- Welded Tuff/Vitrophyre. Black, glassy, w/ acc. felds. phenos by ~950'. Much of section devitrified + punky, bleached, argillic; (especially 961'-990') along fracs + shears. About 7' of unwelded, v. argillic ash right at base. Bio is a prominent acc. in bleached vitrophyre or unwelded zones. Core in general highly fractured by breaks 0°-30° to axis; many fracs partly healed w/ chalcedony. Steep fracs. near 970' have subhorizontal slicks.

Bleached

981'- A clay-filled shear at 35° to core in devitrified tuff.

1,013.5'-1,816' - Whitetail "Gl". Contact at 75° to core axis. Section in upper part comprises silty, marly, and sandy lacustrine sediments; laminated, heavily stained brick-red by hematite. Delicate cross-bedding in some zones, as well as some soft-sediment deformation, scours. Intensity of hematite stain diminishes w/ depth, especially below 1100'. Tuff beds, sandy zones appear below ~1125'. Much of core to 1150' only weakly indurated and fractured areas are a confused welter of slicked, curved surfaces at all orientations. Section turns Sandy ca. 1190'; pebbles + cobbles begin to appear ca. 1265'. Subjacent unit to unconformity at ~1816' is Naco Ls.

1014'- Slicked surface at 90°, rake 75° R.

1032.5'- A 3.4 cm-thick Ls. bed, at 30° to core axis

Core rubbly

1076'- Slicked surface w/ rake = 90°

1081'- Slicked surface in mudst. Rake = 65° L.

1095'- Slicked surface w/ Rake = 80° R.

1100'- Slicked surface at 30°, rake = 75° R.

1118'- Slicked surfaces at 30° to core axis, w/ rake = 55° L.

1140'- Tuff bed ~1.2m thick at ~75° to core axis.

Assay

Cu, Pb, Zn, Mn %
Au, Ag oz/T

0.26 % Cu
0.36 %
0.20 %
0.16 %
0.01 %
0.05 %
0.02 %
0.06 %
0.06 %
0.08 %
0.07 %
0.10 %
0.07 %
0.08 %

F = frac. controlled
D = disseminated

tr. = trace
acc. = accessory

MAGMA COPPER COMPAI

Division: _____ **Drill Hole:** MB-12A **Location:** _____

Coordinates: _____ **Collar Elev:** _____ **Total Depth:** _____

Date Collared: _____ **Completed:** _____ **Angle:** -80° (nominal)

Bearing: S 5 W (nominal) **Core Size:** HQ **Logged By:** SLM

Scale: 1:300

Depth	Rock Type	Alteration/Mineralization Vol. % (Vn. Qtz, Vn. Chal., Vn. Calc., Chl, Clay, Ep, Hm, Goet., Mn-ox, Cu-ox, Mt, Py)	% Oxidized	% Rec'd	RQD % rec'd ≥6" in length	Comments	Assay Cu, Pb, Zn, Mn % Au, Ag oz/T
1150				1132.5 100%	96%	1150-1200' – Weakly indurated sandy siltstones, w/ sand predominant below about 1185'. Mud rip-ups, load casts evident. Muddy or silty intervals are red-brn, sands are generally gray. Matrix may be weakly calcareous. Bedding fairly uniform at 75°-80° to core.	0.08 % Cu
				1163.5 87%	31%		0.08 %
1175		≤1% Hm in matrix		1173.5 100%	26%		0.10 %
				1186.5 98%	67%		0.08 %
				1196.5 100%	57%		0.06 %
1200				1206.5 100%	43%	1200'-1300' – Weakly to moderately indurated sandstone w/ scattered, red-brn silty or muddy layers. Some gypsum at ca. 1240'. Section becomes distinctly pebbly below ~1265'. Small scours, X-beds evident. Sandy zones are lt. yellowish to reddish-tan; silty/muddy interlayers commonly are red-brn to brick-red. Section is weakly calcareous near 1275'.	0.07 %
				1217 100%	79%		0.06 %
1225		≤1% Hm		1227 100%	72%		0.08 %
				1237 97%	59%		0.08 %
				1247 100%	54%	1240' – A gypsum layer ~8 cm thick at 75° to core axis.	0.07 %
1250				1257 96%	85%		0.04 %
				1267 100%	93%		0.06 %
1275				1277 98%	66%		0.05 %
				1287 100%	86%	1286'-Laminated siltst./mudst. w/ soft-sed. deformation. Red-brn to gray. ← A few laminae in this silty zone are quite dark and appear iridescent in direct sunlight.	0.10 %
				1297 80%	69%		0.18 %
1300		≤1% Hm; ≤1% lim.	? Tbx	1306 100%	67%	1300'-1375' – Weakly indurated ss. and pebble cgl. Rounded to angular clasts of schist, diabase, qtzite, slate, ls., hornfels present (mostly sch. + diabase), up to 8cm across but most 3-5cm in diam. Matrix locally calcareous. Pebbly zones generally framework-supported. A few tiny clasts of limonite noted. Clastic section is yellowish-tan to red-brn in color, depending on predominant Fe-ox.	
				1316 100%	53%		
1325		80% clay; ≤1% Hm in matrix		1326 97%	41%		
				1336 99%	30%	1332'-Argillized layer of ash 5-8 cm thick.	
		≤1% lim. in matrix		1346 99%	39%		
1350				1356 100%	34%		
		≤1% Hm; ≤1% lim.		1366 100%	49%		
1375				1376 100%	65%		

F = frac. controlled
D = disseminated

tr. = trace
acc. = accessory

MAGMA COPPER COMPAI

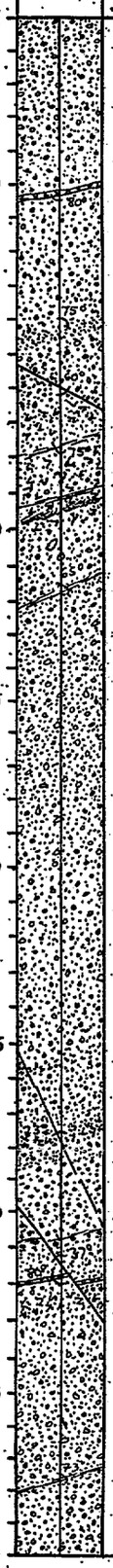
Division: _____ Drill Hole: MB-12A Location: _____

Coordinates: _____ Collar Elev: _____ Total Depth: _____

Date Collared: _____ Completed: _____ Angle: -80°

Bearing: _____ Core Size: _____ Logged By: _____

Scale: 1:300 Page 3 of 12

Depth	Rock Type	Alteration/Mineralization Vol. % (Vn. Qtz, Vn. Chal., Vn. Calc., Chl, Clay, Ep, Hm, Goet., Mn-ox, Cu-ox, Mt, Py)	% Oxidized	% Rec'd	RQD (% rec'd ≥ 6" in length)	Comments	Assay (Cu, Pb, Zn, Mn %; Au, Ag oz/T)
1375			100%	100%	69%	1375-1450' — Polymictic pebble cgl. and tuffaceous ss. Clasts up to 17cm across but most 3-5cm in diameter; rounded to subang. Most clasts are diabase or schist, w/ lesser qtzite, granite/aplite, slate, uncommon Ls. Matrix is yellowish-tan sand, generally non-calcareous. Pebbly zones framework-supported; sandy intervals commonly quite tuffaceous, espec. 1440'-1450'. Some silty interlayers + delicate X-bedding in sandy zones.	
			100%	100%	44%		
1400			100%	99%	49%	1401' - Argillized tuff layer ≥ 7cm thick.	
			100%	100%	21%		
			100%	100%	60%		
1425			100%	98%	50%	1430' - Slicked surface at 60° to core, w/ rake = 80°L.	
			100%	100%	90%		
1450			100%	96%	56%	1450'-1500' - Weakly indurated, polymictic pebble/cobble cgl. much as above. Rounded to ang. clasts mostly schist + diabase, w/ lesser qtzite, purple slate, bull qtz, scattered Ls. and uncommon granitic frags. in a sandy matrix. Generally cgl. is framework-supported; matrix commonly weakly calcareous below ca. 1465'. Matrix is lt. reddish to lt. yellowish-tan. Some clasts appear quite bleached from weathering and/or alteration.	
			100%	99%	37%	1458' - Ss/siltst laminae at 65° to core axis	
			100%	81%	18%	Rubbleized	
1475			100%	100%	20%		
			100%	99%	39%		
			100%	98%	51%		
1500			100%	95%	13%	Rubbly	
			100%	96%	44%	1500'-1600' - Weakly indurated pebble/cobble cgl. w/ clasts of diabase, schist, qtzite, lesser slate, Ls., granitic or aplitic frags., bull qtz, older cgl., chert, vn. qtz, and altered clasts in a gray-brn, yellowish, or reddish sandy matrix. Sandy zones commonly tuffaceous. Much as above, subang. to subround clasts up to 20cm across but most are <3-5cm. Matrix commonly is weakly calcareous.	
1525			100%	100%	19%		
			100%	99%	48%		
			100%	99%	22%	1537' - Slicked surface at 23° to core, w/ rake = 20° R.	
1550			100%	100%	39%		
			100%	100%	60%	1557' - Slicked surface w/ rake at 85° R. 1559' - Tuff layer ≥ 8cm thick, at 80° to core.	
			100%	99%	34%		
1575			100%	98%	46%		
			100%	100%	63%	1588' - Silt lamina in pebbly ss at 73° to core axis.	
1600							

F = frac. controlled
D = disseminated

tr. = trace
acc. = accessory

MAGMA COPPER COMPAI

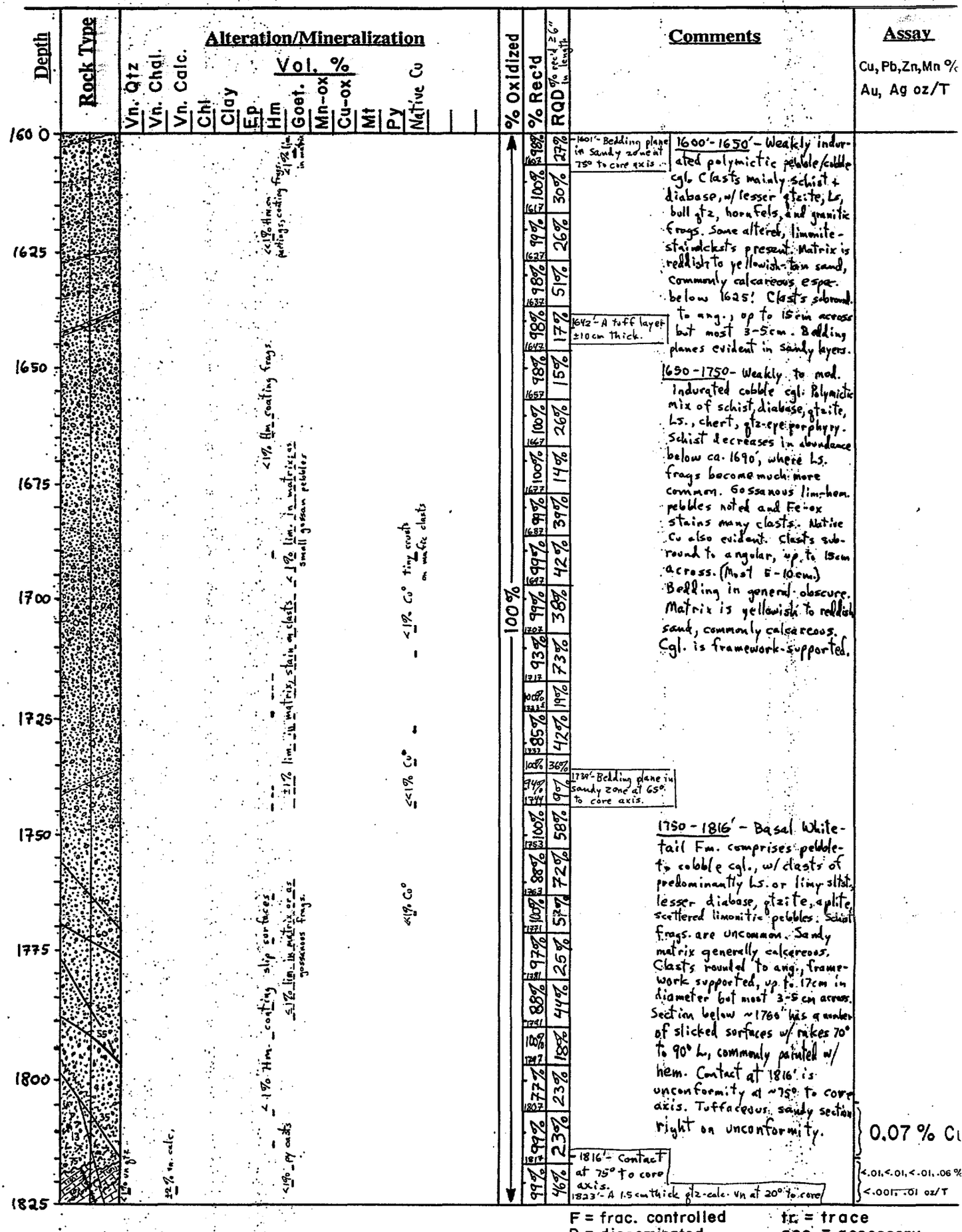
Division: Superior **Drill Hole:** MB-12A **Location:**

Coordinates: **Collar Elev:** **Total Depth:**

Date Collared: **Completed:** **Angle:** -80° (nominal)

Bearing: **Core Size:** HQ **Logged By:** SLM

Scale: 1:300



F = frac. controlled
D = disseminated
tr. = trace
acc. = accessory

MAGMA COPPER COMPAN

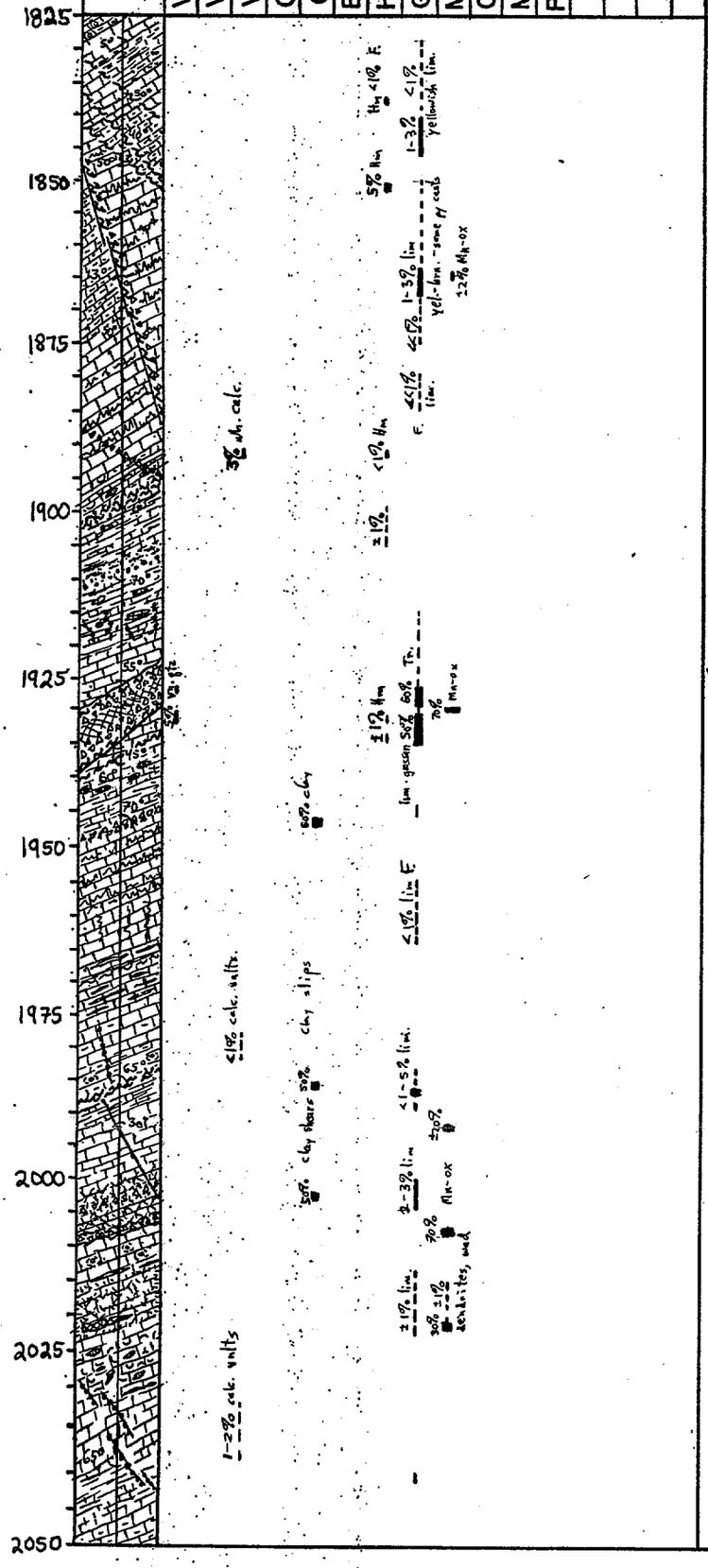
Division: Superior **Drill Hole:** MB-12A **Location:**

Coordinates: **Collar Elev:** **Total Depth:**

Date Collared: **Completed:** **Angle:** -80° (nominal)

Bearing: SSW (nominal) **Core Size:** HQ **Logged By:** SLM

Scale: 1:300 **Page** 5 **of** 12



% Oxidized	% Rec'd	RQD % rec'd >2" in length	Comments	Assay Cu, Pb, Zn, Mn % / Au, Ag oz/T
	1827		1816'-2489' - Naco Group-Ls. Section 1816'-1925' comprises mixed micrite (lt. to med. gy.) and limy sltst./silty Ls. Latter is laminated, gray-grn to olive drab. Fusulinids at top of section. Clay shears tend to be highly stained w/ yellow-brn limonite, lesser hem. Micritic zones commonly stylolitic and voids near 1851' are filled w/ hematite mud. Some "nodular" texture present at top of section (= bioturbation?). Bedding generally 50°-55° from core axis.	<.01, <.01, <.01, .04 / <.001, .01 oz/T
100%	100%	38%		<.01, <.01, <.01, .04 % / <.001, .01 oz/T
100%	100%	35%	1843'- Clay-filled slips + shears.	<.01, <.01, .02, .05 % / <.001, <.01 oz/T
97%	97%	41%		<.01, <.01, <.01, .03 % / <.001, <.01 oz/T
76%	76%	18%		<.01, <.01, <.01, .03 % / <.001, <.01 oz/T
100%	100%	41%	1867'- Steep, clay-filled shear forms contact at 13° to core. Slicks rake 30° R.	<.01, .06, .10, .09 % / <.001, .01 oz/T
100%	100%	46%		<.01, <.01, .02, .04 % / <.001, <.01 oz/T
100%	100%	58%	1882'- ±2cm brx. seam at 60° to core, w/ Hm. Fossil trash	<.01, <.01, <.01, .03 % / <.001, <.01 oz/T
100%	100%	40%		<.01, <.01, .02, .05 % / <.001, <.01 oz/T
98%	98%	59%	1910'- A clastic bed of Ls. pebbles + sand in silty zone, at 70°.	<.01, <.01, .01, .03 % / <.001, <.01 oz/T
100%	100%	31%		<.01, <.01, <.01, .05 % / <.001, <.01 oz/T
95%	95%	15%	1927'-1935'- Oxidized Vn. Clay gouge, brecciated vn. qtz, lim./Mn-ox gossan. Fe-ox is yellow-orange.	<.01, <.01, .08, .07 % / <.001, .06 oz/T
98%	98%	36%	Fossil trash	.13, .36, 1.2, 2.0 % / <.001, 1.3 oz/T
100%	100%	9%	1947'- Brx. seam w/ clay, Mn-ox.	<.01, <.01, .12, .14 % / <.001, .08 oz/T
100%	100%	41%	1935'-2050' Intercalated lt. gray micrites and gray-grn to olive drab limy siltsts. Siltst. is laminated, commonly shows bedding plane slip. Micrite tends to be stylolitic. Chert ribbons 1-2cm thick appear ca. 1965'. Zones of beige to yellowish olive-drab recrystallization texture and partial replacement of Ls. by Mn-ox apparent in interval ~2000' to 2025'.	<.01, <.01, .03, .07 % / <.001, .03 oz/T
98%	98%	46%		<.01, <.01, .02, .05 % / <.001, .02 oz/T
100%	100%	66%		<.01, <.01, .02, .02 % / <.001, .02 oz/T
95%	95%	20%		<.01, <.01, .03, .02 % / <.001, .0 oz/T
79%	79%	30%	1986'- Ox. bedding plane shear in limy sltst. at 65°	<.01, <.01, .07, .26 % / <.001, .02 oz/T
0%	16%	0%	1993'- Steep frac. 1-2cm thick w/ clay, Mn-ox fill.	<.01, <.01, .05, .10 % / <.001, .01 oz/T
99%	99%	6%	Recrystallized	.01, <.01, .66, 1.7 % / <.001, .02 oz/T
99%	99%	0%	2008'- Brx. zone ±25cm thick filled w/ Mn-ox wad. Aff. uncertain.	.10, <.01, .26, 1.1 % / <.001, .03 oz/T
95%	95%	31%	Recrystallized } A small knot of Mn-ox replacement in Ls.	<.01, <.01, .07, .06 % / <.001, .03 oz/T
100%	100%	65%	Fossil trash	<.01, <.01, .03, .06 % / <.001, .01 oz/T
100%	100%	28%	2033'- Calc.-lim. vns at 10°, ±1cm thick. Limy sltsts. are gray-grn to maroon in color	<.01, <.01, .03, .05 %
100%	100%	21%	2037'- Bedding in limy sltst. at 65° to core axis.	

F = frac. controlled
D = disseminated

tr. = trace
acc. = accessory

MAGMA COPPER COMPAN

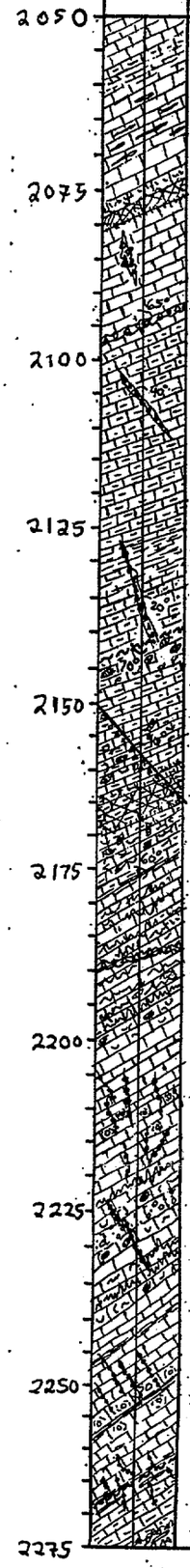
Division: _____ Drill Hole: MB-12A Location: _____

Coordinates: _____ Collar Elev: _____ Total Depth: _____

Date Collared: _____ Completed: _____ Angle: -80° (nominal)

Bearing: _____ Core Size: HQ/NX Logged By: SLM

Scale: _____ Page 6 of 12



Alteration/Mineralization — Vol. %: Vn. Qtz, Vn. Chal., Vn. Calc., Chl, Clay, Ep, Hm, Goet., Mn-ox, Cu-ox, Mt, Py

% Oxidized	% Rec'd	RQD
100%	94%	41%
100%	100%	39%
100%	100%	15%
100%	100%	11%
100%	100%	25%
100%	100%	9%
100%	100%	30%
100%	100%	37%
100%	100%	63%
96%	96%	35%
100%	100%	71%
100%	100%	27%
100%	100%	59%
98%	98%	44%
100%	100%	39%
100%	100%	41%
100%	100%	57%
99%	99%	32%
100%	100%	55%
99%	99%	45%
100%	100%	40%
100%	100%	43%
99%	99%	30%
100%	100%	17%

Comments

2050'-2200' - Micrites and silty Ls./limy siltsts. A beige, recrystallized zone ±1m thick at ~2080' w/ some possible pyx (mudly, grn-brn replacement mineral). Vuggy porosity developed along breaks, which are commonly coated w/ calcite scalenohedrons. Silty zones vary in color from brick-red to purplish-gray to lt. yellowish grn — some beds are quite porcelaneous. Micritic Ls. is lt. gray to blue-gray in color. Micrites commonly stylolitic and may contain vugs filled w/ hematite-saturated mud or sand. Fossil trash common below ~2140' comprising fusulinids, crinoids, bracks.

HQ / NX

Recrystallized (some pyx(?))

2095' - Gossanous brx a few cm's thick. Lim.-stained.

Red to purplish silty zone

2159' - Slip at 40° w/ slicks - rake 26° L. Irreg. Brx in FW.

Recrystallized Beige color

2176' - Bedding in silt layer at 60° to core axis.

2200'-2275' - Mixed sequence of lt. blue-gray micrite or biomicrite and reddish, olive-tan, or yellowish sltst. or silty Ls. Micrites commonly stylolitic. Fractures + voids partly healed or filled w/ calcite ± Fe-oxides. Some clastic texture near 2230'. A brecciated, greenish-tan chert horizon appears at base. Some nodular texture in Ls.

2259' - Bedding in silty layer at 50°

Assay — Cu, Pb, Zn, Mn % / Au, Ag oz/T

<.001, .01 oz/T
<.01, <.01, .07, .06
<.001, .03 oz/T
<.01, <.01, .03, .07
<.001, .03 oz/T
<.01, <.01, .08, .16 %
<.001, .04 oz/T
<.01, <.01, .05, .15 %
<.001, .06 oz/T
<.01, <.01, .05, .03 %
<.001, .02 oz/T
<.01, <.01, .04, .02 %
<.001, .03 oz/T
<.01, <.01, .05, .07 %
<.001, .03 oz/T
<.01, <.01, .07, .06 %
<.001, .03 oz/T
<.01, <.01, .02, .09 %
<.001, .02 oz/T
<.01, <.01, .03, .03 %
<.001, .01 oz/T
<.01, <.01, .06, .16 %
<.001, .06 oz/T
<.01, .03, .06, .10 %;
<.001, .29 oz/T
<.01, <.01, .05, .04 %
<.001, .05 oz/T
<.01, <.01, .03, .03 %
<.001, .03 oz/T
<.01, <.01, .03, .02 %
<.001, .02 oz/T
<.01, <.01, .04, .03 %
<.001, .03 oz/T
<.01, <.01, .06, .04 %;
<.001, .03 oz/T
<.01, <.01, .04, .05 %;
<.001, .02 oz/T
<.01, <.01, .05, .04 %
<.001, .02 oz/T
<.01, <.01, .04, .03 %;
<.001, <.01 oz/T
<.01, <.01, .04, .07 %
<.001, .01 oz/T
<.01, <.01, .10, .04 %;
<.001, <.01 oz/T

F = frac. controlled
D = disseminated
tr. = trace
acc. = accessory

MAGMA COPPER COMPAN

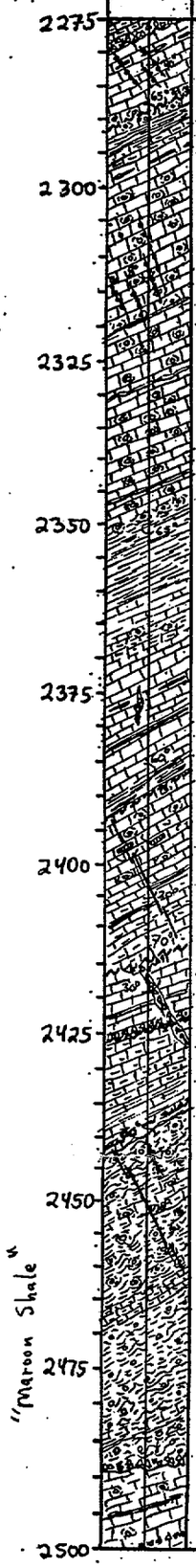
Division: Superior **Drill Hole:** MB-12A **Location:**

Coordinates: **Collar Elev:** **Total Depth:**

Date Collared: **Completed:** **Angle:** -80° (nominal)

Bearing: **Core Size:** NX **Logged By:** SLM

Scale: 1:300



Alteration/Mineralization — Vol. %

Vn. Qtz | Vn. Chal. | Vn. Calc. | Chl | Clay | Ep | Hm | Goet. | Mn-ox | Cu-ox | Mt | Py

% Oxidized | % Rec'd | RQD

Comments

2275'-2400' - Mixed sequence of lt. gray to blue-gray to greenish-gray silty Ls. and dk. green, yellowish, to olive limy sltst. + shale. Silty layers commonly show bedding-plane slip. Ls. is generally nodular. Chert ribbons present. Bedding, where evident, lies at ca. 65° to core axis. Shaly zones are variably calcareous. Some epidote in shale at ~2353'.

2283'-Calc.-lim veins @ ~40° to core.

2312 - Calc.-Mn-ox veins at 18° to core axis.

2330'-A chert ribbon 5-8cm thick.

2352'-Bedding in dk. grn shales at 65° to core axis.

Rubbly

Highly fractured

2379'-Vuggy steep frac. lined w/ calcite.

2387'-Bedding in silty layer at 60° to core.

Fossil trash, incl. crinoids.

2400-2500' - Silty Ls. and calcareous shale. Section dominated by purple shale, ~24% to 2489', w/ contorted bedding and many nodules of Ls. This shale is locally bleached then re-oxidized to yellow-orange limonite w/ relict py. Shale is floored by ~15cm of limonitic chert breccia. A sheared, steep slip w/ much Mn-ox appears at ~2415'. FW to purple shale is lt. gray micrite w/ a few yellow-tan shaly interlayers, local nodular texture.

2415'-A brx. vn. w/ clay, Ls. frags., Mn-ox. Lower contact at 30°, truncated above by bedding plane slip.

Purple shale

2491'-Slicked surface at 25° to core axis, w/ rake = 10° L.

Escabrosa Ls. =>

2489'-Base of purple shale is chert brx. ~ 90° to core axis.

2489'-2751' = Escabrosa Limestone

Assay

Cu, Pb, Zn, Mn %
Au, Ag oz/T

Depth	Cu	Pb	Zn	Mn	Au	Ag
2278	<.01	<.01	.06	.03	<.001	.02
2287	<.01	<.01	.09	.03	<.001	.02
2297	<.01	<.01	.06	.05	<.001	.01
2307	<.01	<.01	.06	.05	<.001	.01
2317	<.01	<.01	.07	.05	<.001	.02
2327	<.01	<.01	.06	.05	<.001	.01
2337	<.01	<.01	.07	.05	<.001	.01
2347	<.01	<.01	.04	.05	<.001	<.01
2357	<.01	<.01	.10	.03	<.001	<.01
2367	<.01	<.01	.04	.09	<.001	<.01
2377	<.01	<.01	.03	.06	<.001	<.01
2387	<.01	<.01	.04	.05	<.001	<.01
2397	<.01	<.01	.07	.46	<.001	.01
2407	<.01	.01	.07	.15	<.001	.02
2417	<.01	.26	.12	1.0	<.001	0.23
2427	<.01	<.01	.07	.26	<.001	.04
2437	<.01	<.01	.02	.06	<.001	<.01
2447	<.01	<.01	.02	.03	<.001	<.01
2457	<.01	<.01	.02	.08	<.001	<.01
2467	<.01	<.01	.02	.03	<.001	<.01
2477	<.01	<.01	.02	.02	<.001	.01
2487	<.01	<.01	.02	.03	<.001	.01
2497	<.01	<.01	.03	.04	<.001	.02

F = frac. controlled
D = disseminated

tr. = trace
acc. = accessory

MAGMA COPPER COMPAN

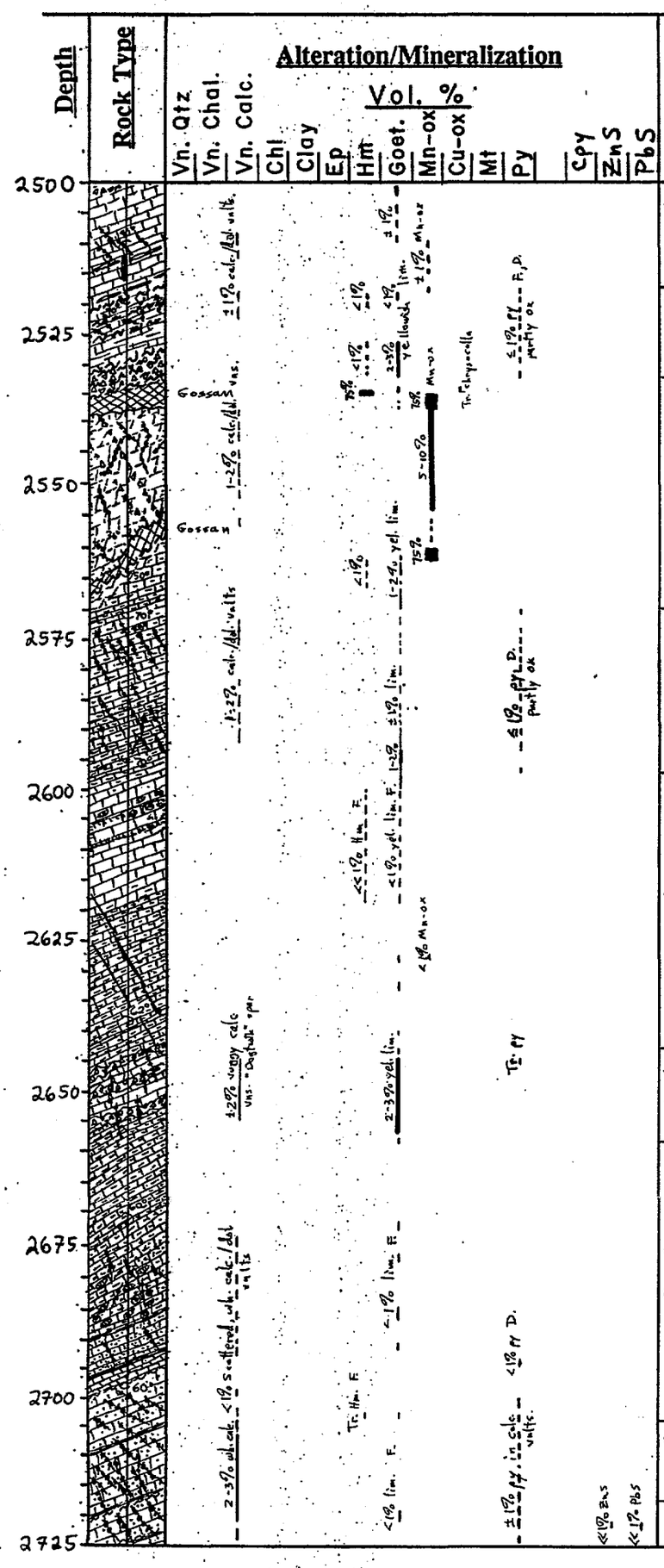
Division: Superior **Drill Hole:** MB-12A **Location:**

Coordinates: **Collar Elev:** **Total Depth:**

Date Collared: **Completed:** **Angle:** -80° (nominal)

Bearing: **Core Size:** NX **Logged By:** SLM

Scale: 1:300



% Rec'd	RQD
96%	18%
100%	26%
92%	67%
100%	9%
96%	16%
100%	19%
100%	31%
100%	27%
98%	22%
100%	10%
100%	16%
33%	0%
100%	5%
100%	33%
100%	18%
98%	19%
98%	0%
70%	16%
100%	38%
99%	51%
100%	66%
100%	60%
100%	10%
100%	50%
100%	34%

Comments

2500'-2600' Escabrosa Ls. composed of micrites, biomicrites, limy sltst. + silty Ls. Silty zones quite sheared + pyritic at top of section. Fe-Mn-ox gossan from 2535'-38' and at 2561', w/ intervening dark, splendant recrystallized/replacement dolomite, comprises "D" Bed. Mn-ox dominates replaced, oxidized rock, but traces chrysocolla seen in hematitic gossan. Silty Ls. in FW of "D" Bed are pyritic where unox; highly colored w/ yel.-org. jarositic lim. otherwise.

2512'- Mn-ox veins ±1cm thick, at 40° to core axis.

2535'- Some 90 cm of Fe/Mn-ox gossan w/ traces chrysocolla.

2538'-2561'- Recrys. texture in dk., splendant dol. Highly frac., w/ Mn-ox on breaks, filling crevices

2561' - ±25 cm of lim./Mn-ox gossan at base of recrys. dolomite

2575'- Calc.-dol. veins ±1cm thick at ~20° to core.

2595'- Bedding laminae in silty Ls. at 70° to core axis.

Sparry Ls.

2634'- Bedding in laminated silty Ls. at 62° to core axis

Partly brx.

2672- Bedding laminae in silty Ls. at 60° to core axis.

Fusulinids or oolites?

2687'- Arenaceous Ls.

2645'-2698'- Black Ls. Upper few cm's essentially coaly shale. Bedding at 60° to core.

Sparry, arenaceous in main part. Some shaly interlayers

Escabrosa

2600'-2725'. Section is coarser, sparry Ls. from ~2600'-2620'; then mostly thin-bedded or even laminated, mottled, silty Ls. Latter is dark blue-gray and shows a "flaser" texture. A broken zone near 2650' is more sparry, highly stained w/ yellow-orange jarositic limonite. Near base of section are arenaceous beds and a thin zone (±80cm) of black Ls. that is ~coaly shale at the top. Some beds are full of fusulinids. Minor replacement texture near 2610'. Calcite veins from ~2700' to 2725' range from 20° to 40° off core axis, ±3mm to ≤2cm thick; commonly contain pyrite on margins ± traces ZnS, PbS.

oolites? →

Assay

Cu, Pb, Zn, Mn %
Au, Ag oz/T

<.01, <.01, .04, .07 %
<.001, .03 oz/T
.02, .06, .12, 1.0 %
<.001, 0.41 oz/T
.14, <.01, .02, .04 %
<.001, 0.47 oz/T
.43, .05, .08, .03 %
.001, 1.55 oz/T
1.1, .14, 6.8, 16.5 %
.001, 0.67 oz/T
.04, .01, 1.25, 2.75 %
<.001, 0.13 oz/T
.07, .03, 1.1, 2.8 %
<.001, 0.21 oz/T
.07, .07, .92, 1.85 %
.001, 0.16 oz/T
.34, .15, 2.9, 5.4 %
.003, 1.75 oz/T
.01, .02, .22, .27 %
.001, .06 oz/T

F = frac. controlled
D = disseminated

tr. = trace
acc. = accessory

MAGMA COPPER COMPANY

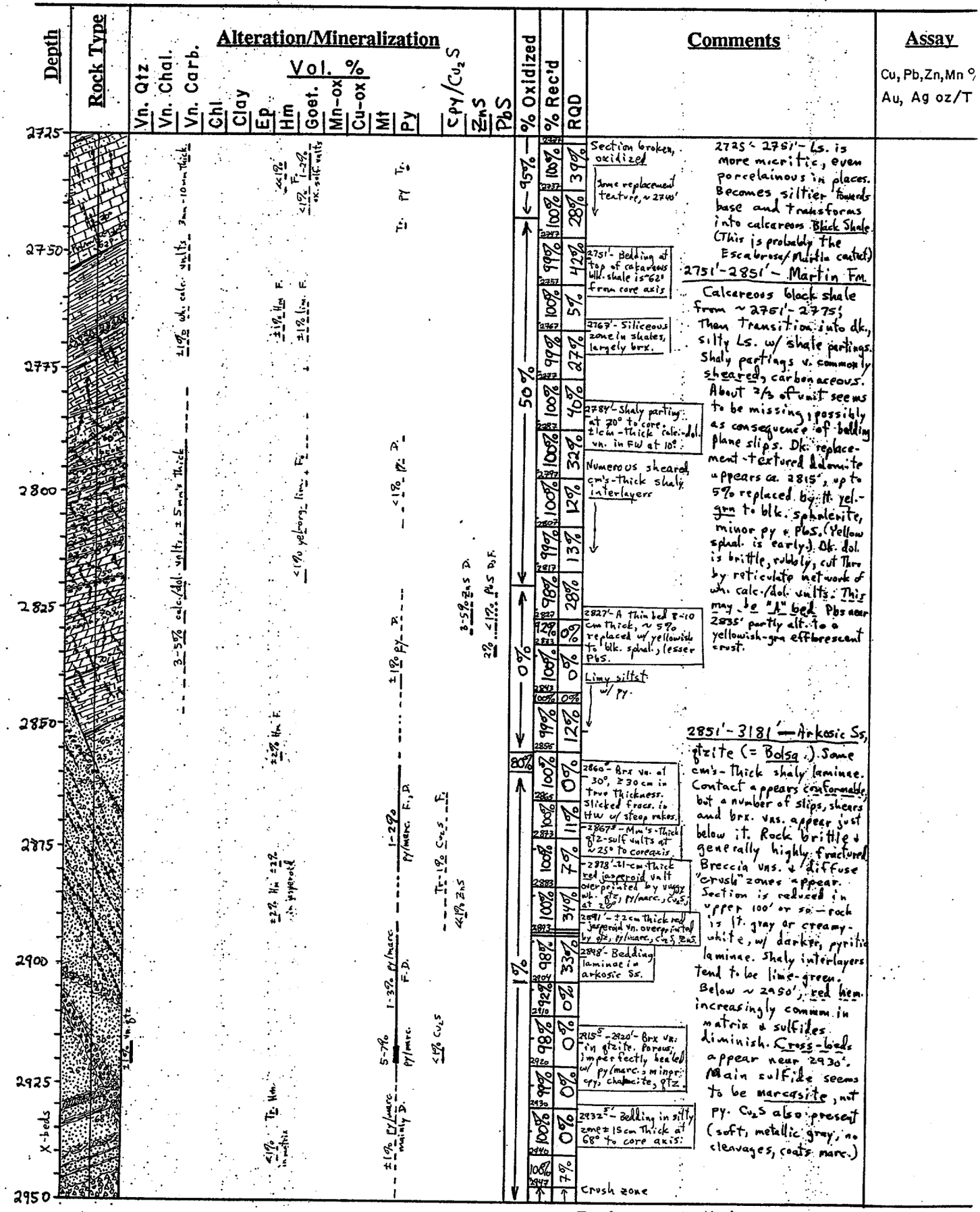
Division: SUPERIOR **Drill Hole:** MB-12A **Location:** _____

Coordinates: _____ **Collar Elev:** _____ **Total Depth:** _____

Date Collared: _____ **Completed:** _____ **Angle:** -80° (nominal)

Bearing: _____ **Core Size:** NX **Logged By:** SLM

Scale: 1:300



F = frac. controlled
D = disseminated

tr. = trace
acc. = accessory

MAGMA COPPER COMPA Y

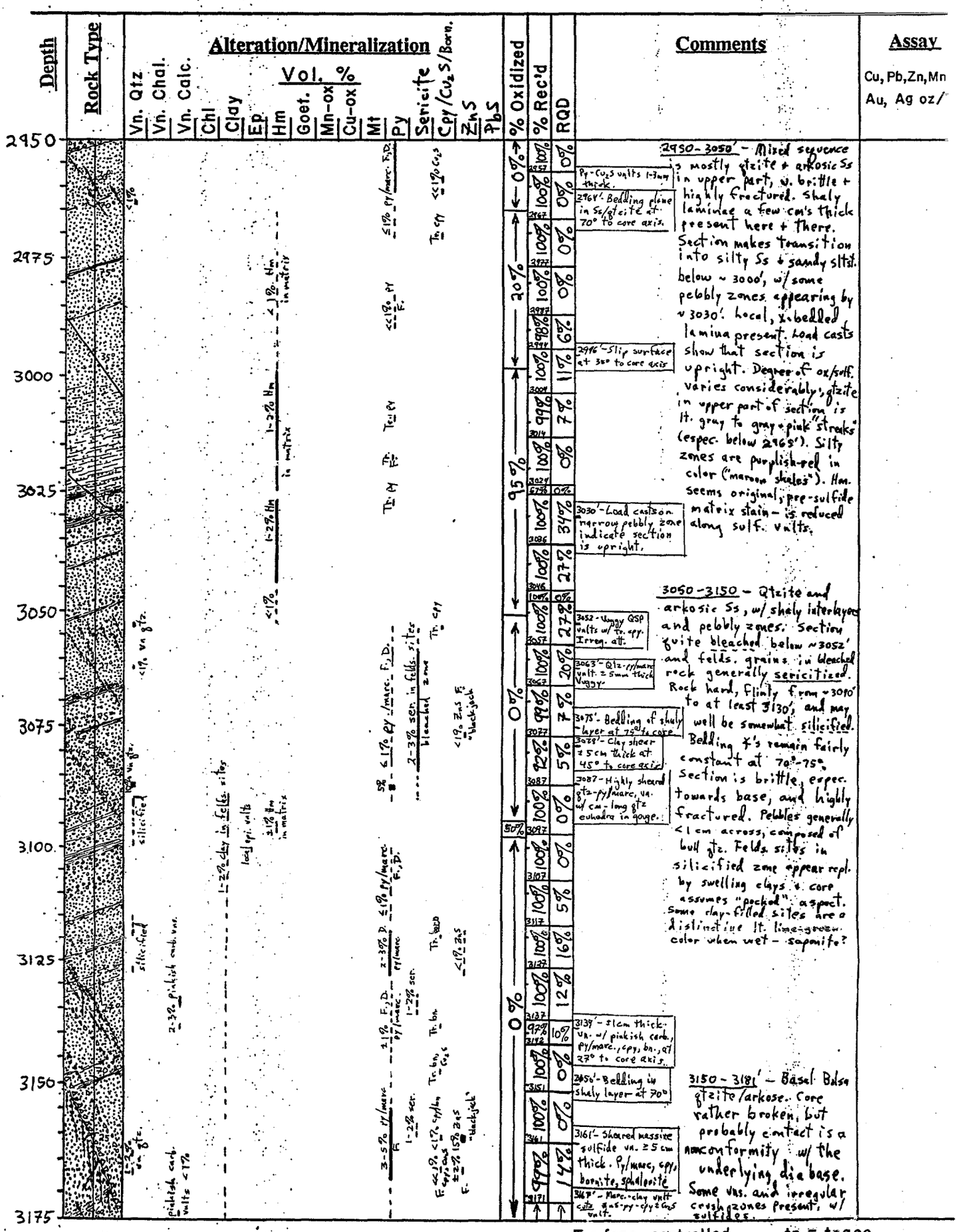
Division: SUPERIOR **Drill Hole:** MB-12A **Location:**

Coordinates: **Collar Elev:** **Total Depth:**

Date Collared: **Completed:** **Angle:** -80° (nominal)

Bearing: **Core Size:** NX **Logged By:**

Scale: 1:300



MAGMA COPPER COMPANY

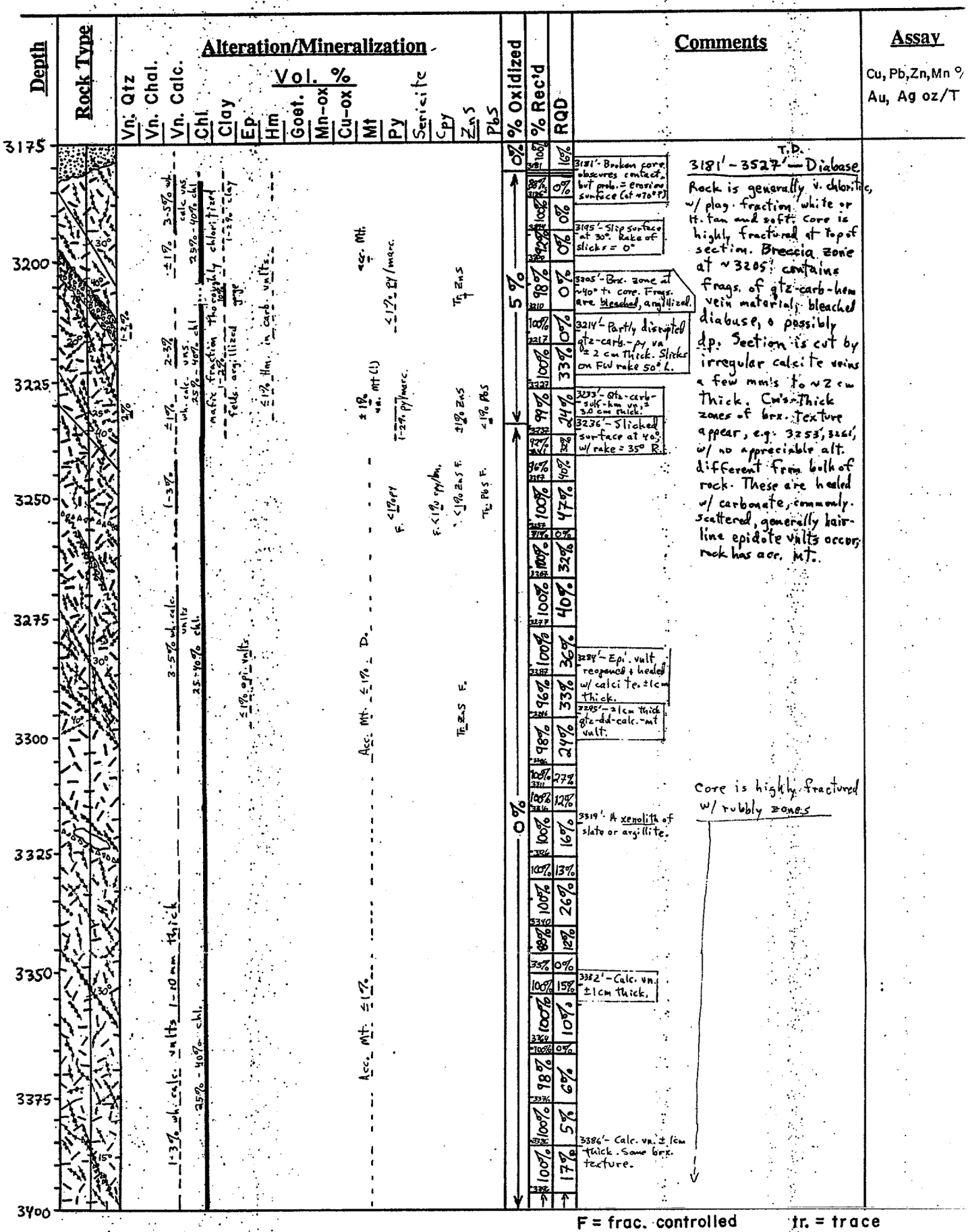
Division: Superior **Drill Hole:** MB-12A **Location:**

Coordinates: **Collar Elev:** **Total Depth:**

Date Collared: **Completed:** **Angle:** -80° (nominal)

Bearing: **Core Size:** NX **Logged By:** SLM

Scale: 1:300 **Page** 11 **of** 12



MAGMA COPPER COMPAN

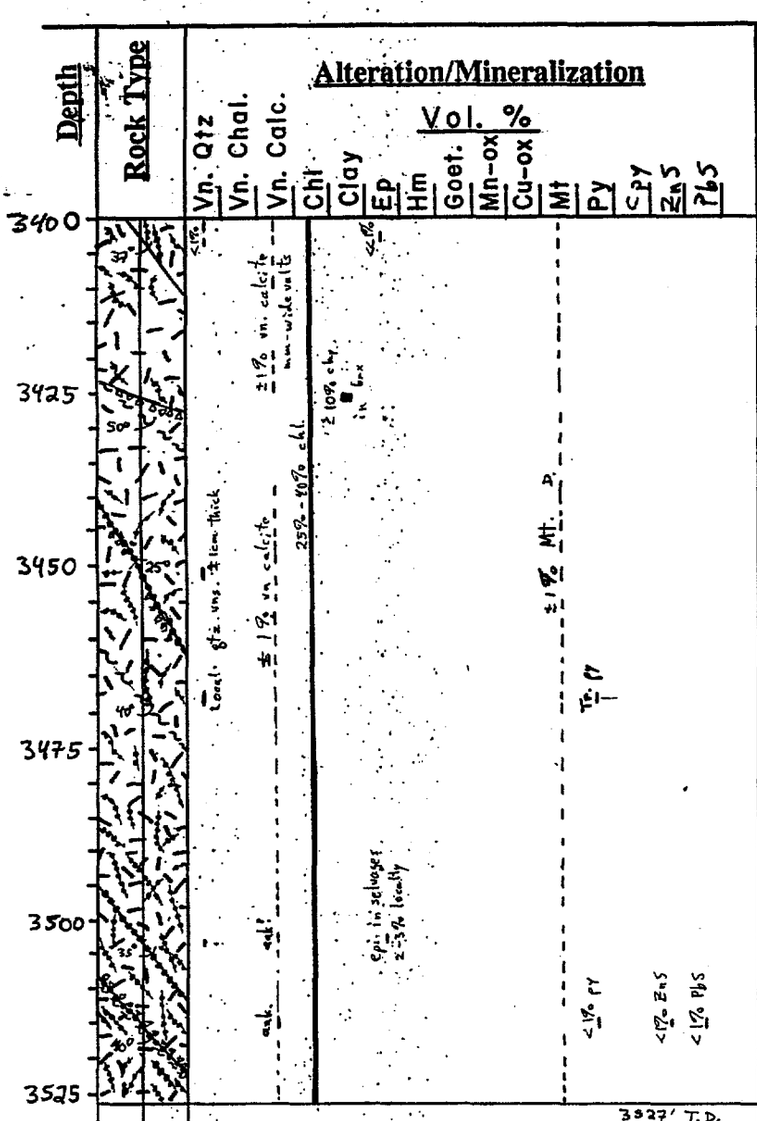
Division: SUPERIOR **Drill Hole:** MB-12A **Location:** South Boundary

Coordinates: _____ **Collar Elev:** _____ **Total Depth:** 3,527'

Date Collared: _____ **Completed:** 9/14/93 **Angle:** -80° (nominal)

Bearing: corkscrew **Core Size:** NX **Logged By:** S. L. Manske

Scale: 1:300 **Page** 12 **of** 12



Comments

3403' - Slicked surface at 37° truncates compound qtz-epi-carb. vn ± 2cm thick. Rake = 0° (hor.)

3426' - Brx zone ≤10 cm thick, ~70° to core axis.

Rubbly

3451' - Qtz-carb. vn 3.5 cm thick. Some brx texture.

Rubbleized

3503' - Qtz-carb vn 2-3 cm thick. Brx texture; some epidote in selvages.

3516' - Sheared, pink carb. vn. ± 15 cm thick. Some brx. Minor py, PbS, ZnS.

Chloritic diabase

Core generally quite fractured. Many breaks are slicked. Mm's - Thick wh. calcite veins nearly ubiquitous. Some pink, ankeritic or ketnohoritic carb. in vn. at ~3515' w/ base-metal sulfides.

F = frac. controlled
D = disseminated

tr. = trace
acc. = accessory

JDS

ASARCO

Exploration Department

December 13, 1993

Mr. T.E. Scartaccini

Magma's Requested Purchase
40 Acres, Sec. 5, T2S, R13E
J.I. Ranch Area, So. of Oak Flat
Pinal County, Arizona

SUMMARY

Dr. Graybeal requested that I review the data on drill holes submitted by Magma Copper Company that lie within 4000 feet of the 40 acre parcel. The data will be given to Sal Anzalone for his review.

Magma has drilled nine holes on the west and south sides of the block, while Asarco has drilled one deep hole east of the block and another further east.

The Asarco hole A-3 at 6008' T.D. bottomed in post-mineral Whitetail Conglomerate.

Magma drilled six holes on a north-south line 2800 feet west of the block (Figure 1) and encountered a number of veins similar to that which they have mined south of #9 shaft. The shaft and veins are in a "Mesozoic conglomerate" of Magma's nomenclature, but this unit I believe is an intrusive breccia of pre-mineral age.

Although the veins are indicative of being of a grade sufficient to mine underground, they are relatively narrow. The two veins mined by Magma in the breccia have given the miners many problems. The values in the drill holes are higher in zinc and manganese and probably represent the western zonation with copper values increasing downward and to the east. Thus their interest in the 40 acre block.

The Asarco hole, 3000 feet east of the block, has fragments of the breccia as clasts in the Whitetail Conglomerate. Thus the tertiary breccia mass terminates west of Asarco hole A-3 and north of the east-west line of Magma holes on the south edge of Sections 5 and 6, as these holes hit the normal stratigraphic sequence of sediments and apparently had minor mineralization.

I would concur with Dr. Graybeal and sell the 40 acres, retaining the surface and a gross royalty of production as proposed.

ASARCO Incorporated P. O. Box 5747 Tucson, Az 85703
1150 North 7th Avenue (602) 792-3010

HISTORY OF EXPLORATION OF THE BRECCIA

In the early 1960's the breccia was encountered on the 2800 level of the East Replacement Division at Magma. As pyrite-chalcopyrite and possible chalcocite/bornite was noted, several holes were placed into the mass. One was a 2000 foot horizontal hole to the south, another was a 300 foot vertical hole, and both stayed in the breccia. The bulk value of the breccia was 0.35% copper.

Later in the 1970's, Magma sank their No. 9 shaft in Section 32, and at a depth of 3250 feet hit the intrusive breccia under the Whitetail Conglomerate. Magma later drilled a 2000 foot vertical hole from the bottom of #9 shaft and stayed in the breccia for a known thickness of 3500 feet vertically.

They had also drilled some holes to the south as they believed their replacement orebody on the north side could be duplicated on the south side of the breccia. They intercepted several veins and one varied from 7 to 25 feet in width, was steeply inclined and carried 1½ to 5% copper, as chalcopyrite-bornite.

In mid 1975 they reported a reserve of one million tons in the "south vein." However, they have had abundant mining problems, and are apparently now thinking of some sort of sublevel caving as a means of getting the vein-shear mined.

With the surface drilling, the extent of the breccia extends 500 feet north of #9 shaft, 3000 feet west of #9 shaft, and 8500 feet southeast of #9 shaft. The line of Magma drill holes is 3000 feet east (but south) of #9 shaft, potentially covering in excess of four square miles.

MINERAL VALUES IN THE BRECCIA

The metal values in the breccia overall are of interest. As stated earlier, the 1960's assay of the breccia from 2500 feet of core averaged 0.35% copper.

Table 1 lists the assays of the overall core in the breccia from the recent drill holes.

Table 1. Overall TiBx Values

Hole	Footage	Feet	% Cu	% Pb	% Zn	% Mn	oz/T Ag
MB-9	2617-3267	650	0.25	tr	0.23	tr	tr
MB-11	2560-3367	807	tr	tr	0.93	0.61	tr

A number of veins were cut during the Magma drilling and are listed in Table 2. The higher lead, zinc, manganese, may suggest that the western part where the drill holes are, will pass into better copper values with depth and to the east. Thus higher grade copper values may underlie the 40 acre block.

Table 2. Vein Assays in TiBx

Hole	Footage	Feet	% Cu	% Pb	% Zn	% Mn	oz/T
MB-9	3025-3050	25	1.36	0.09	1.31	0.09	0.84
MB-11	2500-2530	30	tr	tr	0.56	1.32	0.02
MB-11	2905-2915	10	0.83	0.61	4.47	0.55	1.50
MB-11	3200-3220	20	0.25	13.25	2.14	0.29	0.60
MB-11A	2805-2840	35	tr	tr	1.44	6.21	0.59
MB-11A	4570-4585	15	1.53	tr	tr	tr	1.33
MB-11B	3275-3285	10	tr	tr	0.38	1.35	0.11
MB-11B	3310-3320	10	tr	tr	0.18	1.20	0.01
MB-11B	3360-3370	10	tr	tr	10.00	0.47	0.02
MB-11B	3615-3620	5	0.20	1.20	3.50	0.31	0.38
MB-11B	3805-3810	5	1.75	0.40	0.96	0.20	0.73
MB-12	3520-3550	30	0.06	3.08	4.33	2.79	0.52
MB-12	3610-3625	15	0.05	1.40	3.82	0.52	0.29
MB-12	3645-3695	50	0.44	2.65	4.38	1.28	1.69
Average		19	0.40	1.96	2.68	1.70	0.74

The Magma drill holes along the south side did not penetrate any breccia.

REPLACEMENT UNIT VALUES

Magma drilled a number of holes east-west near the top of Sections 7, 8, and 9. All of these were generally reported to be oxidized to depth and values not given for any metallics.

Hole MB-12 and MB-12A both had breccia within recognizable sedimentary units and have assay values. Table 3 is the data on the values in the sedimentary/diabase units taken from what they mentioned as "replacement units" in the Paleozoics and shears in the Precambrian diabase.

Table 3. Assay Values in Penn., Miss., and pεdb Units

Hole	Footage	Feet	% Cu	% Pb	% Zn	% Mn	oz/T Ag
A. Pennsylvanian Naco Limestone							
12	3220-3270	50	tr	tr	0.04	0.29	0.02
12A	1925-1935	10	0.13	0.36	1.20	2.00	1.30
12A	2005-2025	20	0.05	tr	0.46	1.40	0.02
12A	2415-2420	5	tr	0.26	0.12	1.00	0.23
B. Mississippian Escabrosa Limestone							
12	3356-3362	6	0.18	1.80	8.30	4.40	1.29
12A	2530-2570	40	0.31	0.08	2.13	4.69	0.80
C. Precambrian Diabase							
12	3850-3860	10	0.22	0.89	3.48	0.58	0.46
12	3880-3895	15	0.20	0.43	3.33	1.76	0.80

It is probably the zinc-manganese values in the lower units shown in Table 3 above interested Magma to investigate the 40 acre block of fee land in Section 5.

Mr. T.E. Scartaccini December 13, 1993

Data from Hole MB-4 on Figure 1 has not been received, the inspection of the site suggested it bottomed in the Apache group units at 3200 feet.

The AZ-1 hole in the northeast corner of Section 5 did not penetrate the surface dacite unit.

James D. Sell

James D. Sell

JDS:mek
Attachment

cc: S.A. Anzalone (logs also)
F.T. Graybeal (no logs)

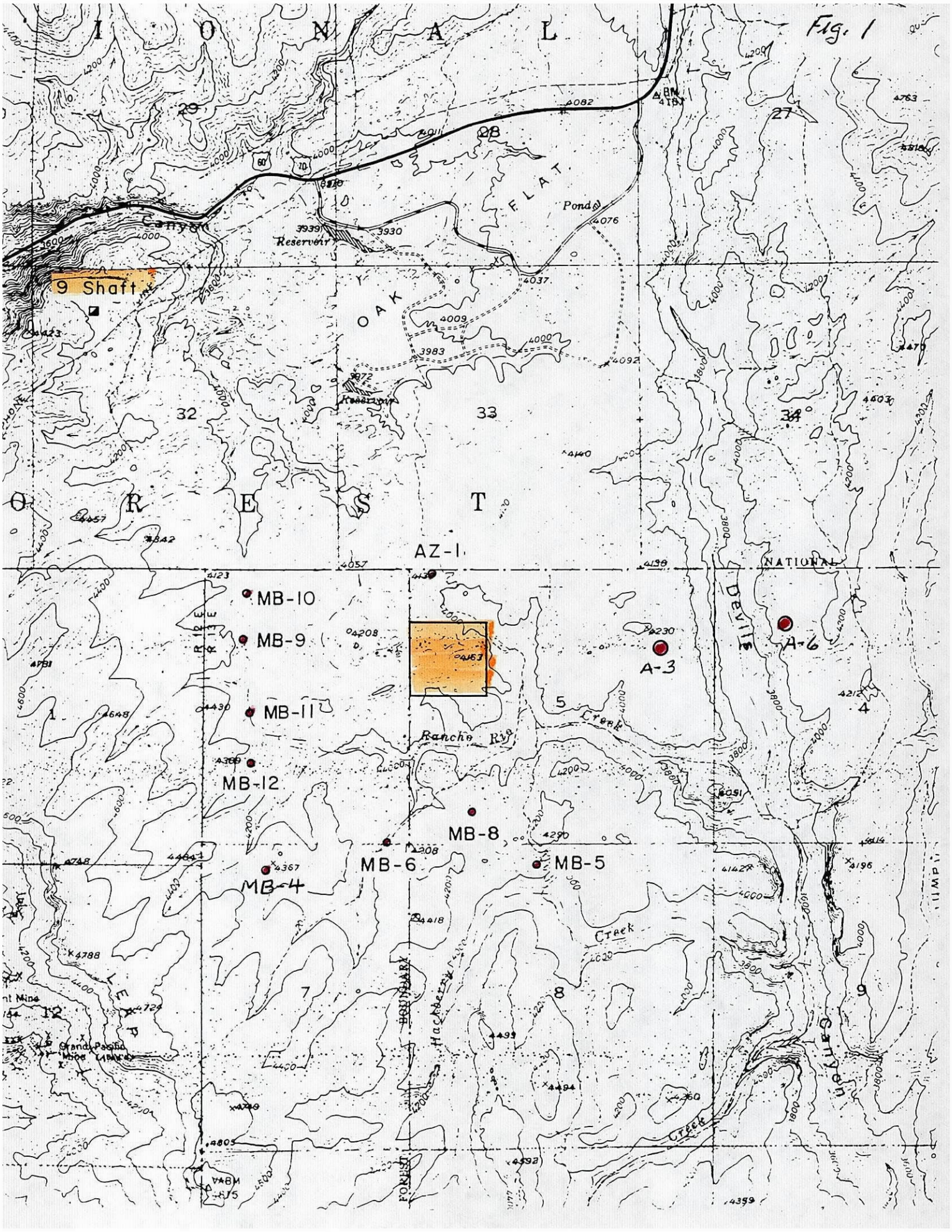


Fig. 1
I O N A L
F O R E S T
NATIONAL
9 Shaft
Canyon
Reservoir
Pond
OAK FLAT
AZ-1
MB-10
MB-9
MB-11
MB-12
MB-8
MB-6
MB-5
MB-4
A-3
A-6
Devil
Creek
Ranche Rio
Hackberry
Canyon
Creek
Grand Pacific Mine
29
28
27
32
33
34
5
4
7
8
9
12

Mr. T.E. Scartoccini
Mr. J.W. Sell

Magma's Requested Purchase
40 acres, Sec. 5, T2S, R13E
J. I Ranch area, So. of Oak Flat
Pinal County, AZ

SUMMARY

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relatively narrow, ~~and~~ of the two ~~breccia~~ veins mined by Magma in the breccia, have given the miners many problems. The values in the drill holes are higher in ~~Zn~~ zinc and manganese and probably represent the western zonation with copper values increasing downward and to the east. Thus their interest in the 40 acre block.

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I would concur with Dr. Grabert and sell the 40 acres, retaining the surface and a gross royalty of production as proposed.

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Section 32, ~~at~~ and at a depth of 3250 feet hit the ~~the~~ intrusive breccia under the Whitetail Conglomerate. Magma later drilled a 2000 foot vertical hole from the bottom of #9 shaft and stayed in the breccia, for a known thickness of 3500 feet vertically.

They had also drilled some holes to the south as they believed their replacement ore body on the north side could be deglaciated on the south side of the breccia. They intercepted several veins and one varied from 7 to 25 feet in width, was steeply inclined and carried 1½ to 5% ~~copper~~ as chalcopyrite-bornite. In mid 1975 they reported a reserve of one million tons ~~of~~ in the "South vein". However, they have had abundant mining problems, and are apparently now thinking of some sort of sublevel caving as a means of getting the vein-shear mined.

With the surface drilling, the extent of the breccia extends ~~[illegible]~~ ~~no~~ 500 feet north of #9 shaft, 3000 feet west of #9 shaft, and 8500 feet south-southeast of #9 shaft. The line of Magma drill holes are 3000 feet east (but south) of ~~Magm~~ #9 shaft, potentially covering in excess of four square miles.

MINERAL VALUES IN THE BRECCIA

The metal values in the breccia overall is of interest. ~~As stated earlier, breccia core from about 2500 feet of drilling assayed 0.35% copper. In Magma's hole MB-9, 100 averaged 0.59% copper and with 0.30~~ oz/T silver

As stated earlier, the 1940's assay of the breccia from 2500 feet of core averaged 0.35% copper.

Table 1 lists the assays of the overall core in the breccia from the recent drill holes

Table 1: Overall TiBx values

Hole	Footage	Feet	% Cu	% Pb	% Zn	% Mn	oz/T Ag
MB-9	2617-3267	650	0.25	tr	0.23	tr	tr
MB-11	2560-3367	807	tr	tr	0.73	0.61	tr

A number of veins were cut during the Magma drilling and are listed in Table 2. The higher lead, zinc, manganese, may suggest that the western part where the drill holes are, will pass into better copper values with depth and to the east. These higher grade copper values may underlie the 40 acre block.

Table 2 - Vein Assays in Breccia from Magma Drill Holes

Hole No.	Footage	Feet	% Cu	% Pb	% Zn	% Mn	oz/T Ag
MB-9	3025-3050	25	1.36	0.09	1.31	0.09	0.84
MB-11	2500-2530	30	tr	tr	0.56	1.32	0.02
MB-11	2905-2915	10	0.83	0.61	4.47	0.55	1.50
MB-11	3200-3220	20	0.25	13.25	2.14	0.29	0.60
MB-11A	2805-2840	35	tr	tr	1.44	6.21	0.59
~~MB-11A~~	~~4232-4235~~	~~3~~	~~24.00~~	~~tr~~	~~tr~~	~~tr~~	
MB-11A	4570-4585	15	1.53	tr	tr	tr	1.33
MB-11B	3275-3285	10	tr	tr	0.38	1.35	0.11
MB-11B	3310-3320	10	tr	tr	0.18	1.20	0.01
MB-11B	3360-3370	10	tr	tr	10.00	0.47	0.02
MB-11B	3615-3620	5	0.20	1.20	3.50	0.31	0.38
MB-11B	3805-3810	5	1.75	0.40	0.96	0.20	0.73
MB-12	3520-3550	30	0.04	3.08	4.33	2.79	0.52
MB-12	3610-3625	15	0.05	1.40	3.82	0.52	0.29
MB-12	3645-3695	50	0.44	2.65	4.38	1.28	1.69
~~MB-12~~							
ave		19	0.40	1.94	2.68	1.70	0.74

The Magma drill holes along the south side did not penetrate any breccia.

REPLACEMENT UNIT VALUES

Magma drilled a number of hole east-west near the top of Section 7-8-49. ~~all~~ ~~holes~~ of these were generally reported to be oxidized to depth and values not given for any metallics.

Hole ~~12~~ MB-12 and MB-12A ~~both~~ both had breccia within recognizable sedimentary units ~~but~~ and have assay values. Table 3 is the data on the values in the ~~Paleozoic~~ ~~section~~ sedimentary/diabase units taken from what they mentioned as "replacement unit" in the Paleozoics, & shown in the precambrian diabase.

Table 3: Assay Values in Penn., Miss, & pre-db unit.

A. Pennsylvanian Naco Limestone

Hole	Footage	Feet	% Cu	% Pb	% Zn	% Mn	oz/T Ag
12	3220-3270	50	tr	tr	0.04	0.29	0.02
12A	1925-1935	10	0.13	0.36	1.20	2.00	1.30
12A	2005-2025	20	0.05	tr	0.46	1.40	0.02
12A	2415-2420	5	tr	0.24	0.12	1.00	0.23

B. Mississippian Escabrosa Limestone

Hole	Footage	Feet	% Cu	% Pb	% Zn	% Mn	oz/T Ag
12	3356-3362	6	0.18	1.80	8.30	4.40	1.29
12A	2520-2570	40	0.31	0.68	2.13	4.69	0.80

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C. Precambrian diabase

Table 3 continued

Hole	Footage	Feet	% Cu	% Pb	% Zn	% Mn	oz/T Ag
12	3850-3860	10	0.22	0.89	3.48	0.58	0.46
12	3880-3895	15	0.20	0.43	3.33	1.74	0.80

It is probably the zinc-manganese values in the lower units shown in Table 3 above which interested Magma to investigate the 40 acre block of fee land in Section 5.

Data from hole MB-4 on Figure 1 has not been received, the inspection of the site suggested it bottomed in the Apache group units at 3200 feet.

Jerry D Bell

Attachment

cc: S.A. Anzalone (log also).
FT Graybeal (no log).

The AZ-1 hole in the northeast corner of section 5 ~~is only~~ did not penetrate the surface dacite unit.

JDS

December 14, 1993

Jim Sell
Geologist, Exploration Department
ASARCO, Inc.
P.O. Box 5747
Tucson, AZ 85703

RECEIVED
DEC 16 1993
EXPLORATION DEPARTMENT

Dear Mr. Sell:

In reference to our telephone conversation on December 13, enclosed please find a copy of the log for MB-4, one of the "historic" holes drilled by Magma Copper in years past on the plateau above Apache Leap in the Superior District. I apologise that this was left out of the original packet; my initial figuring had it lying just outside the 4,000-foot perimeter relative to the ASARCO block in Section 5. Admittedly, however, my map position of that block was not as accurate as it should have been.

I hope that this will answer any remaining questions that you may have on our agreed-upon data swap, and that our land agreement may thereby be expedited. If there are other issues that need discussion, please be aware that I am shortly posting to Nevada for the medium term. Any further questions probably should be tendered to Alex Acosta in Magma's Land Department at the Tucson corporate offices (tel. ph. # 575-5600), who can then forward them to me if necessary. Thank you for your time and attention.

Sincerely yours,

Scott L. Manske

Scott L. Manske
Staff Geologist
c/o Magma Copper Co. - Superior Division
P.O. Box 37
Superior, AZ 85273
(602) 229-4256
FAX (602) 229-4323

cc: Alex Acosta
Mark VanDyke Sander
Alex Paul

enc.

Summary Log - Drill Hole MB-4

From To	Interval	Lithology-Remarks
0-1060	1060	Tertiary dacite (post mineral)
1060-1745	685	Tertiary Whitetail conglomerate (post mineral)
1745-2270	475	Pennsylvanian Naco formation Limestone & siltstone alternating 2097-2132 MnOx-FeOx along small faults
2270-2299	29	Fault, Naco siltstone & limestone breccia with abundant massive FeOx-fragments.
2299-2302	3	Vein-95% MnOx, 5% FeOx, lower contact @ 55° dip
2302-2437	135	Mississippian Escabrosa limestone, 2302-2237 recrystallized & soaked by MnOx. 2337-2344, Vein @ 60°, 40% replaced by MnOx-FeOx 2344-2358 Oolite, 80% recrystallized w/5% MnOx 2358-2360 Replaced bed, 50% MnOx-FeOx 2360-2363 Siltstone-gouge 2363-2365 Replaced bed, 60% MnOx 2365-2437 Dolomite (replacement texture), well fractured w/MnOx coatings.
2437-2787	350	Devonian Martin formation 2437-2501 "Last black" siltstone, 2501-2621 Limestone, siltstone & dolomite, alternating. 2621-2641 Calcareous sandstone & quartzite 2641-2776 "Hanging wall" dolomite 2776-2781 Replaced beds, 30% FeOx-MnOx 2781-2787 "Footwall" siltstone, bleached
2787-2929	142	Cambrian Bolsa quartzite-upper unit 2787-2788 Vein - 60% FeOx 2788-2822 Fault, quartzite breccia w/abundant FeO 2822-2853 quartzite, ±2% FeOx 2853-2856 Fault, ±25% FeOx, 50° dip 2856-2929 quartzite ±1% pyrite
2929-3048	119	Cambrian Bolsa quartzite-Lower unit 2929-2978 quartzite, siltstone, conglomerate, alternating, ±3% pyrite 2978-3048 Sand, silt & conglomerate alternating
3048-3051	3	Fault
3051-3224	173	Precambrian diabase

ASSAY LOG - DRILL HOLE MB-4

	ppm Cu	ppm Pb	ppm Zn	ppm Ag	ppm Au	ppm Mn	ppm Fe
1080-1100	95	60	170	1	-0.1	840	2.1%
1100-1120	315	90	390	-1	-0.1	0.14%	4.7%
1120-1130	345	70	370	-1	-0.1	0.13%	4.7%
1130-1150	675	80	380	-1	-0.1	0.14%	6.1%
1150-1170	760	80	400	-1	-0.1	0.13%	6.0%
1170-1190	485	60	250	-1	-0.1	980	4.6%
1190-1210	465	50	260	-1	-0.1	950	4.4%
1210-1230	495	50	260	-1	-0.1	960	4.5%
1230-1250	565	60	300	-1	-0.1	0.14%	5.2%
1250-1270	435	50	310	-1	-0.1	0.12%	5.2%
1270-1290	325	50	280	-1	-0.1	0.10%	4.8%
1290-1310	330	60	260	-1	-0.1	860	4.7%
1310-1330	315	60	300	-1	-0.1	0.13%	5.0%
1330-1350	290	60	320	-1	-0.1	0.15%	4.3%
1350-1370	260	40	280	-1	-0.1	0.17%	4.4%
1370-1385	415	70	470	-1	-0.1	0.17%	5.1%
1385-1398	290	60	420	-1	-0.1	0.18%	5.0%
1398-1422	425	80	600	-1	-0.1	0.18%	7.1%
1422-1430	350	70	610	-1	-0.1	0.21%	6.1%
1430-1445	420	70	820	-1	-0.1	0.18%	5.7%
1445-1454	410	70	580	-1	-0.1	0.16%	5.2%
1454-1475	320	50	400	-1	-0.1	0.16%	5.7%
1475-1488	405	50	390	-1	-0.1	0.16%	5.9%
1488-1508	400	60	470	-1	-0.1	0.13%	6.1%
1508-1528	500	60	530	-1	-0.1	0.15%	6.5%
1528-1548	390	70	660	-1	-0.1	0.13%	6.3%
1548-1565	390	60	560	-1	-0.1	0.16%	6.5%
1565-1585	360	70	0.16%	-1	-0.1	0.14%	6.2%
1585-1605	390	70	600	-1	-0.1	0.20%	6.2%
1605-1625	395	80	810	-1	-0.1	0.15%	6.5%
1625-1645	410	90	0.13%	-1	-0.1	0.18%	6.1%
1645-1665	240	90	750	1	-0.1	0.20%	3.9%
1665-1685	100	80	360	2	-0.1	0.11%	2.0%

ASSAY LOG - DRILL HOLE MB-4 (continued)

		ppm Cu	ppm Pb	ppm Zn	ppm Ag	ppm Au	ppm Mn	ppm Fe
1705-1725		160	80	520	1	-0.1	0.12%	2.4%
1725-1745		165	70	530	1	-0.1	0.13%	3.4%
1745-1765		155	90	500	1	-0.1	0.11%	3.3%
1765-1785		170	100	720	1	-0.1	0.10%	3.4%
1785-1805		150	90	320	1	-0.1	0.11%	3.3%
1805-1825		135	70	260	1	-0.1	0.10%	3.5%
1825-1845		120	80	230	2	-0.1	920	2.4%
1845-1865		165	80	300	1	-0.1	950	2.4%
1865-1880		195	90	780	1	-0.1	0.12%	3.9%
1880-1900		150	80	860	2	-0.1	810	2.3%
1900-1920		130	100	390	2	-0.1	0.10%	2.2%
1920-1940		110	110	760	2	-0.1	710	1.4%
1940-1960		145	90	500	2	-0.1	0.11%	2.4%
1960-1980		140	100	500	2	-0.1	890	2.3%
1980-2000		215	80	0.16%	2	-0.1	0.11%	3.0%
2000-2020		285	120	0.23%	3	-0.1	0.27%	2.4%
2020-2040		230	110	900	2	-0.1	0.18%	2.3%
2040-2060		100	90	480	2	-0.1	930	1.6%
2060-2080		80	80	490	2	-0.1	850	1.9%
2080-2095		305	220	0.11%	1	-0.1	0.18%	4.2%
2267-2270	3	0.12%	30	750	-1	-0.1	650	9.0%
2270-2273	3	0.28%	60	0.28%	1	-0.1	0.27%	5.7%
2273-2281	8	.0275	130	160	-1	-0.1	440	3.8%
2281-2291	11	.0615	970	410	1	-0.1	650	6.5%
2291-2299		0.43%	0.22%	0.38%	2	0.5	0.29%	32.0%
2299-2302	3	0.93%	0.75%	2.1%	54	-0.1	19.2%	20.0%
2302-2312		0.19%	950	0.70%	8	-0.1	4.2%	2.5%
2312-2319		0.12%	360	0.42%	9	0.2	0.85%	2.1%
2319-2333	14	.0460	650	0.31%	10	-0.1		
2333-2340	7	0.74%	0.86%	1.7%	29	-0.1	5.2%	7.1%
2340-2343	3	0.26%	930	0.84%	13	-0.1	2.1%	2.8%
2343-2358	15	.0615	450	0.64%	13	-0.1		
2358-2361	3	0.31%	0.61%	2.7%	58	-0.1	5.9%	3.8%
2361-2363	2	0.98%	0.69%	7.4%	6	0.1	0.55%	21.0%

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ASSAY LOG - DRILL HOLE MB-4 (continued)

	ppm Cu	ppm Pb	ppm Zn	ppm Ag	ppm Au	ppm Mn	ppm Fe
2363-2366	0.26%	1.89%	3.1%	82	-0.1	5.6%	2.4%
2366-2372	100	280	0.14%	14	-0.1		
2372-2379	165	390	0.18%	3	-0.1		
2379-2382	0.25%	500	0.62%	1	-0.1	0.32%	12.0%
2382-2392	310	280	0.22%	3	-0.1		
2392-2402	305	210	0.13%	2	-0.1		
2402-2412	100	140	700	2	-0.1		
2412-2423	355	80	0.11%	2	-0.1		
2423-2427	0.27%	160	0.57%	1	-0.1	0.48%	8.7%
2427-2437	440	110	0.14%	2	-0.1		
2437-2440	0.31%	200	0.46%	2	-0.1	0.11%	5.9%
2440-2450	230	60	760	2	-0.1		
2450-2460	20	50	520	1	-0.1		
2460-2470	25	50	530	2	-0.1		
2750-2760	20	110	510	2	-0.1		
2760-2770	25	160	0.11%	2	-0.1		
2770-2776	80	370	0.23%	1	-0.1		
2776-2785	0.28%	0.30%	1.6%	3	-0.1	3.3%	12.0%
2785-2787	0.17%	0.23%	0.49%	3	-0.1	0.78%	13.0%
2787-2793	155	440	0.21%	14	0.1	770	5.7%
2793-2801	265	280	410	18	.02		
2801-2809	100	260	260	2	-0.1		
2809-2816	160	420	960	16	-0.1		
2816-2818	430	810	0.47%	9	0.3	500	12.0%
2818-2820	170	190	0.17%	5	-0.1	750	4.1%
2820-2823	150	290	0.16%	5	0.3	890	4.4%
2851-2853	595	240	0.22%	12	0.2	940	5.9%
2853-2856	695	1000	0.79%	4	0.1	0.13%	23.0%
2856-2866	775	160	200	44	-0.1		
2866-2876	610	230	210	9	-0.1		

ASSAY LOG - DRILL HOLE MB-4 (continued)

	ppm Cu	ppm Pb	ppm Zn	ppm Ag	ppm Au	ppm Mn	ppm Fe
2876-2886	110	120	300	3	-0.1		
2886-2896	405	130	140	9	-0.1		
2896-2906	735	90	160	1	-0.1		
2906-2917	825	330	110	3	-0.1		
2917-2920	525	630	160	10.60 oz.	-0.1	840	2.4%
2920-2922	180	130	960	25	-0.1	970	2.0%
2922-2931	440	140	0.10%	1	-0.1		
2931-2940	30	70	670	-1	-0.1		
2940-2949	455	680	140	2	0.3	0.37%	5.9%
2949-2959	0.11%	310	950	1	-0.1		
2959-2968	0.26%	0.13%	0.66%	3	0.1	0.44%	8.2%
2968-2978	0.15%	780	0.43%	2	-0.1		
2978-2987	40	120	0.15%	-1	-0.1		

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December 14, 1993

Jim Sell
Geologist, Exploration Department
ASARCO, Inc.
P.O. Box 5747
Tucson, AZ 85703

Dear Mr. Sell:

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Sincerely yours,

Scott L. Manske

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Staff Geologist
c/o Magma Copper Co. - Superior Division
P.O. Box 37
Superior, AZ 85273
(602) 229-4256
FAX (602) 229-4323

cc: Alex Acosta
Mark VanDyke Sander
Alex Paul

enc.

Summary Log - Drill Hole MB-4

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0-1060	1060	Tertiary dacite (post mineral)
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2270-2299	29	Fault, Naco siltstone & limestone breccia with abundant massive FeOx-fragments.
2299-2302	3	Vein-95% MnOx, 5% FeOx, lower contact @ 55° dip
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2437-2787	350	Devonian Martin formation 2437-2501 "Last black" siltstone, 2501-2621 Limestone, siltstone & dolomite, alternating. 2621-2641 Calcareous sandstone & quartzite 2641-2776 "Hanging wall" dolomite 2776-2781 Replaced beds, 30% FeOx-MnOx 2781-2787 "Footwall" siltstone, bleached
2787-2929	142	Cambrian Bolsa quartzite-upper unit 2787-2788 Vein - 60% FeOx 2788-2822 Fault, quartzite breccia w/abundant FeO 2822-2853 quartzite, ±2% FeOx 2853-2856 Fault, ±25% FeOx, 50° dip 2856-2929 quartzite ±1% pyrite ~10 oz Ag!
2929-3048	119	Cambrian Bolsa quartzite-Lower unit 2929-2978 quartzite, siltstone, conglomerate, alternating, ±3% pyrite 2978-3048 Sand, silt & conglomerate alternating
3048-3051	3	Fault
3051-3224	173	Precambrian diabase

ASSAY LOG - DRILL HOLE MB-4

	ppm Cu	ppm Pb	ppm Zn	ppm Ag	ppm Au	ppm Mn	ppm Fe
Tw 1080-1100	95	60	170	1	-0.1	840	2.1%
1100-1120	315	90	390	-1	-0.1	0.14%	4.7%
1120-1130	345	70	370	-1	-0.1	0.13%	4.7%
1130-1150	675	80	380	-1	-0.1	0.14%	6.1%
1150-1170	760	80	400	-1	-0.1	0.13%	6.0%
1170-1190	485	60	250	-1	-0.1	980	4.6%
1190-1210	465	50	260	-1	-0.1	950	4.4%
1210-1230	495	50	260	-1	-0.1	960	4.5%
1230-1250	565	60	300	-1	-0.1	0.14%	5.2%
1250-1270	435	50	310	-1	-0.1	0.12%	5.2%
1270-1290	325	50	280	-1	-0.1	0.10%	4.8%
1290-1310	330	60	260	-1	-0.1	860	4.7%
1310-1330	315	60	300	-1	-0.1	0.13%	5.0%
1330-1350	290	60	320	-1	-0.1	0.15%	4.3%
1350-1370	260	40	280	-1	-0.1	0.17%	4.4%
1370-1385	415	70	470	-1	-0.1	0.17%	5.1%
1385-1398	290	60	420	-1	-0.1	0.18%	5.0%
1398-1422	425	80	600	-1	-0.1	0.18%	7.1%
1422-1430	350	70	610	-1	-0.1	0.21%	6.1%
1430-1445	420	70	820	-1	-0.1	0.18%	5.7%
1445-1454	410	70	580	-1	-0.1	0.16%	5.2%
1454-1475	320	50	400	-1	-0.1	0.16%	5.7%
1475-1488	405	50	390	-1	-0.1	0.16%	5.9%
1488-1508	400	60	470	-1	-0.1	0.13%	6.1%
1508-1528	500	60	530	-1	-0.1	0.15%	6.5%
1528-1548	390	70	660	-1	-0.1	0.13%	6.3%
1548-1565	390	60	560	-1	-0.1	0.16%	6.5%
1565-1585	360	70	0.16%	-1	-0.1	0.14%	6.2%
1585-1605	390	70	600	-1	-0.1	0.20%	6.2%
1605-1625	395	80	810	-1	-0.1	0.15%	6.5%
1625-1645	410	90	0.13%	-1	-0.1	0.18%	6.1%
1645-1665	240	90	750	1	-0.1	0.20%	3.9%
1665-1685	100	80	360	2	-0.1	0.11%	2.0%

Tw

ASSAY LOG - DRILL HOLE MB-4 (continued)

	ppm Cu	ppm Pb	ppm Zn	ppm Ag	ppm Au	ppm Mn	ppm Fe	
1705-1725	160	80	520	1	-0.1	0.12%	2.4%	
1725-1745	165	70	530	1	-0.1	0.13%	3.4%	Tw
1745-1765	155	90	500	1	-0.1	0.11%	3.3%	
1765-1785	170	100	720	1	-0.1	0.10%	3.4%	
1785-1805	150	90	320	1	-0.1	0.11%	3.3%	
1805-1825	135	70	260	1	-0.1	0.10%	3.5%	
1825-1845	120	80	230	2	-0.1	920	2.4%	
1845-1865	165	80	300	1	-0.1	950	2.4%	
1865-1880	195	90	780	1	-0.1	0.12%	3.9%	
1880-1900	150	80	860	2	-0.1	810	2.3%	
1900-1920	130	100	390	2	-0.1	0.10%	2.2%	
1920-1940	110	110	760	2	-0.1	710	1.4%	
1940-1960	145	90	500	2	-0.1	0.11%	2.4%	
1960-1980	140	100	500	2	-0.1	890	2.3%	
1980-2000	215	80	0.16%	2	-0.1	0.11%	3.0%	
2000-2020	285	120	0.23%	3	-0.1	0.27%	2.4%	
2020-2040	230	110	900	2	-0.1	0.18%	2.3%	
2040-2060	100	90	480	2	-0.1	930	1.6%	
2060-2080	80	80	490	2	-0.1	850	1.9%	
2080-2095	305	220	0.11%	1	-0.1	0.18%	4.2%	
2267-2270 3	0.12%	30	750	-1	-0.1	650	9.0%	TPN
2270-2273 3	0.28%	60	0.28%	1	-0.1	0.27%	5.7%	
2273-2281 8	.0275	130	160	-1	-0.1	440	3.8%	
2281-2291 11	.0615	970	410	1	-0.1	650	6.5%	
2291-2299 8	0.43%	0.22%	0.38%	2	0.5	0.29%	32.0%	Pin fault
2299-2302 3	0.93%	0.75%	2.1%	54	-0.1	19.2%	20.0%	VN oxidized
2302-2312 10	0.19%	950	0.70%	8	-0.1	4.2%	2.5%	Me
2312-2319 7	0.12%	360	0.42%	9	0.2	0.85%	2.1%	neg acid
2319-2333 14	.0460	650	0.31%	10	-0.1			
2333-2340 7	0.74%	0.86%	1.7%	29	-0.1	5.2%	7.1%	vn acid
2340-2343 3	0.26%	930	0.84%	13	-0.1	2.1%	2.8%	
2343-2358 15	.0615	450	0.64%	13	-0.1			neg acid
2358-2361 3	0.31%	0.61%	2.7%	58	-0.1	5.9%	3.8%	neg bad acid
2361-2363 2	0.98%	0.69%	7.4%	6	0.1	0.55%	21.0%	neg bad
2363-2366 3	0.26	1.89	3.1			5.6	2.4	

ASSAY LOG - DRILL HOLE MB-4 (continued)

	ppm Cu	ppm Pb	ppm Zn	ppm Ag	ppm Au	ppm Mn	ppm Fe	
2363-2366	0.26%	1.89%	3.1%	82	-0.1	5.6%	2.4%	resulted acid
2366-2372	100	280	0.14%	14	-0.1			
2372-2379	165	390	0.18%	3	-0.1			
2379-2382	0.25%	500	0.62%	1	-0.1	0.32%	12.0%	
2382-2392	310	280	0.22%	3	-0.1			some rgl text oxidized
2392-2402	305	210	0.13%	2	-0.1			
2402-2412	100	140	700	2	-0.1			
2412-2423	355	80	0.11%	2	-0.1			
2423-2427	0.27%	160	0.57%	1	-0.1	0.48%	8.7%	
2427-2437	440	110	0.14%	2	-0.1			Me
2437-2440	0.31%	200	0.46%	2	-0.1	0.11%	5.9%	Dm
2440-2450	230	60	760	2	-0.1			
2450-2460	20	50	520	1	-0.1			
2460-2470	25	50	530	2	-0.1			
2750-2760	20	110	510	2	-0.1			
2760-2770	25	160	0.11%	2	-0.1			
2770-2776	80	370	0.23%	1	-0.1			
2776-2785	0.28%	0.30%	1.6%	3	-0.1	3.3%	12.0%	"Aled 30% oxidized
2785-2787	0.17%	0.23%	0.49%	3	-0.1	0.78%	13.0%	Dm
2787-2793	155	440	0.21%	14	0.1	770	5.7%	Eb
2793-2801	265	280	410	18	.02			partly oxidized
2801-2809	100	260	260	2	-0.1			
2809-2816	160	420	960	16	-0.1			
2816-2818	430	810	0.47%	9	0.3	500	12.0%	
2818-2820	170	190	0.17%	5	-0.1	750	4.1%	
2820-2823	150	290	0.16%	5	0.3	890	4.4%	
2851-2853	595	240	0.22%	12	0.2	940	5.9%	
2853-2856	695	1000	0.79%	4	0.1	0.13%	23.0%	
2856-2866	775	160	200	44	-0.1	50 ppb	25% FeOx	
2866-2876	610	230	210	9	-0.1			

ASSAY LOG - DRILL HOLE MB-4 (continued)

	ppm Cu	ppm Pb	ppm Zn	ppm Ag	ppm Au	ppm Mn	ppm Fe	
2876-2886	110	120	300	3	-0.1			
2886-2896	405	130	140	9	-0.1			
2896-2906	735	90	160	1	-0.1			
2906-2917	825	330	110	3	-0.1			
2917-2920	525	630	160	10.60 oz.	-0.1	840	2.4%	Eb
2920-2922	180	130	960	25	-0.1	970	2.0%	upper
2922-2931	440	140	0.10%	1	-0.1			low
2931-2940	30	70	670	-1	-0.1			
2940-2949	455	680	140	2	0.3	0.37%	5.9%	
2949-2959	0.11%	310	950	1	-0.1			Eb
2959-2968	0.26%	0.13%	0.66%	3	0.1	0.44%	8.2%	
2968-2978	0.15%	780	0.43%	2	-0.1			
2978-2987	40	120	0.15%	-1	-0.1			

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