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FACSIMILE MESSAGE

DATE: 12/19/94

TO: Bill Rehrig

FROM: J D Sell

PHONE/FAX: To: 1-303-741-5625

SUBJECT: Robbers' Roost Granodiorite Porphyry

NUMBER OF PAGES INCLUDING COVER 2

I believe you'll be able to find the area and the drill holes SW of the town of Tombstone, along the Charleston Road.

Cheers &
Happy Holidays

☺

OOPS!
I note that BHP mislabled the Sections — Should be Sec. 29 & 30!
Well — well what's a mile or so?

☺

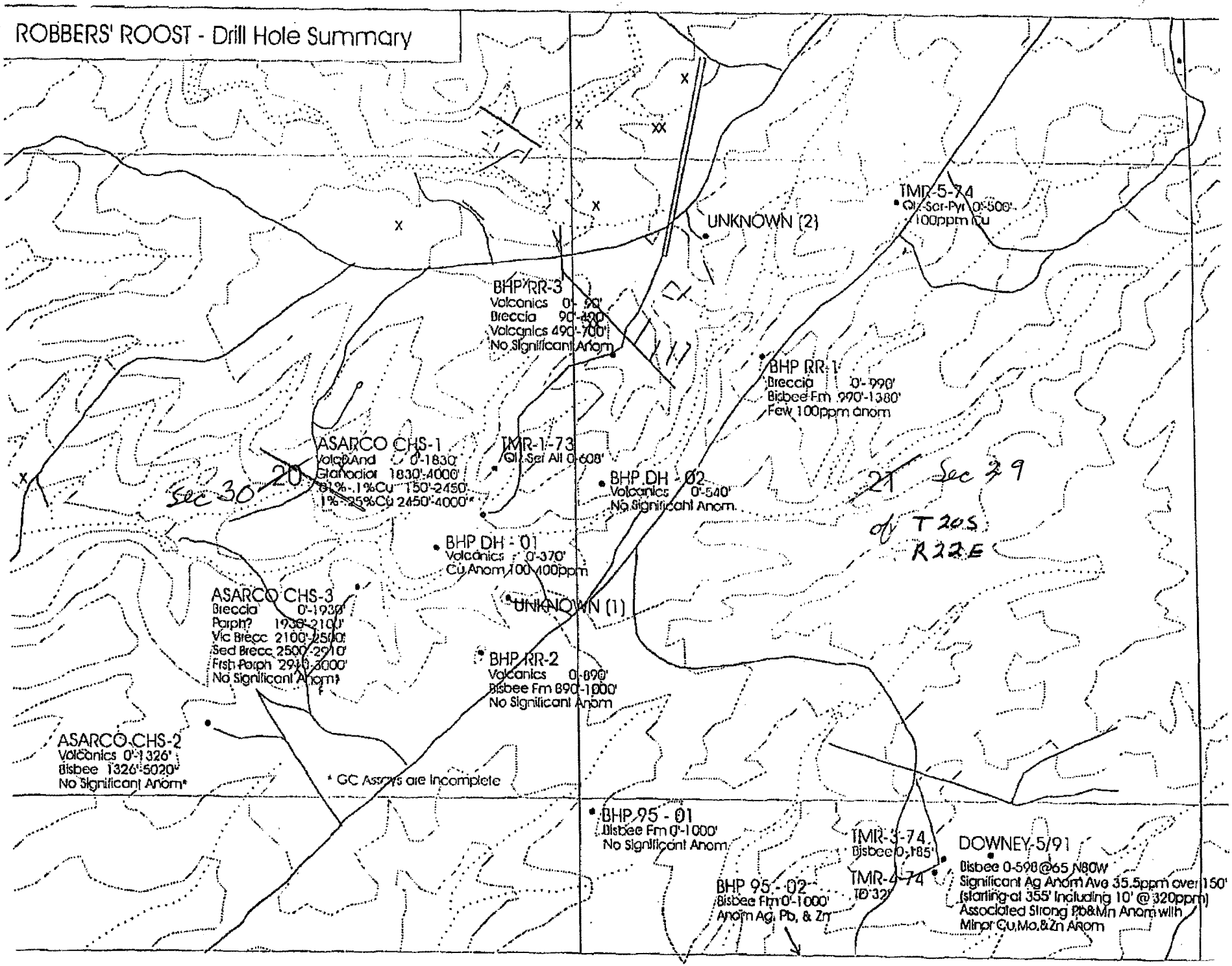
ASARCO

EXPLORATION DEPARTMENT

JAMES D. SELL

ASARCO INCORPORATED P.O. BOX 5747 TUCSON, AZ 85703
1150 NORTH 7TH AVENUE (602) 798-7714

ROBBERS' ROOST - Drill Hole Summary



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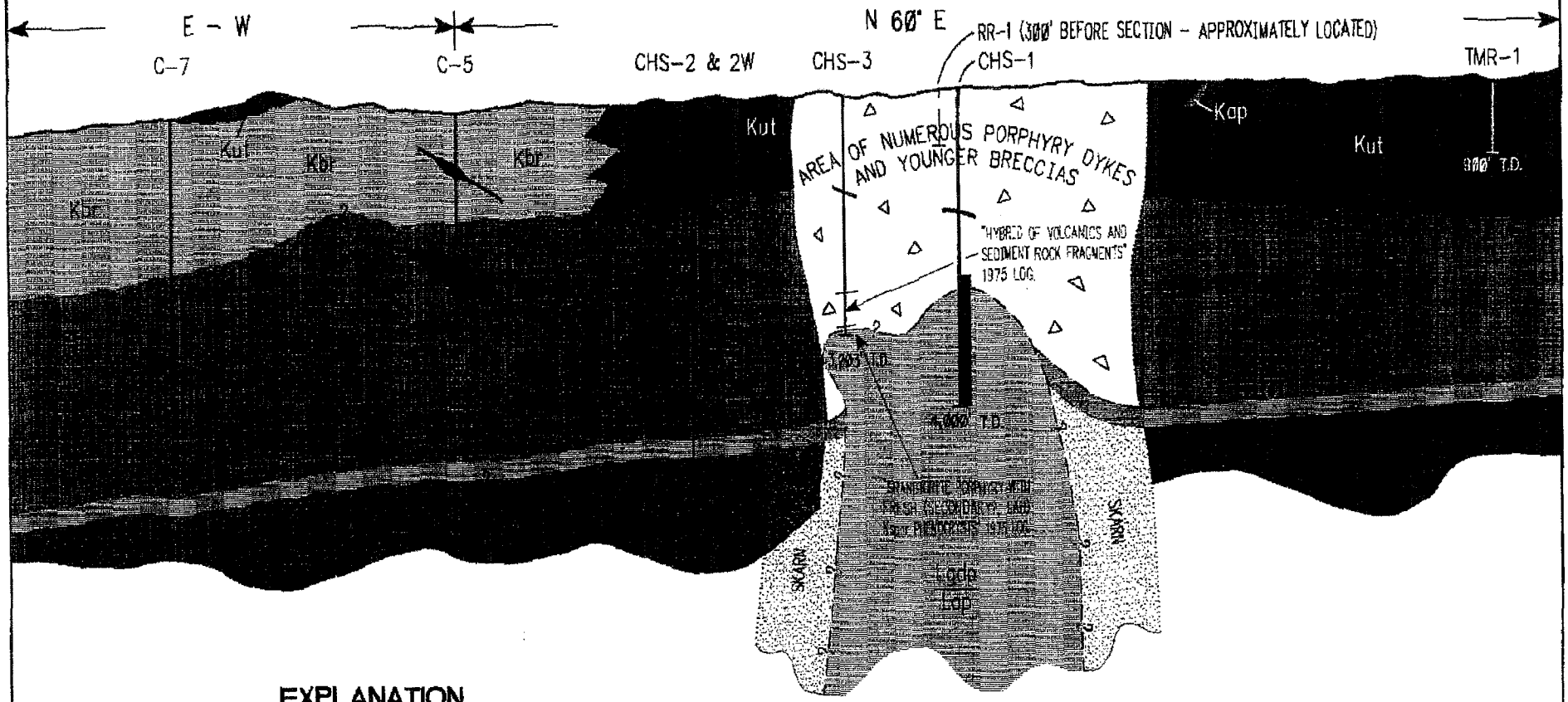
1150 NORTH 7TH AVENUE (602) 798-7714

GEOLOGIC CROSS SECTION
(Looking Northwest)



EXPLANATION

- LARAMIDE HYDROTHERMAL BRECCIAS WITH DIKES OF Lap & Lgdp.
- LARAMIDE GRANODIORITE PORPHYRY & ANDESITE PORPHYRY (Lgdp).
- Kut LARAMIDE UNCLE SAM TUFF.
- Kbr LARAMIDE BRONCO VOLCANICS.
- CRETACEOUS BISBEE GROUP.
- Kbg CRETACEOUS BISBEE GLANCE CONGLOMERATE.
- PALEOZOIC NACO LIMESTONE.
- GEOLOGIC CONTACT - APPROXIMATELY LOCATED.
- GEOLOGIC CONTACT - INTERPRETED.

> 0.1% Cu ASSAY

2000 1000 0 2000

SCALE 1" = 2,000'

PREPARED FOR:
EXCELLON RESOURCES, INC.

PREPARED BY:
JAB

ROBBERS ROOST PROJECT
Tombstone Mining District, Cochise County, Arizona
From ASARCO 1975

ASARCO CHARLESTON PROJECT
Updated by James A. Briscoe October 20, 1994

ASARCO

EXPLORATION DEPARTMENT

JAMES D. SELL

ASARCO INCORPORATED P.O. BOX 5747 TUCSON, AZ 85703
1150 NORTH 7TH AVENUE (602) 798-7714

Claude

Chis-1 TABLE of compos. assays

0 - 1100	1100'	approx	.03% Cu or less			
1100 - 1650	550'	"	.09%			
1650 - 2525	875'		.05% or less			
2525 - 2665	140'		.15%	350'	.18%	455' .16%
2665 - 2875	210'		.195%			
2875 - 2980	105		.12%			
2980 - 3180	200'		.05			
3180 - 3365	185'		.135	425	.19%	
3365 - 3605	240'		.233			
3605 - 3905	300'		.053			
3905 - 4002	97'		.169%			
2525 - 4002	1477	—	.133% (.1331)			

JRK
23 Sept

cpy to ~~RBC~~ JRK

5-29-75

3/7/75 – 5/29/75 801'
5/29/75 – 9/4/75 (2949') – to be drilled in 3 months

BILL:

RE CHARLESTON
YOUR ATTACHED NOTE

CHS-2W was 4227' @ 2300 hrs on 7 Mar '75. This was in a hole originating at a wedge-out at 2488' in CHS-2 (which had been lost after attaining a depth of 3415'.

Final depth reached in CHS-2W was 5028' on 6 May '75.

Thanks on contract requirements. Discussed subject w/ RBC on 5-28-75 because of extended salvage operation.

NW

CHS-1	0-3753'	IN	4 Mos.-2 wks.
CHS-2	0-3415'	IN	3 Mos.-1 wk.

3.20.27 W.L.K.

SKYLINE LABS, INC.
Hawley & Hawley, Assayers and Chemists Division
1700 W. Grant Rd., P.O. Box 50106, Tucson, Arizona 85703
(602) 622-4836

W. L. K.
APR 4 1975

Charles E. Thompson
Arizona Registered Assayer No. 9427
William L. Lehmbeck
Arizona Registered Assayer No. 9425

CERTIFICATE OF ANALYSIS

ITEM NO.	SAMPLE IDENTIFICATION	Au ppm	Ag ppm	Cu %	Pb ppm	Zn ppm	Mo ppm			
	Chs-2 W 4205-4215	<0.02	27	1.04	295	220	< 2			

TO:
American Smelting & Refining Co.
Southwestern Exploration Div.
P. O. Box 5747
Tucson, Arizona 85703

Attn: Mr. John King

REMARKS:

CERTIFIED BY: 8427

DATE REC'D:	DATE COMPL.:	JOB NUMBER:
3/14/75	3/26/75	750573

WLK

Charleston Proj.

WLK

Proposed Chs-3
Site

The map shows the proposed location for Chs -3 which will be flagged tomorrow. Below is the geochem from Chs-2W - 4205-4215.

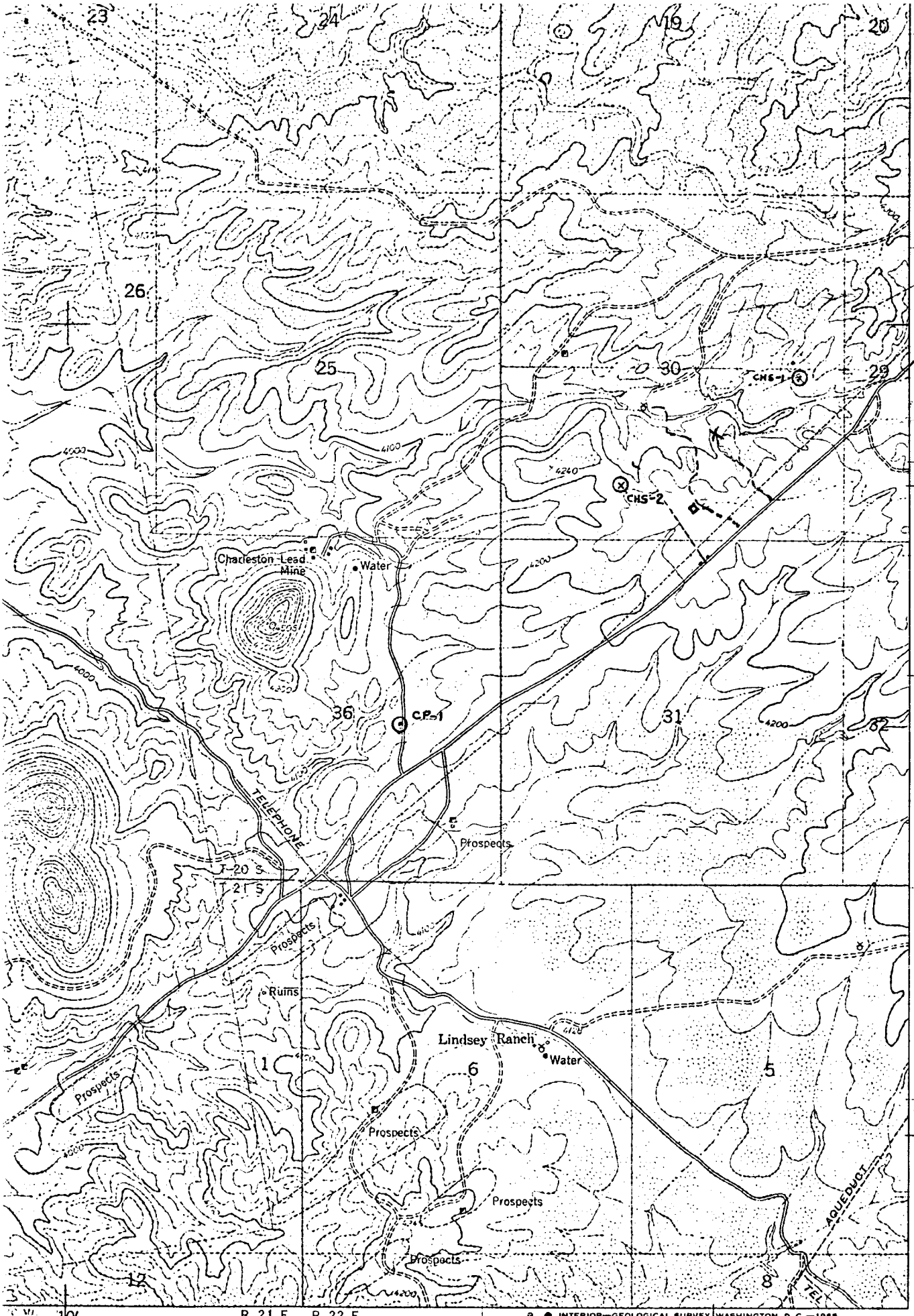
Cu	Pb (ppm)	Zn (ppm)	Mo (ppm)	Au	Ag
1.04%	285	220	<2	<.02	2.7 ppm

The copper probably represent 20' intercept. of similar grade 4195-4215.
May have forty feet of .5% Cu 4175-4215

I feel this interval should be geochem 4150-4250

Also feel for the Kb ~~entire~~ point of the hole Chs 2W every ten feet geochemed. 50' composite geochem out of every 1000' feet.

JRK

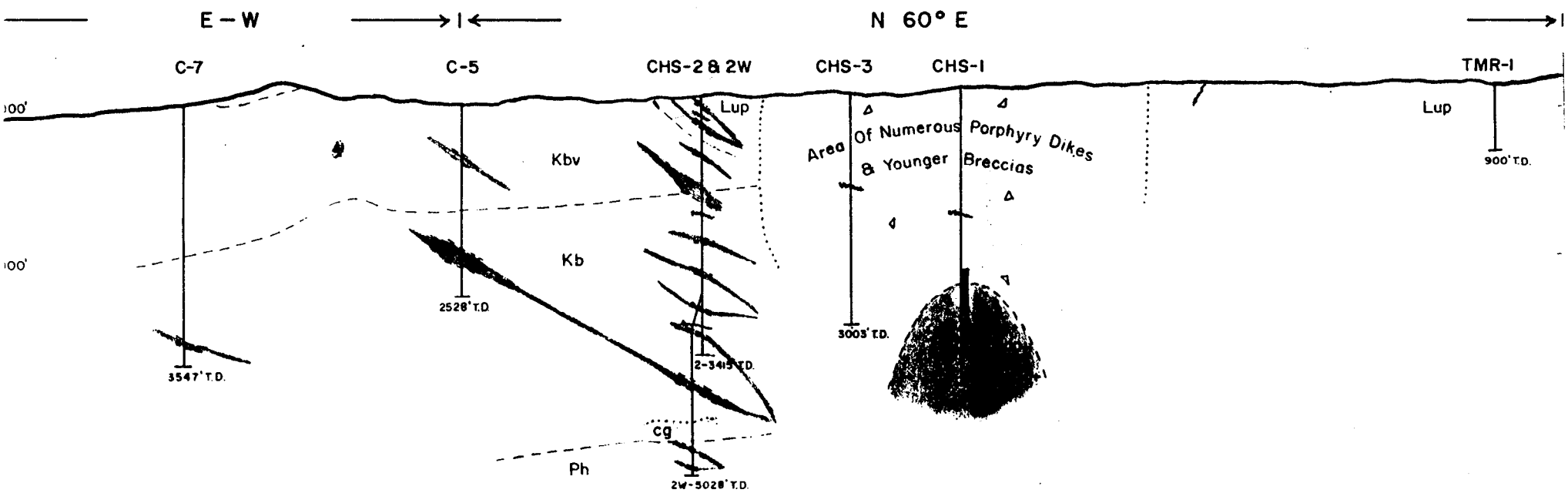


INTERIOR—GEOLOGICAL SURVEY, WASHINGTON, D. C.—1965

ROAD CLASSIFICATION

GEOLOGIC CROSS SECTION

(LOOKING NORTHWEST)



EXPLANATION

- Laramide Hydrothermal Breccias With Numerous Dikes Of Lan & Lgdp
- Lgdp - Laramide Granodiorite Porphyry & Andesite Porphyry (Lan)
- Lup - Laramide Uncle Sam Porphyry
- Kbv - Cretaceous Bronco Volcanics
- Kb - Cretaceous Bisbee Group
- Ph - Paleozoic Horquilla Limestone
- faults

> .1 % Cu assay

CHARLESTON PROJECT

COCHISE COUNTY, ARIZONA

SCALE 1" = 2,000'

1975

~~JHC~~
~~cc: for JRK, SRD~~

July 2, 1975

WLK:

W. L. K.
JUL 2 1975

CHARLESTON

It would appear that CHS-3 is following same alteration and fluid inclusion pattern as CHS-1

The relatively weaker alteration in CHS-3: >90 (fresh plagioclase) is worrisome, but may simply be a local phenomenon

Fluid inclusions about the same in type as CHS-1 (favorable) but are less abundant (not so favorable)

Suspect more samples needed for definitive comparison of CHS-1, 2, and 3.

F.T.G.

PETROGRAPHIC ANALYSIS

Section No. CHS-3: 790

Rock Name
Schieffelin granodiorite (?) porphyry

Megascopic description

Massive, gray, with irregularly distributed white, sericitized feld pheno in darker gray siliceous groundmass (fine gr.); elongate gray pods up to 1/8" long probably c.gr. sericite + perovskite pseudomorphs after mafic; 4% diss pyrite. Rock texture clearly visible.

Microscopic description

Minerals

quartz - 26% 1% rounded, wk. resorbed, c.gr. phenocrysts; 25% fine gr uniformly distrib. in matrix.

orthoclase - 20%; mostly as anhedral, c.gr. grains - phenocrysts, generally with abundant particulate cwd; possibly 2-5% med-f gr. in matrix.

plagioclase - 20%; c.gr. euhed. pheno with heavy dusting of particulate material similar to 2nd kspar; however plag. twinning is clearly visible; pervasive light dusting of sericite

kaolinite - tr.

sericite - 30%; fine gr., dissem. throughout matrix; in masses after former mafics; dusting on plag.

barite - tr.

sulfide - 4%

Textures

Well-developed porphyritic texture. Alteration is somewhat unclear due to uncertainty of whether any of the kspar is hydrothermal. Abundance of plagioclase, regardless of particulate and sericite dusting, is anomalous, in view of the abundance of sericite and their apparent strong alteration in hand specimen.

Phyllic alteration

ETG - 11.17.1975

FLUID INCLUSION PETROGRAPHY

Section No. CHS-3:790

Rock Type
Schieffelin granodiorite por.
(500x)

Host mineral
quartz phenocryst

Abundance, size of inclusions
a.) size - small to large, large incl mostly Type 2; 25% neg. xtls
b.) abundance - 20 incl / 0.04 mm²;

Distribution of inclusions
Abundance somewhat variable as inclusions tend to be more common near edges of qtz grains.
Estimate 50% primary.

Inclusion data

Type	Abundance	Size	Fluids - vol. %	Minerals
1	2%	S-L	gas = 20%	
2	95%	M-L	gas = 60-90%	opaque (?)
3	3%	S-L	gas = 20-40%	2%-halite 1%-opaque tr-hematite tr-chalcopyrite (?)

Halite most abundant of all daughter minerals; chalcopyrite guessed at from tetrahedral shape.

Type 2 inclusions clearly more abundant near border of grains
Type 3 " probably uniform or more abundant near center of grains.

Appears that boiling event has been superimposed on an earlier saline event; perhaps saline fluids are true primary inclusions

F.T.G. - July 2, 1975

PETROGRAPHIC ANALYSIS

Section No. CHS-3: 852

Rock Name
Schieffelin granodiorite (?) porphyry

Megascopic description
Massive, grayish; greenish-white altered feldspars in fine-gr. matrix of med. gray quartz-sericite; rock texture mostly destroyed
3% diss py; 2% py in 1/16" qtz-py veins w. no selvage.

Microscopic description

Minerals
quartz - 34% 2% med-cgr rounded phenocrysts, 2% med. gr. subhedral uniform size in qtz-py vein; 30%, uniform med-f. gr., equant in matrix

sericite - 35%; fine gr. discem in matrix and in large masses after former feldspar pheno with brownish material

brownish, translucent material - 20%; in former feldspar pheno. cites with sericite; may have been another mineral no rendered amorphous (?) by alteration? was diaspore (?.?)

chlorite - 5%; discem; fine gr; almost isotropic, probably Mg-rich, Fe-poor

pyrite - 6% discem. and in center of qtz-py vein

Textures
Clearly a porphyritic igneous rock, now strongly altered.
Abundance of chlorite is anomalous in a strong phyllic alteration such as this

F.T.G. - July 2, 1975.

FLUID INCLUSION PETROGRAPHY

Section No. CHS-3: 852

Rock Type
Schiefelin granod(?) por
(500x)

Host mineral
quartz phenocryst

Abundance, size of inclusions
size - small to large; Type 2 clearly the largest; 20% negative xtls.
abundance - 50/0.04mm²

Distribution of inclusions
Abundance somewhat variable in larger phenocrysts with inclusions clearly more abundant near edge of grain.

Inclusion data

Type	Abundance	Size	Fluids - vol. %	Minerals
1	trace	S	20%	
2	98%	M-L	60-90%	
3	1%	S-M	20-40%	halite sylvite high relief rods blocky, birefringent hematite

Association hal - blocky biref is common; again the type 3 inclusions are more abundant near center of phenocryst as though they have been destroyed by an overpoint of boiling fluids near the edges of the grains. Indication is therefore that original magmatic fluids may have been saline before boiling.

F.T.G. - July 2, 19

+ abundant
✓ minor
tr. tr.

Final depth 4003
Elevation
Coordinates
Inclination Vertical

ASARCO
GEOLOGIC LOG

Project Charleston

HOLE NO. Chs 1
Sheet No. 1
Date Completed
Logged by J R King

From	To	Interval	Size	Spec	Recovery %	Total % Sulf.	Diss/Fract	Mineralization Ratio	Py	Cpy	Mo	Others	Alteration Phy	Arg	Pot	Mag	Anhy	Rock	Remarks
0	22																		PLUG BIT
22	181	159	NC		+85	6-8	3/1		+				✓	+				U.S. por	oxidized to 150' alter is intense, breccia cavities occas. pres small fault 181-186
181	228	47	NC		"	5-7	3/1		+				✓	+				An por	PROB dike,
228	278	50	NC		"	4-8	3/1		+				✓	+				Δ (An por)	Heterolithic breccia with open cavities
278	356	78	NC		"	7	3/1		+				+	✓				Δ	as above. less OPEN cavities, small FAULT 236 & 284.
356	450	94	NC		"	6-8	3/1		+				+	✓				Δ	good breccia w/ FLUI NATURE as w/ MIN.
450	505	55	NC		"	3-5	4/1	100/1	+	tr			+			tr		An por	mix Gd por, alter becoming more abd, mag as disd & vns, pres fault 470-490
505	690	185	NC		"	5-7	3/1	100/1	+	tr			+					Δ	beautiful heterolith breccia as seen in outcrop
690	811	121	NC		"	4-6	2/1		+				+					An por	breccia in part alter decreasing in int $CaCO_3$ occurring along fract.
811	831	20	NC		"	6	4/1		+				+					Gd por	less gmss, lighter colour, alter remainin same intensity
831	916	85	NC		"	4-5	2/1	20/1	+	tr			+			✓		And por	somewhat fluidized & brecciated, cpy both dis & fract
916	950	34	NC		"	3-4	1/1	15/1	+	✓	?		+			tr		Gd por	well mineral but alter. decreasing

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ASARCO
GEOLOGIC LOG

Project Charleston

HOLE NO. Chs-1
Sheet No.
Date Completed
Logged by J. R. King

From	To	Interval	Size	Spec	Recovery %	Total % Sulf.	Diss/Fract	Mineralization Ratio	Py	Cpy	Mo	Others	Alteration Phy	Arg	Pot	Mag	Anhy	Rock	Remarks
950	960	10	NC		+85	4	1/2		+				+			tr		Δ	intrusive breccia mod to strong alter
960	1000	40	NC		+85	5	2/1		+				+			tr		6d por	as before, small faults 967, 998.
1000	1021	21	NX		+85	5	2/1		+				+			tr		"	as above
1021	1411	390	NX		+85	3	1/2	20/1	+	tr			✓			✓	✓	An por	alter - weak to moder chl increasing.
1411	1658	247	NX		+85	2-4	1/3	15/1	+	✓			+		tr	✓	✓	Δ	intrusive heterolith breccia no open cavities faulting 1500-17, 1610-12
1658	1829	171	NX		+85	2	1/1	15/1	+	tr			+			✓	✓	6d por	as before, shows several zones of brecciation, good gouge 1792-1800, 1829
1829	2151	322	NX		+85	3	1/2	20/1	+	tr			+			tr	✓	6d por	as before, alter. mod to strong
2151	2312	161	NX		+85	4	1/2	25/1	+	tr			+				+	Δ-6d por	variable por & breccia, alter stro
312	2392	80	NX		+85	5	1/1	30/1	+	tr		?Gn	+				+	6d por	small fault-2307 alter strong
2392	2617	225	NX		+85	4	1/2	15/1	+	✓			+			✓	✓	Δ-6d por	as above alter mod-strong heterolith breccia in part, some stockwork veining.
2617	2879	262	NX		+85	3	1/3	10/1	+	✓			+		tr	tr	tr	Δ	Heterolith breccia & gd por - mix - au por alter mod to strong
2879	2947	68	NX		+85	2	1/4	20/1			?		+		tr	✓	tr	6d por	as before alter wk to mod.
			END OF NX																

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ASARCO
GEOLOGIC LOG

Project Charleston

HOLE NO. Chi 1
Sheet No.
Date Completed
Logged by A R King & S.R. Dan

From	To	Interval	Size	Spec	Recovery %	Total % Sulf.	Diss/Fract	Mineralization Ratio	Py	Cpy	Mo	Others	Alteration Phy	Arg	Pot	Mag	Anhy	Rock	Remarks
2947	3005	58	Bx		+85	2	1/4	20/1	+	✓	?		+		?	tr		Gd por	as before, An por 29-2967, alteration weak to moderate
3005	3038	33	Bx		+70°	2	?											cataclastic - broken - faulted	
3038	3469	431	Bx		+85°	1-2	1/4	10/1	+	✓			+		tr	✓		Gd por -	mix An por, alter weak to moderate cpy more abundant
3469	3605	136	Bx		+85	2	1/3	8/1	+	✓	?		+		✓	tr		Gd por -	mix An por as above, some zones of better cpy zone
3605	3656	51	Bx		+65	2	1/2	20/1	+	tr								fault	
3656	3749	93	Bx		+85	1-2	1/1	30/1	+	tr			+		✓	tr		Gd por	with some zones of An por (3600-14). alteration weak
3749	3890	141	Bx		+85	1	1/2	15/1	+	✓	?		+		✓	tr		Gd por	as above, small fault 3890, altera weak.
3890	4002 TD	52	Bx		+85	2	1/2	10/1	+	✓	?		+		✓	✓		Gd por.	mix an por, as before, alteration weak, small fault 3913, 3922.

nal depth -3405- wedge 5028
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ASARCO
GEOLOGIC LOG

+ [illegible]
✓ minor
tr trace

Project Charleston

HOLE NO. Chs-2
Sheet No. 1
Date Completed
Logged by J R King - S R Da

From	To	Interval	Size	Spec	Recovery %	Total % Sulf.	Diss/Fract	Mineralization Ratio	Py	Cpy	Mo	Others	Alteration Phy	Arg	Pot	Mag	Anhy	Rock	Remarks
0	21																		PLUG BIT
21	182		NC		+85	?	? 1/3	-					✓	+				Lus por	oxidized, with dikes of And por 80-100, 132-159, alter is usu. mod in Lus por, wk-v in And por, numerous small faults 30, 80-85, 10 103, 132-133, CO_3 UNIN
182	619?		NC		+85	1-3	20/1		+				✓	+				Lus por "Uncle Sam"	as above, alter & uni variable wk-mod, An por dikes 182-19 274-287, 429-463, pebble dikes freq. assoc w/ above, faulting 166, 195-208, 219-221, 236 267-274, 289, 310, 334 326-403, 447, 460, 480
619	1226		NC		+85	1-3	20/1		+			tr GN Sph	+	+				Klbu	bronco volcanics contact approx, alter moderate, min some weaker; An por dik 768-808, 919-923, 940-94 1166, breccia 1185 1226 - strong alter
			↓ 1012 Nx																
1226	1327		Nx		+90	1	20/1		+	tr		tr GN Sph	✓	+				An por	dike - variable alter w/ some epi.
1327	1355		Nx		+90	1-2	10/1		+				✓	+				BISBEE	sediments, silts-sand Bedding 10°, alter weak to mod.
1355	1407		Nx		+95	1	20/1		+					✓				An por	as above, epidote common, min very weak

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ASARCO
GEOLOGIC LOG

Project Charleston

HOLE NO. Chs-2
Sheet No.
Date Completed
Logged by JRK, & S.R.D.

From	To	Interval	Size	Spec	Recovery %	Total % Sulf.	Diss/Fract	Mineralization Ratio	Py	Cpy	Mo	Others	Alteration Phy	Arg	Pot	Mag	Anhy	Rock	Remarks
1407	1853		NX		+95	≥1	20/1		+				tr	✓				Bisbee	sediments fg sandst, siltst, mudstones, alt weak to mod.; fault 1560-1579, 1588, 1646 pebble dike 1709, bedding 7°;
1853	1874		NX		+95	1	20/1		+					+				An por	mafic dacite w/ scattered qtz phenocr and alter mod
1874	2210		NX		+95	≥1	25/1		+	?		tr ? Gn		✓			✓	Bisbee	sediments - as ab alter. weak, poss flourite, fault 2187 92, bedding 10°
2210	2268		NX		95	1-2	20/1		+					+			+	An por	breccia - pebble dike in part, Bisbe frags in Δ, strong anhydrite UNING
2268	2302		NX		95	≥1	10/1		+					+				Bisbee	as above, nodular mudstones, siltst, sandstones, bedd., 12°
2302	2352		NX		95	2-4	10/1		+				+	+				Peb dike	- fault zone
2352	2949		NX		95	1-4	10/1		+	tr		tr Gn Sph	✓	+				Bisbee	- as above, alter weak - mod, bedd 15°, numerous an dacite dikes, 2470-8 2503-40, 2572-76, 2592-2625, 2671-27 2878-2903, epi comm
2949	3033		3002 BX		85	3-6	10/1						+	✓		tr	✓	An por -	Gd por alter moder bounded by a fault
3033	3093		Bx		65													FAULT	involves both sediment

nal depth 3405
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ASARCO
GEOLOGIC LOG

Project Charleston

HOLE NO. Chs-2
Sheet No. 3
Date Completed
Logged by JRK

From	To	Interval	Size	Spec	Recovery %	Total % Sulf.	Diss/Fract	Mineralization Ratio	Py	Cpy	Mo	Others	Alteration Phy	Arg	Pot	Mag	Anhy	Rock	Remarks
3093	3245		BX		+90	1-4	15/1		+	tr		tr 6N	✓	✓		tr	✓	BISBEE	[illegible], sandst limey silt-stone, alter mod, bedding 5°, dike at 3112-3149.
3245	3260		BX		+90	2-4	5/1	50/1	+	tr			+		tr		tr	Au pow	as before, alter strong
3260	3415		BX		+90	1-4	5/1		+	tr		tr 6N SPH	✓	+			tr	BISBEE	siltst, limey silt, limest, minor conglo alter is mod, epi common, silicified
							/loss	hole	due	to	wash	at	3050	ft	;			wedge	set for Chs-2W1 at 2495

nal depth 5028
levation
ordinates
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ASARCO
GEOLOGIC LOG

Project Charleston

HOLE NO. Chs-2W
Sheet No. 4
Date Completed
Logged by JRK

From	To	Interval	Size	Spec	Recovery %	Total % Sulf.	Diss/Fract	Mineralization Ratio	Py	Cpy	Mo	Others	Alteration Phy	Arg	Pot	Mag	Anhy	Rock	Remarks
wedge			NX																
2495	3415		3202		90														as described on
			BX																page three.
			↓																
3415	3895		Bx		90	1-2	1/3		+	tr	tr	GN SPH	+	✓			✓	Bisbee	siltst, limesilt, sandst
																			epidote, chlor, garnet
																			prevalent, alter
																			mod to strong
3895	4075		Bx		90	1-2	1/2		+				+		tr			An por	note related to
																			Gd por, alter variable
																			silicification noted
4075	4493		Bx		+90	1	1/1		+	tr		tr GN SPH	+		?		+	Bisbee	siltst, limest,
																			alter strong
																			silicification
																			bedding 10°.
4493	4828		Bx		+90	≥1	2/1		+	tr		tr GN SPH	✓	✓				Bisbee	limest, congl. lim
																			stone, alter wk
																			to mod, silicificati
																			variable, bedding
																			10°
4828	4959		Bx		+85	≥1	2/1		+			tr GN SPH						Paleozoic	marble
																			alter is weak
			↓																bedding 5°
4959	4990		4985		+90	2-4	3/1		+				+					An por	fine grnd, mod
			AX																altered, poor
			↓																core recovery of
																			contacts, silificat
																			noted
4990	5028		AX		+80	.5-2	3/1		+	tr		tr GN SPH						Paleozoic	marble, as
																			before, contacts
																			poor core recovery
																			otherwise alteration
																			wk, bedding 5°
																			small fault 5027-28

nal depth 3003
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ordinates
clination Vertical

ASARCO
GEOLOGIC LOG

tr trace
✓ minor
+ abundant

Project Charleston

HOLE NO. Chs-3
Sheet No. 1
Date Completed
Logged by John R. King

From	To	Interval	Size	Spec	Recovery %	Total % Sulf.	Diss/Fract	Mineralization Ratio	Py	Cpy	Mo	Others	Alteration Phy	Arg	Pot	Mag	Anhy	Rock	Remarks
0	23																		Plug Bit
23	115	92	NC		+80	?1-4	–	–	+				+	+				Δ	Breccia w/ open cavities oxidation to ≈ 150' pred. por gd & US por fr
115	210	95	NC		+80	1-3	3/1		+					+				Dacpor	dacite gd; phenos of PLAG, Hb, Qtz, MAG, Py alter is relative weak bottom 10' [illegible]
210	560	350	NC		+75	3-6	5/1		+				+	✓				Gdpor Δ	breccia in part, py-qz filling some cavities alteration along faults, 225, 255, 310, 335, 355, 458, 470, 51[illegible]
560	610	50	NC		+85	3-6	4/1		+									Gdpor	as before except relative no breccia
			631																
610	1070	460	NX		+85	2-5	3/1	100/1	+	tr		tr GN SPH	+			tr	tr	Δ	heterolithic igneous breccia pred gd por frags, alter strong minor open cavity Δ [illegible]
1070	1093	23	NX		+85	2-3	5/1		+				+					Dacpor	as above except no py phenos, only plag, hb, qtz,
1093	1104	11	NX		+85	2-3	2/1		+				+					Δ	heterolithic breccia as above, alter is decreasing
1104	1266	162	NX		+90	2-3	10/1		+			tr GN SPH	+				✓	Qtz Ulz Por	with strong py. dissem. plag strongly [illegible] fault at 1260 otherwise rock is unfractured. sulfide ON NG is UNUSUALLY NON EXISTENT

nal depth 3003
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ASARCO
GEOLOGIC LOG

Project Charleston

HOLE NO. Chs-3
Sheet No. 2
Date Completed
Logged by JRK

From	To	Interval	Size	Spec	Recovery %	Total % Sulf.	Diss/Fract	Mineralization Ratio	Py	Cpy	Mo	Others	Alteration Phy	Arg	Pot	Mag	Anhy	Rock	Remarks
1266	1484	218	NX		85	2	3/1	25/1	+	tr			+		tr	tr	✓	Gd-Por	with prominent K-sp phenos. also plag hb & qtz phenos. faulting 1278, 1302, 134 some brecciation approx 1453-1484.
1484	1516	32	NX		90	2	3/1	20/1	+	✓		tr GN Sph	+			tr	✓	Δ	Heterolithic igneous breccia, with son pass sed-vole frags
1516	1587	71	NX		95	1	4/1	20/1	+	✓			✓			tr	✓	An por	alter definitely decreasing. typical of An por of Ch-1
1587	1930	343	NX		95	1-2	4/1	20/1	+	✓			✓			✓	✓	Gd-por	with prom K-spar phenos, alter varies wk to strong, overall [illegible] TWINNING reflections. An por mix 1830-1930
1930	2103	173	NX		95	1	8/1	15/1	+	✓			✓		tr	✓	✓	Gd-por	dense, relatively unjointed. K-phenos generally lacking alter weak
2103	2340	237	NX		95	≤1	4/1	10/1	+	✓			✓		✓	✓	✓	Gd por	mix and por, quite possibly a intrusive breccia zone.
2340	2501	398	NX		95	1	2/1	15/1	+	✓			✓		✓	✓	tr	Gd por	mix and por, both rocks with K-spar phenos, in part rock show definite intrusive brecciation qtz veining & mag veining prevalent

nal depth 3003
levation
oordinates
clination Vert.

ASARCO
GEOLOGIC LOG

Project Charlotte

HOLE NO. Che-3
Sheet No. 3
Date Completed
Logged by JRK

From	To	Interval	Size	Spec	Recovery %	Total % Sulf.	Diss/Fract	Mineralization Ratio	Py	Cpy	Mo	Others	Alteration Phy	Arg	Pot	Mag	Anhy	Rock	Remarks
2501	2910	409	NX		+95	2	3/1	10/1	+	✓			+		✓	✓	✓	HYBRID	VOL-STOC(?) alter mod to strong, rock f.g.; weakly pot in places, not seen in Che holes before. breccia in places, fault 275°/
2910	3003	93	NX		+95	≤1	2/1	15/1	+	✓			tr		tr	tr	tr	Gd pot	very fresh, with Kspar phenos. alter weak. mafics are chlor'd.
		TD																	

HOLE NO. Che-3

CHARLESTON PROJECT
Hole Chs-1

Depth	Cu	Mo	Pb	Zn
68-75	25	10	30	20
143-152	40	8	30	25
164-169	310	4	25	30
194-199	105	4	75	125
321-326	255	6	120	100
398-403	255	16	110	185
520-528	300	8	45	70
591-599	280	10	40	130
692-700	180	4	105	200
792-800	450	8	25	95
923-933	330	14	60	80
983-993	400	30	60	50
1087-1097	600	14	25	20
1257-1267	850	36	45	60
1347-1357	750	40	45	60
1442-1452	950	22	50	55
1552-1562	900	18	40	35
1632-1642	1350	14	35	20
1745-1754	20	22	30	5
1857-1867	235	2	15	10
1948-1958	610	6	35	40
1996-2006	475	4	20	5
2041-2051	135	30	20	5
2124-2134	1200	12	20	5
2207-2217	60	<2	10	5
2280-2290	630	2	10	10
2380-2390	620	10	10	5
2455-2465	1150	20	10	10
2525-2535	.19%	12	1000	85
2612-2622	.19%	18	20	20
2684-2694	.19%	22	20	20
2787-2797	.13%	16	15	15
2844-2854	.41%	16	15	20
2919-2929	950	10	25	15
3011-3021	425	<2	15	15
3102-3112	495	2	10	15
3231-3241	1300	<2	10	30
3305-3315	0.20%	6	15	40
3401-3411	0.25%	10	15	15
3459-3469	0.21%	<2	10	35
3545-3554	0.23%	14	10	85
3626-3636	500	6	85	110
3710-3719	430	6	220	240
3849-3858	0.23%	18	15	35
3905-3914	0.26%	4	45	160

SKYLINE LABS, INC.
Hawley & Hawley, Assayers and Chemists Division
P.O. Box 50106 • 1700 West Grant Road
Tucson, Arizona 85703
(602) 622-4836

REPORT OF SPECTROGRAPHIC ANALYSIS

Job No. 122298
H & H No. 751865
September 5, 1975

American Smelting & Refining Company
Southwestern Exploration Division
P.O. Box 5747
Tucson, Arizona 85703

Attention: Mr. John King

Values reported in parts per million, except where noted otherwise, to the nearest number in the series 1, 1.5, 2, 3, 5, 7 etc.

	Sample Number		
Element	Chs-2 4470-4479	Chs-2 4742-4747	Chs-2 5012-5021
Fe	1.5%	1%	1%
Ca	1.5%	>20%	>20%
Mg	.2%	3%	.5%
Ag	<1	<1	<1
As	<500	<500	<500
B	<10	10	<10
Ba	2,000	50	10
Be	<2	<2	<2
Bi	<10	<10	<10
Cd	<50	<50	<50
Co	<5	<5	<5
Cr	50	30	15
Cu	50	<2	15
Ga	10	<10	<10
Ge	<20	<20	<20
La	70	20	20
Mn	300	700	700
Mo	<2	<2	<2
Nb	<20	<20	<20
Ni	<5	5	<5
Pb	<10	30	10
Sb	<100	<100	<100
Sc	<10	<10	<10
Sn	<10	<10	<10
Sr	500	150	1,000
Ti	1,000	500	500
V	20	20	50
W	<50	<50	<50
Y	20	20	<10
Zn	<200	<200	<200
Zr	100	70	20

~~William L. Lehmbeck~~
Manager

Charles E. Thompson
Arizona Registered Assayer No. 9427

William L. Lehmbeck
Arizona Registered Assayer No. 9425

SKYLINE LABS, INC.
Hawley & Hawley, Assayers and Chemists Division
1700 W. Grant Rd., P.O. Box 50106, Tucson, Arizona 85703
(602) 622-4836

Charles E. Thompson
Arizona Registered Assayer No. 9427

William L. Lehmbeck
Arizona Registered Assayer No. 9425

CERTIFICATE OF ANALYSIS

ITEM NO.	SAMPLE IDENTIFICATION	Au ppm	Ag ppm	Cu ppm	Pb ppm	Zn ppm	Mo ppm
1	CP-1 240-250		<0.2	15	50	185	2
2	CP-1 330-350		0.2	15	65	180	2
3	CP-1 370-395		<0.2	15	25	90	2
4	Chs-2 4351-4356	<0.02	<0.2	10	45	40	8
5	4470-4479	<0.02	<0.2	100	5	30	2
6	4742-4747	<0.02	<0.2	15	65	70	2
7	4971-4980	<0.02	<0.2	25	15	50	24
8	Chs-2 5012-5021	<0.02	<0.2	35	50	320	2

REGISTERED ASSAYER CERTIFICATE NO. 9425 WILLIAM L. LEHMBECK ARIZONA U.S.A.

TO:

American Smelting & Refining Company
Southwestern Exploration Division
P.O. Box 5747
Tucson, Arizona 85703

Attn.: Mr. John King

REMARKS:

Trace analysis

Spectrographic analysis and invoice pending.

CERTIFIED BY:

DATE REC'D:	DATE COMPL.:	JOB NUMBER:
8/22/75	9/2/75	751865

FROM: W. L. KURTZ

8/2/75 — Chs-3

TO: JRK

SRD has spent 1/2 day logging and I have asked FTG to log 2,000-3,000 to see if we want to continue hole

I have instructed MPW to stop hole at 3,000 unless FTG, JRK can make strong argument to continue.

Hole should be thru this week.

In either event you should plan to make detail log of hole and prepare final report of post-mortem type (assuming we terminate)

Lois knows how and where I can be reached.

P.S. welcome home!

cc. FTG JHC MPW

5/2/75

FROM: W. L. KURTZ

TO: FTG

I contemplate stopping this hole at 3,000 feet, unless you or JRK can come up with some reason to continue.

I glanced at core from 2-2000 Thursday and find it difficult to believe we will enter anything remotely approaching ore grade.

Please take a trip down and look at core (Tony B. could help you move boxes — over

It a terrible place to try and log inside because of some damn green translucent panels!

They could be to 3000 this coming week. Please check depths with HPW.

I can be reached at home Wednesday-Tuesday. After that three days.

cc. HPW.

7-17-75

WLK.

CHS-3

Attached is my log for Charleston drill hole CHS-3. The rock type names are still in some question in my mind, the granodiorite porphyry seemed to fit where sufficient qtz was visible & Phenocrysts comprise ≥ 75% of the whole rock. A diorite, andesite or dacite might be appropriate elsewhere. Here also are some additional core specimens.

JRD.

AMERICAN SMELTING & REFIN. G CO.
GEOLOGIC LOG

PROPERTY Charleston
MINING DISTRICT Tombstone
COUNTY, STATE Cochise Ariz

DRILL HOLE CHS-3
FINAL DEPTH

PAGE 1
DATE 2-16-75
LOG BY SRD

DEPTH FROM	DEPTH TO	ROCK	MINERALIZATION	ALTERATION	REMARKS
0	23'	—	LIM AND HEM REPLACE DIS & FROM SUL'S ± 3%, ALSO 1-3% TRANSPORTED FROM ON FRAC'S & IN VUGS.	DOM CLAY W/ MINOR SERICITE, FEW VNLTS OF GYP - ANHY & TRACE QTZ VNLTS. ROCK VERY PONKY & SOFT TO 65'. SER INCR TO ± 50% of TOTAL ALT BELOW 85%.	PILOT BIT, NO CORE
23'	115'	Bx			BRECCIA, NUMEROUS OPEN SPACES, FRAGMENTS DOMINANTLY VOLCANIC QTZ LATITE & AN(?) PORPHYRY'S, FEW FINE GRAINED CLASTS.
115'	175'	GD Po(?)	COARSE CRYST PYR DISS IRREG THROUGHOUT ROCK, OXIDATION TO HEM-LIM & JARS APPROX 60% OF TOTAL 2 TO 5 VOLUME %.	CHLORITIZED W/ STR CLAY ALT & WEATHERING, ESPECIALLY ALONG FAULTS & FRACTURES	GRANODIORITE (?) EQUAL NO. FELDSPAR & COARSE AOG - HYBID PHENOCRYSTS, FEW PINK ORTHOCLASE(?) PHENOS & SCATTERED, RESORBED QUARTZ PHENOS. FEW HIGH ANGLE (+60%) FRACTURES W/ MINOR CLAY GOUGE.
175'	201'	GD Po(?)	PYRITE DISS @ ± 3%, VARICOLORED WHITE TO YELLOW.	MOD TO STR PROPOLITIZATION CHL : EPI RATIO ± 5:1. RARE DK & LAT VENOLITHS ->	GRD Po(?) SLIGHTLY FINER GRAINED 179'-152' STILL CONTAINS QUARTZ & LARGE ZONED FELDSPAR'S, SOME W/ GREEN CAST FLOODING. MINOR TRANS LIM - HEM ALONG FEW HIGH ANGLE FRAC'S.
201'	295'	GD Po(?)	DISS PYR 2 - 8%, AVE ± 5%, MINOR FRAC CONTROLLED [illegible], RARE MICRO VENLETS. RATIO DISS : FRAC = 10:1	STRONG CLAY-SERICITE ALT, ROCK OFTEN SOFT & FRIABLE W/ INCR # OF FRAC'S VERY FEW W/ ALT STRONGER THAN WALL ROCK. RARE QTZ AND ANHY-GYP VNLTS	GD Po(?) STRONGLY ALT ASPERAPHIC IN HIGH QTZ [illegible] FOR TYPICAL QMP. INCREASED FRACTURING ALT [illegible] W/ ASSOC GOUGE.

AMERICAN SMELTING & REFIN..G CO.
GEOLOGIC LOG

PROPERTY _____ PAGE 2

MINING DISTRICT _____ DRILL HOLE CHS-3 DATE 7-16-75

COUNTY, STATE _____ FINAL DEPTH _____ LOG BY JVD

DEPTH FROM	DEPTH TO	ROCK	MINERALIZATION	ALTERATION	REMARKS
295'	314	GGE-BX	PYR DISS & VNLT ± 4%, SHRD BY GGE ZONES.	CLAY-SERICITE & SERP(?), ROCK CRUSHED & MYLONITIC CLAY GOUGE W/SERP SMEARS & STAINS.	FAULT ZONE, OR EDGE OF BRECCIA? MIXED GGE & BX W/FEW OPEN SPACES & MINOR SLICKENSIDES, MOTTLED OVERALL APPEARANCE.
314'	425'	GD Po & BX	DISS & RARE FRAC PYR AVE ± 4%, USUALLY COARSE EUH CRYST'S. TR. Cpy @ 340'	VAR MOD TO STR CLAY-SER W/ OCCASIONAL RELICT CHL & TR EPI.	GD Po(?) LOCAL 10' TO 15' BX ZONES & ± 3" FRAC SPACING. FRACTURES GEN HIGH ANGLE. OCCASIONAL FOREIGN FRAGM'S OF FINE GRAINED VOLC OR CLASTIC IN
425'	532'	GD Po(?)	CONSID DISS & VNLT PYR, AVE 6%, RATIO 3:1 DIS:FRM PYR OFTEN TARNISHED TO Cpy LUSTRE, BUT NO Cpy RECOGN	STR TO INT CLAY-SER, RARE TR OF REMNANT CHL. FEW LOCAL QTZ VNLTS, DOES ANHY-GYP VNLTS ALSO PRES.	Po(?) INCREASED BIOTITE & COARSE CRYST OF FELD, LOCALLY VERY XENOLITH W/Eg VOLC, Db & AN? Po FRAGMENTS. ROC HAS MIXED FIRM TO RUBBLY BROKEN APPEARANCE W/ FEW BX & MAROLITIC CAVITIES PARTIALLY FILLED W/SER & SUL'S. FRAC AVE 1"-3" SPAC.
532'	582'	GD Po(?)	AVE 2½% PYR, MOST WELL DISS, RATIO DIS/VNLT = 10:1	MIXED ALT, USUALLY CLAY & LOCAL STR, BUT LOCAL, LESS FRACTURED ZONES CONT CHLORITIZED BIOT & MNR-AUG. LOC MICRO VNLTS & FLDNG OF SiO_2	GD Po(?) MORE XENOLITHIC & LOCALLY LESS PORPHYRITIC THAN ABOVE, OFTEN RESEMBLING AN Po BUT ALWAYS CONTAIN QUARTZ PHENOS, SLIGHTLY TO STRLY REC INCR FRAC & SHRNG BELOW 550' (±1/1"
582'	610'	GD Po(?)	DISS & VNLT PYR ≈ 4%, DISS:VNLT RATIO = 2:1	MAINLY STR CLAY-SER, MIN QTZ VNG & RARE CHL.	GD Po(?) COARSE GRAINED AS ABOVE 532 FRACTURING MOD W/ ±1:1½" LOCAL STR ZON
610'	735	X-NOLITHIC GD Po(?)	PYR DISS & VNLT ≈ 4%. DISS:VNLT = 2:1, RARE GREY SUL'S. NEAR 648' AN	VARIABLY ALT, AVE 75-80% CLAY-SER, 20-25° CHL	GD Po(?) MATRIX, SURROUNDING FRAG'S OF MIXED VOLC-CLAST COMP, RARE DIA & QTZT(?) FRAG'S ALSO NOTED. SOMEWHAT

AMERICAN SMELTING & REFIN...G CO.
GEOLOGIC LOG

PROPERTY _____ PAGE 3

MINING DISTRICT _____ DRILL HOLE CHS-3 DATE 2-16-75

COUNTY, STATE _____ FINAL DEPTH _____ LOG BY SRD

DEPTH FROM	DEPTH TO	ROCK	MINERALIZATION	ALTERATION	REMARKS
610'	735'	XENOLITHIC (?) Gd Po(?)	CONT	CONT.	CONT. THE COMPLEX FRAGMENT ZONE MAY BE A HIGHLY XENOLITHIC INTRUSIVE ROOF OR POSSIBLY THIN INTR STRINGERS IN THE BRONCO OR SIMILAR PRE-EXISTING VOLC UN
735'	898'	XENO-Gd Po? HYBRID RX	AVE 4% DISS & VNLT PYR, D:V RATIO ≈ 3:1. PYR HAS LOCAL STR BRASSY TARNISH & RARE PEACOCK IRRIDESCENCE. TR of Cpy LOCALLY QUESTIONS.	STRONG TO INT CLAY-SER INCLUDING LOCAL GREEN SER. VERY MINOR RELICT CHLORITE.	MIXED INTR & VOLC ROCK, SOME FLOWAGE AND COMPACTION EVIDENT, MAY BE THE BRONCO VOLC. Gd Po(?) CONST ± 50% TOT WEAKLY FRACTURED, MOST REHEALED W/ Q & GYP(?), MINOR CLAY.
898'	1030'	Gd Po(?)	2-5% PYR, AVES 3½%. DISS:FRAC ≈ 2:1, AGAIN YELLOW TARNISH IS COMMON.	STRONG TO INT SERICITIZATION LOCAL CLAY & REMN CAL VERY MINOR. CONSID SILICA FLOODING & NUMEROUS V SMALL QTZ VNLTS.	Gd Po(?) FAR LESS FRAG-XENOLITHIC THAN ABOVE, MORE COARSELY PORPHYRITIC W/ INCR IN QTZ PHENOCRYSTS & QTZ FLDNG & VEINING (POSSIBLY A QUARTZ DIORITE Po?) WEAKLY FRACTURED, < 50% REHEALED BY QTZ FEW SOMEWHAT COMPRESSED-FLOW? TEXT'S BY INC
1030'	1048'	XENO Gd Po? HYBRID RX	AVE 3% PYR D:V = 4:1	STR CLAY-SER, MINOR CHLORITE	AS DESCR 735'-898', POSS BRONCO VOL.
1048'	1070'	BX	AVE 5% PYR D:V = 3:1	STR-INT SER & LOCAL CLAY	BRECCIA ZONE, MIXED FRAG'S, OPEN & SUL FILL
1070'	1253'	Gd Po	PYR ≈ 2½% D:V = 10:1, RARE QTZ-PYR VNLTS. SUL' CONT LOWEST IN ZONES OF VERY COARSE (+5 MM) PYR DISS.	VARIABLE CLAY, SER & RELICT CHL & OR GREEN SERIC. FELDSPARS ALT TO GRN CLAY-SER AS WELL AS WHITE AND OCCASIONAL PINK.	Gd Po, CROWDED PHENOCRYSTS OF ORTHO PLAGIO, QTZ & PYROX (Hyp-Aug). A GOOD Gd-Gd Po ROCK W/ MORE INTR TEXTURE THAN ABOVE. VARIABLE QTZ EYE CONTEN ≈ 5-15%. WEAKLY FRAC (6":1 FR QTZ PHENO'S DECR SOMEWHAT BELOW 115 LARGE ZONED FELDSPARS UP TO 15 MM

AMERICAN SMELTING & REFINING CO.
GEOLOGIC LOG

PROPERTY _____
MINING DISTRICT _____
COUNTY, STATE _____

DRILL HOLE CHS-3
FINAL DEPTH _____

PAGE 4
DATE 7-16-75
LOG BY SRD

DEPTH FROM	DEPTH TO	ROCK	MINERALIZATION	ALTERATION	REMARKS
1253'	1272'	XENOLITHIC GdPo	DISS PYR AVE 1½%, TR VNLT ORIENTED PYR.	STR-INT CLAY SER & LOC CHL, XENOLITHS VAR MORE OR LESS ALT	GdPo SIMILAR TO ABOVE W/NUMEROUS XENOLITHS OF AN, Db & LAT(?). GdPo MATRIX ACCOUNTS FOR ± 60% OF TOTAL ROCK
1272'	1350'	GdorDiPo	DISS PYR AVE ½% TO 1300' & TO 1½% 1300' TO 1350', RARE VNLT PYR. DIS:VNLT RATIO = 20:1 RARE CPY NOTED.	DENSE, ALMOST SILICEOUS FLOODED APPEARANCE, MINOR RECOGN CLAY ALT, MAINLY OF FELDSPARS. K-FELDSPAR ZONED OVERGROWTH PHENOCRYSTS UP TO 20 MM. CHLOR VAR REPL MAFICS. 1/4" NEAR VERT ANHY-GYP VN @ 1325-35	GdOR DiPo, SIMILAR TO ABOVE. THE AUG-HNB PHENO'S ARE OBVIOUS, BUT FELDSPARS DIFFICULT TO SEE. THE ROCK HAS A DENSE, SILICEOUS LOOK AND A FEW LARGE K-SPAR PHENOS ARE PRESENT.
1350'	1426	GdPo	DISS PYR AVE 2%, TR. OF VNLT PYR. DISS:VNLT = 10:1 PYRITE COMMONLY VERY COARSE EUHEDRAL CRYSTALS FILLING MAFIC SITES & MIAROLITIC CAVITIES	STR CLAY ALT W/MINOR SER DECREASES W/INCR DEPTH, CHLORITIZATION EQUAL TO CLAY-SER below 1390'	GdPo, COARSE GRAINED, UNIFORM TEXT, INCR XENOLITHS BELOW 1398'. ROCK HAS NUMEROUS MIAROLITIC CAVITIES, SOME W/COARS PYR PARTIAL FILLING. FELDSPAR DISPLAY A WHITE TO PALE GREEN ALT COLOR SIM TO MICROC
1426'	1453'	GdPo	SIMILAR TO ABOVE, 1-1½ DIS SUL INCLUDES LOCAL CPY(VFG). PYR:CPY = 20:1 (ALL DISS)	SIMILAR TO ABOVE, BUT FELDSPARS ALT TO GREEN & PINK CLAYS. POSSIBLE MINOR EPI & SERPENTINE(?). MOD CHL & LOC GYP-ANH HI ANG VNMG	GdPo, SIMILAR TEXT TO ABOVE BUT MORE DENSE SILICEOUS APPEARANC MODERATELY XENOLITHIC. WK FRACTURE ALL HIGH ANGLE.
1453'	1518'	XENO RK W/GdPo	VARIABLY PYR AS BOTH DISS & VNLTS, AVE ±2½% 3:1 RATIO OF DIS-VNLT. CPY MORE COMMON,	VARIES W/RK TYPE, MAINLY CLAY-SER & CHLORITIZATION. CONSID ANHY AS VEINS &	FRAGMENTAL OR XENOLITHIC ROCK, INCLUDES AN, Db, AnPo & MISC GdO & DI MATRIX FLOODING. FROM 1485 TO

AMERICAN SMELTING & REFIN. .G CO.
GEOLOGIC LOG

PROPERTY _____
MINING DISTRICT _____
COUNTY, STATE _____

DRILL HOLE GS-3
FINAL DEPTH _____

PAGE 5
DATE 7-16-75
LOG BY JRD

DEPTH FROM	DEPTH TO	ROCK	MINERALIZATION	ALTERATION	REMARKS
1518'	1588'	AnPo?	Diss Pyr ≈ 1% & locally abun Vfg Cpy. Average Pyr:Cpy ratio >20:1	Strongly chloritized w/ minor clay & poss rare ser. Anhy-Gyp common as vnlts. Sil Fldd.	Porphyritic An or Da, dark grey to black Fg matrix, scattered mafic & feld crystals. Rare xeno and weak, Hi angle frac (>6":1 fra
1588'	1760'	Gd Po(?)	Diss & rare vnlt pyr from ½ to 2%, ave 1½%. Cpy common as Vfg Diss & in rare vns & vnlts. Est Pyr Cpy ratio ±20:1 ¾" to 1" 80° Gal-Cpy-Sph vnlt in Anhy & Sid(?) @ 1593'-1595'	Clay-Ser(?) alt strong to 1650, then mod to 1760 Chl relict alt common below 1650. Local dense siliceous zones.	Gd or Di Po, coarse to med text, dense rock. Feld & Maf phenocrys crowded in rock which locally shows grn & pink clay alt feld's. Wkly fractured, most med to Hi An
1760'	1883'	Gd Po(?)	Fg Diss pyr & Cpy, Tot ±1½% by volume. Pyr:Cpy ratio 8:1. Cpy ratio highest in rock w/ ≤ ½% Tot Sul, decreasing w/ greater depth.	Variable mod to strong clay alt w/ loc chloritizat. Feld & partial groundmass clay alt, mafic & maf gm chl alt. Overall dense-siliceous nature, few qtz & anhy vnlts.	Gd Po(?) or Di Po, qtz phenocrysts less than above average, more transparent feldspar (sanidine?). Other feld's alt to grn, pink & white clay in str clay zones.
1883'	1920'	Di(?) {An(?) Po	Fg diss pyr & Cpy as above Tot Sul est 1½%, Pyr/Cpy ratio 18:1. Diss:Vnlt = 10:1	Variably clay altered to silicified & chloritized as above. Minor Anhy vnlts.	Diorite? porphyry & porphyritic andesite. Wk to locally mod frac, mostly Hi-angle to vert.
1920'	2006+	Di Po(?)	Diss & vnlt pyr ≈ 2½%. Dis:Vnlt ratio 8:1. Tr Cpy as diss's & in irreg, thin magnetite-pyr-Cpy vnlts	Variably clay-ser(?) alt and silicified as above. Few very thin anhy vnlts.	Diorite(?) or Gd porphyry, few def qtz phenos. Xenolithic Fg vol frag zone @ 1958'-1981'. Wkly fractured variable angle. ½ rene

AMERICAN SMELTING AND REFINING COMPANY
TUCSON ARIZONA

October 1, 1973

FILE MEMO

Charleston District
Cochise County, Arizona

A brief reconnaissance of the district on September 26 revealed the following:

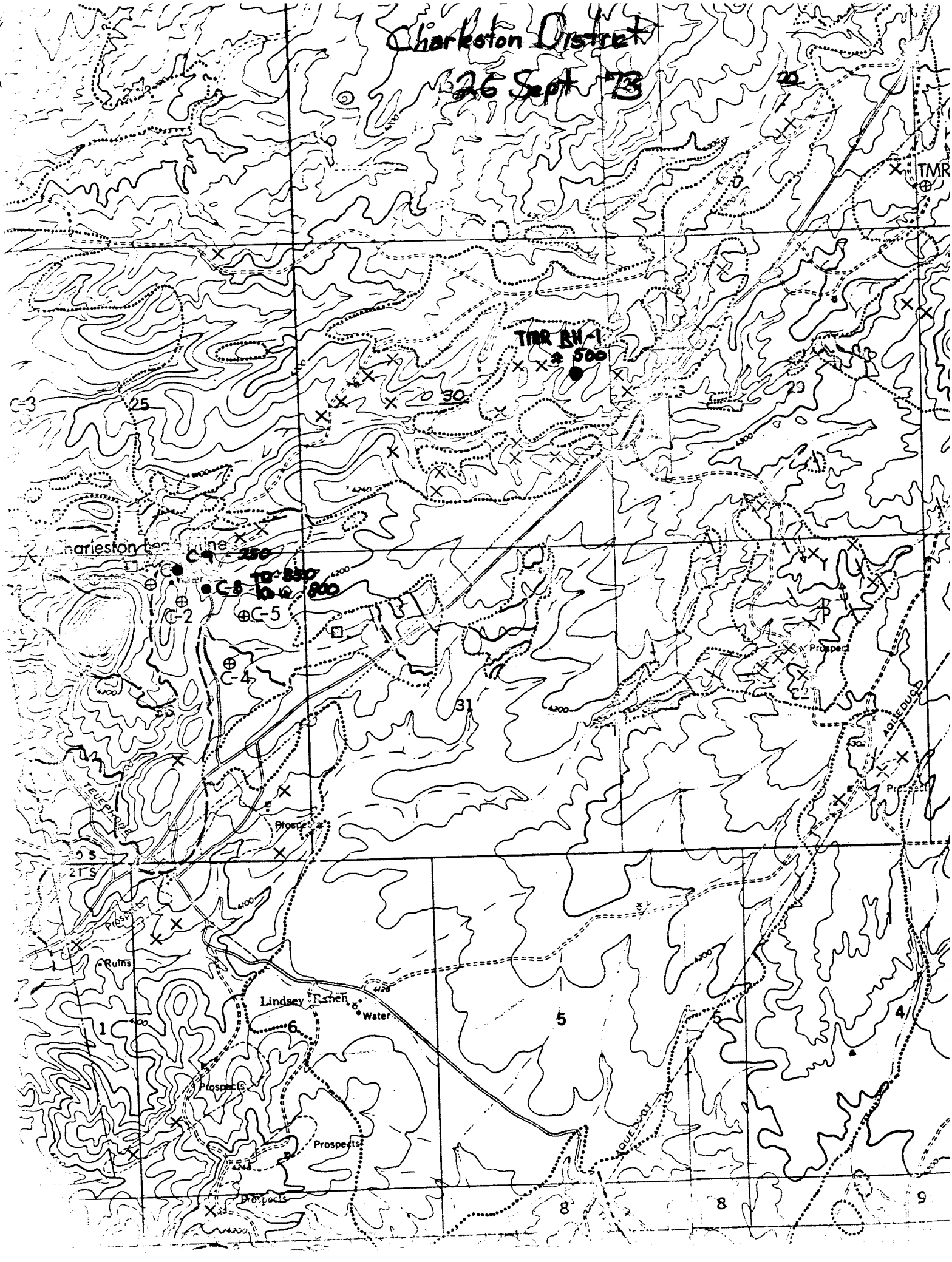
Sierra Mineral Management drilled a rotary hole in sec. 35 on TMR claims to an approximate depth of 500 feet. Pyrite is abundant in the cuttings. Also, they have had their D-9 bulldozer working with apparent ecological disregard by making numerous closely-spaced pits both in sec. 30 and sec. 20. John Beeder, formerly of Tenneco, has joined Sierra M.M. as a salaried geologist.

The J. Stewart Co. has moved the Joy rig off of hole C-8 and onto location C-9. Drill hole C-8 is approximately 850 feet deep and encountered Bisbee group sediments at approximately 800 feet. The Bisbee is hydrothermally altered and mineralized.

John R. King

JRK:lb

cc: WLKurtz
RBCrist


Charleston District
26 Sept '73
TMR BH-1
≈ 500
C-3
25
30
20
TMR
Charleston Tear Line
C-9 ~250
C-8 TD ~850
ho @ 800
C-2
C-5
C-4
31
Prospect
AQUEDUCT
Prospects
Ruins
Lindsey Ranch
Water
1
6
5
4
Prospects
Prospects
Prospects
8
8
9

PRINTED IN USA. 9/69

FORM 302-E

New York No. .....

APPLICATION FOR EXPLORATION AUTHORIZATION

November 7, 19 73

Originating Office Tucson - SWED

DESCRIPTION:

LOCATION OF PROSPECT/PROJECT: Charleston Project
Sections 24, 25, 36, T20S, R21E; sections 19, 30, 31, T20S, R22E
Cochise County, Arizona, approximately six miles southwest of
Tombstone, Arizona.

PARTNERS:

Partner's Per Cent .....

COMPANY: [X] ASARCO

[ ] Subsidiary. Specify .....

WORK CONTEMPLATED:

Diamond drill two 3500-5000 foot holes to test
for porphyry copper mineralization.

Total estimated cost (FORM 302-EA ATTACHED) $ 175,000

Reviewed by .....
Acct. Mgr. or Chief Acct.

Approved by .....
Vice President

Recommended by .....
Supervisor

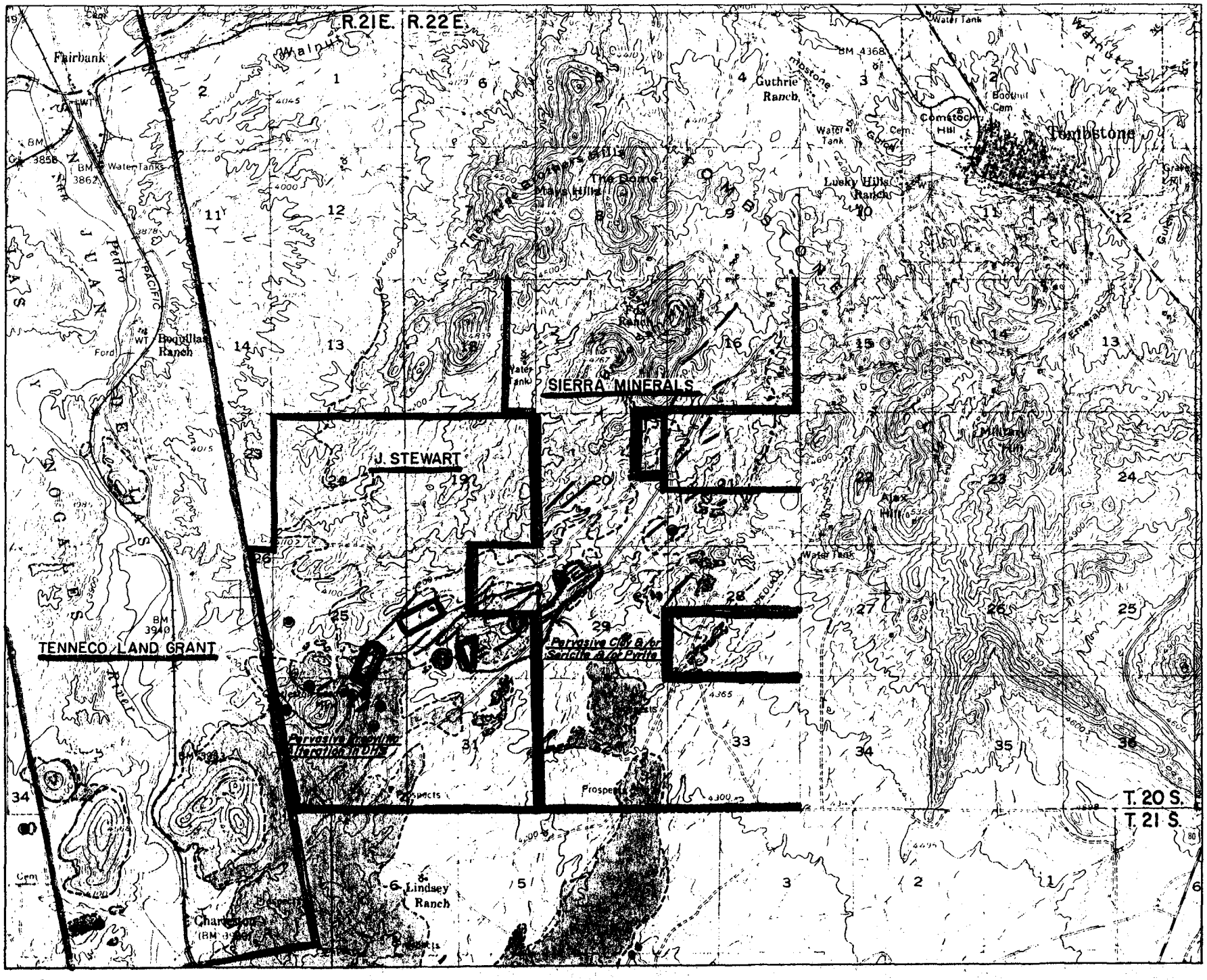
Approved by .....
Comptroller

Account Chargeable to .....
To be designated by Comptroller

Approved by Advisory Committee
.....19 ...

Approved by Board of Directors
.....19 .....

.....
Secretary



LARAMIDE ANDESITE DIKES

LARAMIDE UNCLE SAM PORPHYRY

CRETACEOUS BRONCO VOLCANICS

PREVIOUS DRILL HOLES

PROPOSED DRILL HOLES

CHARLESTON PROJECT

COCHISE COUNTY, ARIZONA

Scale: 1" = 1 mile

AMERICAN SMELTING AND REFINING COMPANY
TUCSON ARIZONA

February 20, 1975

Mr. T. C. Osborne
Assistant Director of Exploration
New York Office

Supplemental Exploration
Authorization Request
Charleston Project
Cochise County, Arizona

Dear Sir:

Drill hole Chs-1 was bottomed at 4002 feet after penetrating about 1500 feet that averaged 0.13% copper in Laramide intrusive rocks. Drill hole Chs-2 is currently drilling at 3818 feet in altered and weakly mineralized Cretaceous Bisbee formation. This hole will be continued to test for ore grade copper mineralization in the lower, limy section of the Bisbee Formation and in the Paleozoic limestones which should underlie the Bisbee.

Regardless of the final results of Chs-2, another drill hole is justified to test for ore grade primary copper mineralization at the margins of the Laramide stock and located south or southwest of Chs-1. Results of this hole will determine whether or not additional drilling on the Charleston Project is justified.

The Stewart Mines Limited Partnership Agreement required a second year drilling commitment of 15,000 feet. We have renegotiated this commitment into two six-month periods, each requiring 3750 feet of drilling. Entering the first six-month period does not commit us to the second.

I recommend Asarco sign the amended agreement and enter into the first six-month commitment of 3750 feet of drilling. I estimate total project charges for this drilling plus commitments on State Prospecting Permits at $80,000. If you approve, please request a Supplemental Exploration Authorization in this amount. Forms 302-EA and 302-EB are attached.

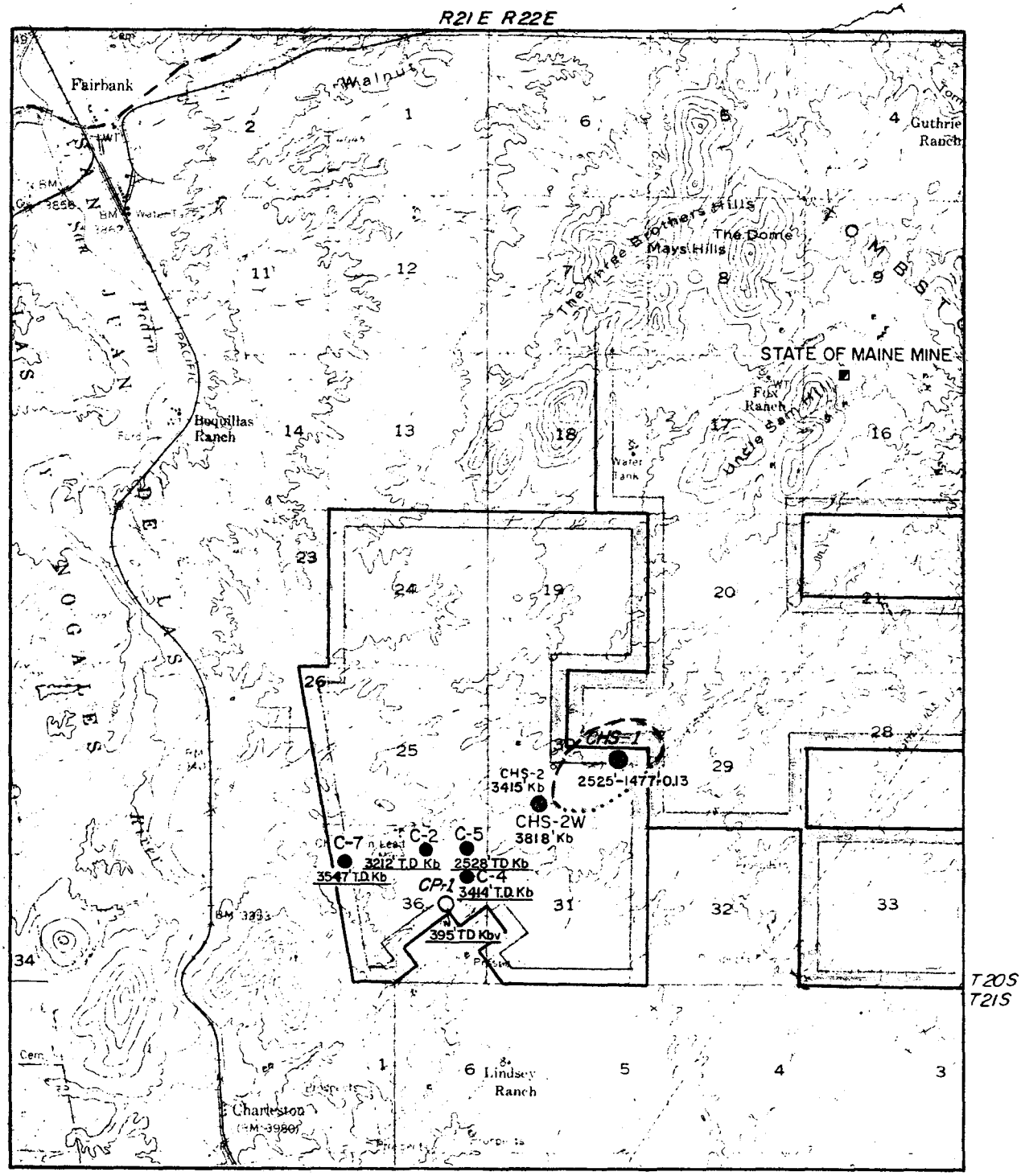
Respectfully submitted,

W. L. Kurtz

W. L. Kurtz

WLK:lb
Atts: Map; Forms 302-EA & EB

cc: JHCourtright
RBCrist
JRKing
NPWhaley
WGKellogg



EXPLANATION

ASARCO property boundary

Sierra Minerals managment property

ASARCO drill hole

Previous drill hole

Area of pervasive surface hydrothermal alteration & associated brecciation

ASSAY DATA KEY

Depth – Length – % Cu

ROCK TYPES

Lgd — LARAMIDE GRANODIORITE

Kbv — CRETACEOUS BRONCO VOLCANICS

Kb — CRETACEOUS BISBEE GROUP

TO ACCOMPANY Supplemental Exploration Authorization Request

DATED Feb. 20, 1975

BY W. L. Kautz

DRILLING PROGRESS MAP
for the month of _____

CHARLESTON PROJECT

COCHISE CO., ARIZONA

scale 1 inch = 1 mile

J.R.K.

ASARCO

Your comm
No assay?

FILE

Exploration Department
Southwestern United States Division

January 28, 1986

Mr. James A. Briscoe
James A. Briscoe & Associates, Inc.
Suite 120
5701 E. Glenn Street
Tucson, AZ 85712

project file

Charleston Mine Area
Tombstone District
Cochise County, AZ

Dear Mr. Briscoe:

Attached are five pages of 1978 drill logs by B.J. Devere from two holes (C-1: 2764'TD and C-5A: 1405'TD) in Section 36, T20S, R21E, next to Las Boquillas y Nogales land grant. Hole 1 is 2600' S80W and hole 5A is 1500' S45W of the NE corner of Section 36.

We hope this information will be useful to you and to the owner with the present land status problems adjoining the Boquillas Grant.

Very truly yours,

Fleetwood R. Koutz
Geologist

FRK:mek

Att.

cc: W.L. Kurtz/J.D. Sell

ASARCO Incorporated P. O. Box 5747 Tucson, Az 85703-0747
1150 North 7th Avenue (602) 792-3010

AMERICAN SMELTING & REFINING CO.
GEOLOGIC LOG

PROPERTY Charleston Pb Mine
MINING DISTRICT Tombstone
COUNTY, STATE Cochise, Arizona

DRILL HOLE 1
FINAL DEPTH 2764 ft.

DATE 10-18-78
LOG BY BJD

DEPTH FROM	DEPTH TO	ROCK	MINERALIZATION	ALTERATION	REMARKS
0	2103	?	?	?	Drilled previously
2103	2115	congl.	traces of py in occ. quartzite fragments, one 1/16" wide cpy vn in ls fragment	None	Cretaceous Bisbee Formation
2115	2147	Sandstone	fn gr diss pyrr < 1/2%, frm 2144 2147 rare traces of fn gr diss py, pyrr, cpy & sph?	moderate silicification	Laminated, bedding 45° to core axis Cretaceous Bisbee Formation, rock poorly broke
2147	2159	Siltstone	fn gr diss py on rare fractures occ tr sph on fractures, total sulfide 2%	weak bleaching and silicification	lower contact 45° to core axis, rock poor broken, Cretaceous Bisbee Formation
2159	2175	Sandstone	fn gr py on fractures and occ. diss in rock, rare speck of cpy, some honeycolored sph on fractures also some black jack, total sulfide ±1% py : sph 10:1	Moderate silicification, some chlorite on fractures	Laminated; Cretaceous Bisbee Formation
2175	2176.5	Fault	2% xlyn py diss in gouge	—	—
2176.5	2196.5	Sandstone	occ. rare trace of fn gr diss py, cpy and very rare speck of galena total sulfide content trace; @ 2195 1.5' of massive xlyn py with some Rhodochrosite	moderate silicification, occ light green sericite on fractures	Rock poorly broken - Cretaceous Bisbee F
2196.5	2218	Siltstone	fn gr diss py & rare trace sph total sulfide 1%, py : sph 5:1	moderately silicified - weakly bleached	Beds 45° to core axis, Rock more massive, mottled pink and green - Cretaceous Bisbee Fm
2218	2252	Sandstone	< 1/2% fn gr diss py, occ vuggy calcite veinlets	Rare 1/8"-1/4" wide fractures with clay alt. & trace of sericite?	massive, gray, Cretaceous Bisbee Fm
2252	2263	Siltstone	Barren	weak silicification	Laminated, beds 45° to core axis, KB
2263	2266	Fault	Barren	—	—
2266	2281	Sandstone	rare trace of fn gr diss py & cpy	—	Badly broken - KB
2281	2301	Andesite	fn gr diss py ± 2%	Epidote clots, feldspar clouded	Tertiary andesite dike?
2301	2326.5	Mudstone	Barren	calcite and occ epidote along fractures	Red mudstone - KB

AMERICAN SMELTING & REFINING CO.
GEOLOGIC LOG

PROPERTY Charleston Pb Mine
MINING DISTRICT Tombstone
COUNTY, STATE Cochise, Arizona

DRILL HOLE 1
FINAL DEPTH 2764 ft

PAGE 2 of 2
DATE 10-18-78
LOG BY BJD

DEPTH FROM	DEPTH TO	ROCK	MINERALIZATION	ALTERATION	REMARKS
2326.5	2329	Sandstone	Barren	moderately well silicified	massive, upper contact gradational, Kb
2329	2334.5	mudstone	Barren	None	Red mudstone - Kb
2334.5	2382	Sandstone	fn gr diss hematite	None	Massive, gray fn gr, Kb
2382	2482.5	mudstone	Barren	None	massive, below 2427' rock become mottled with white calcite clots - Kb
2482.5	2508	mudstone	very fn gr diss specks of py <½%	weak bleaching, chlorite and Epidote filled fractures, moderate silicification	appears to be same rock as interval above moderately well broken - Kb
2508	2514	mudstone	Barren	None	massive, Red mudstone - Kb
2514	2573	mudstone	very fn gr diss speck of py <1%. more py diss on fractures	weak bleaching, moderate silicification, some chlorite on fractures	moderately well broken, alternating bands of sandstone, fn gr, and mudstone - Kb.
2573	2577	sandstone	fn gr xlyn py diss throughout <½%	moderate silicification	fn gr SS, rock somewhat arkosic - Kb
2577	2639.5	mudstone	very fn gr diss specks of py throughout rock and on fractures <1% total sulfide	weak silicification, some vuggy calcite filled veinlets, chlorite and epidote in some fractures	appears very similar to interval 2514-2573; beds dip 35° to core axis
2639.5	2764	mudstone	Barren	traces of epidote along occ fractures	Red mudstone, massive - Kb.
			Bottom 2764 feet		

AMERICAN SMELTING & REFINING CO.
GEOLOGIC LOG

PROPERTY Charleston Pb Mine
MINING DISTRICT Tombstone
COUNTY, STATE Cochise, Arizona

DRILL HOLE 5-A
FINAL DEPTH 1405 ft

PAGE 1 of 3
DATE 10-19-78
LOG BY BLD

DEPTH FROM	DEPTH TO	ROCK	MINERALIZATION	ALTERATION	REMARKS
0	631	?	?	?	Drilled previously
631	647	Andesite	Barren	None	trace of magenitite, Bronco volcanics
647	675	Andesite	medium to fn gr diss xlyn py ±2%	moderate to strong clay, some vuggy calcite filled fractures	Rock shattered, Bronco volcanics
675	700	Andesite	Barren	Very weak clay	massive red andesite, similar to interval 631-647
700	711	andesite	medium to fn gr diss xlyn py ±2%	moderate to strong clay, calcite along some fractures	massive, vague impression of flow banding @ 65° to core axis, Bronco volcanics
711	714	Fault	3% py diss in gouge & Fault Bx matrix	None	fragments of Hb in fault Breccia
714	733	Dacite Porphyry	rare trace of very fn gr py diss. along occ fractures	weak clay, weak chlorite	massive dacite porphyry - Bronco volcanics
733	748	Andesite Porphyry	Barren	None	massive, fresh Bronco volcanics
748	759	Dacite Porphyry	Barren	None	massive, fresh Bronco volcanics
759	772.5	Andesite Porphyry	Barren	None	Some talc and occ. Hb phenos. Massive Bronco v
772.5	779	Dacite Porphyry	Barren	None	massive, fresh as interval 748-759', Bronco volcan.
779	784	Fault	Barren	None	—
784	785	Andesite Porphyry	Barren	None	Same as interval 759-772.5', Bronco volcanics
785	811	Dacite Porphyry	1% very fn gr diss py	Hb replaced by chlorite, diss calcite in groundmass, weak clay	massive - Bronco volcanics
811	820	Andesite	Trace very fn gr diss py	None	Somewhat felted texture, massive, Bronco volcan
820	824	Fault	2% xlyn py diss in gouge	None	—
824	845	Andesite	Barren	Some talc and calcite on fractures	Badly broken - Bronco volcanics
845	847	Fault	Barren	None	—
847	867	Andesite	Barren	talc and calcite on fractures	Same as interval 824-845' except much more massive - Bronco volcanics

AMERICAN SMELTING & REFINING CO.
GEOLOGIC LOG

PROPERTY Charleston Pb Mine
MINING DISTRICT Tombstone
COUNTY, STATE Cochise, Arizona

DRILL HOLE 5-A
FINAL DEPTH 1405 ft

DATE 10-19-78
LOG BY BJD

DEPTH FROM	DEPTH TO	ROCK	MINERALIZATION	ALTERATION	REMARKS
867	894	Dacite Porphyry	trace fn gr diss py, usually with chlorite that replaces Hb	chlorite after Hb & on fractures weak clay	very badly Broken - Bronco volcanics
894	901	Fault	Barren	None	—
901	915	agglomerate	Barren	None	andesite fragments in Sandy, volcanic matrix - Bronco
915	957	Andesite	Barren	None	massive fresh Red andesite - Bronco volcanics
957	984	agglomerate	Barren	None	Same as interval 901-915' - Bronco volcanics
984	1017	Siltstone	very fn gr xlyn py diss <1%	weak silicification	massive - Kb
1017	1025	Sandstone	Barren	None	Massive, fn gr maybe a Sandstone lense in Siltstone - Kb
1025	1050	siltstone	Barren	None	Brecke, somewhat fissel - Kb
1050	1063	Sandstone	Barren	None	fn gr, massive, - Kb
1063	1065	Fault	Barren	None	—
1065	1070	Siltstone	Barren	None	same as interval 1025-1050' - Kb
1070	1076	Sandstone	Barren	None	same as interval 1050-1063' - Kb
1076	1084	Fault	Barren	None	1/2" gauge zone down center of core; half fokne silt other half Sandstone
1084	1112	Siltstone	rare trace of very fn gr py on fractures	some calcite filled fractures	moderately broken, - Kb
1112	1129	mudstone	Barren	None	poorly broken, contains some qtz pebbles and calcite blebs - Red mudstone - Kb
1129	1135	Sandstone	Barren	xlyn calcite along fractures	occ. qtz pebbles scattered throughout fn gr SS-[illegible]
1135	1181	Sandstone	Barren	None	Sandstone grades back & forth between fn gr cl[illegible] Sand & Sandy mudstone - Kb
1181	1205	Sandstone	rare trace of very fn gr xlyn py	chlorite surrounding occ. qtz pebbles	fn gr, moderately well broken - Kb

AMERICAN SMELTING & REFINING CO.
GEOLOGIC LOG

PROPERTY Charleston Pb Mine
MINING DISTRICT Tombstone
COUNTY, STATE Cochise, Arizona

DRILL HOLE 5-A
FINAL DEPTH 140.5 ft

DATE 10-19-78
LOG BY BJD

DEPTH FROM	DEPTH TO	ROCK	MINERALIZATION	ALTERATION	REMARKS
1205	1224	Congl.	Tr py in monzonite fragment elsewhere barren	wk chlorite & xlyn sericite in monz fragment - no other silicates	fragments of Kb and medium gr. monzonite, could be Pc fragment, congl. - Kb
1224	1242	mudstone	Barren	None	laminated bed dip 50° to core axis - Kb
1242	1305	siltstone	ore rare specks of sph & gr xlyn py	None	massive siltstone with chert blebs - Kb
1305	1315	Shale	rare trace of fn gr xlyn py	calcite filled fractures	badly broken, faint black shale appearance 55° to core axis - Kb
1315	1321	siltstone	trace fn gr xlyn py	None	massive, sandy siltstone - Kb
1321	1323	Fault	Barren	None	—
1323	1337	shale	Barren	calcite filled fractures	as interval 1305-1315' except no sulfides - Kb
1337	1341	Fault	veins of py up to ½" wide in gouge	None	—
1344	1375	Shale	rare fine gr py along fractures that have some gouge, usually < ½" wide	None	moderately well broken black silty shale - Kb
1375	1379	Fault	xlyn py dis throughout < 1%	None	—
1379	1382	Shale	Barren	None	as interval 1344-1375 except no sulfides - Kb
1382	1405	Sandstone	fn gr dis xlyn py	chlorite along sec. fractures	fn gr, somewhat friable, some carbonaceous blebs & lenses, arkosic - Kb
			Bottom 1405 ft.		

ASARCO

Exploration Department
Southwestern United States Division
R. B. Crist
Property Manager

December 6, 1978

J. Stewart Company
3033 North Central Avenue
Phoenix, Arizona 85012

Tombstone Dist

Attention: Mr. Roger Horne

Charleston Mine
Cochise County, Arizona

Dear Roger:

Sorry to be so late with this. Burt Devere, the Asarco geologist who handles the Tombstone area, gave me the enclosed log regarding your Charleston property.

In October, he logged the core from Drill Holes 1 and 2.

The alteration was weak and the mineralization decreased with depth. None of the core was assayed due to the lack of mineralization.

We always appreciate the opportunity to look at rocks. In this instance the core was not split for assay work, however, I did promise assays and if you ask again, I will get some for you.

Very sincerely,

R. B. Crist

R. B. Crist.

RBC:jlh
encls BJD log

ASARCO Incorporated P. O. Box 5747 Tucson, Az 85703
1150 North 7th Avenue (602) 792-3010

11/78
B.J.Devere

Charleston Pb Mine
Cochise County, Arizona

Hole #1

From	To	
0	2103	Drilled previously.
2103	2252	Cretaceous Bisbee Group, <½% py, rare Tr sph mineral.
2252	2514	Cretaceous Bisbee Group, barren to rare Tr py mineral.
2514	2640	Cretaceous Bisbee Group, weak py <1% mineral.
2640	2764	Cretaceous Bisbee Group, barren, no mineral.

Bottom 2764 feet.

Hole #5-A

0	631	Drilled previously.
631	733	Tertiary-Cretaceous Bronco Volcanics, ±2% diss py mineral.
733	785	Tertiary-Cretaceous Bronco Volcanics, barren, no mineral.
785	824	Tertiary-Cretaceous Bronco Volcanics, ±1% diss py mineral.
824	984	Tertiary-Cretaceous Bronco Volcanics, barren, no mineral.
984	1184	Cretaceous Bisbee Group, barren, no mineral.
1184	1405	Cretaceous Bisbee Group, rare trace diss py, mineral.

Bottom 1405 feet.

BJD:jlh

py = pyrite
Tr = trace
sph = sphalerite
diss = disseminated

FTC

BJD - This looks good. Thanks for trouble. I/ WLK too don't like to distrib. our detailed geol. logs. Then others want them too. FTG.

Charleson Pb Mine

Cochise Co. Ariz

Hole # 1

From	to	
0	2103	Drilled previously
2103	2252	Cretaceous Bisbee Group <½% py, rare tr sph. mineral
2252	2514	Cretaceous Bisbee Group, Barren to rare Tr py mineral
2514	2640	Cretaceous Bisbee Group, weak py <1% mineral
2640	2764	Cretaceous Bisbee Group, Barren, no mineral

Bottom 2764 feet

Hole 5-A

0	631	Drilled previously
631	733	Tertiary-Cretaceous Bisbee Volcanics, ±2% dis py mineral
733	785	Tertiary-Cretaceous Bisbee Volcanics, Barren, no mineral
785	824	Tertiary-Cretaceous Bisbee Volcanics, ±1% dis py mineral
824	984	Tertiary-Cretaceous Bisbee Volcanics, Barren, no mineral
984	1184	Cretaceous Bisbee Group, Barren, no mineral
1184	1405	Cretaceous Bisbee Group, rare trace dis py, mineral

Bottom 1405 feet

~~Fred: Is this sufficient detail?~~

~~Bert~~

ASARCO

Southwestern Exploration Division

October 26, 1978

TO: F. T. Graybeal

FROM: B. J. Devere

J. Stewart Company Drilling
Charleston Pb Mine
Cochise County, Arizona

J. Stewart Company have just completed deepening two drill holes on their claims at the Charleston Pb Mine in Cochise County. DDH 1, located about 300 feet east of the old open cut was deepened from 2,[redacted] to 2,764 feet. The drilling was entirely in the Cretaceous Bisbee formation and probably in the upper half of the formation at that. Mineralization encountered was weak, mostly pyrite with occasional fracture fillings of sphalerite and rare specks of galena and chalcopyrite. The maximum sulfide encountered was 2% disseminated pyrite in fault gouge at 2,175 feet.

Drill hole 5-H, located on the south side of the road into the mine about 300 yards, west of the Tombstone-Sierra Vista road, was deepened from 631 to 1,405 feet. Bronco volcanics were drilled to 984 feet, and rocks of the Cretaceous Bisbee formation from 984 to the bottom of the hole at 1,405 feet. Mineralization was weak to non-existent throughout the hole, andesites in the Bronco volcanics contained up to 2% disseminated pyrite while 3% pyrite occurs in fault gouge at 711 feet. The basal member of the volcanics is an agglomerate with an andesitic matrix that cements semi-rounded fragments of Bisbee formation rocks and an intrusive monzonite. The monzonite is usually fresh, but occasionally contains traces of pyrite and some crystalline sericite. The rock is probably Precambrian.

In both holes, the weak alteration and mineralization decreases with depth.

None of the core was assayed due to the lack of mineralization. Copies of the geologic logs have been given to Bob Crist, who will forward them on to the Hornes in Phoenix.

Burton J. Devere, Jr.

BJD:jlh
attachments

AMERICAN SMELTING & REFINING CO.
GEOLOGIC LOG

PROPERTY Charleston Pb Mine
MINING DISTRICT Tombstone
COUNTY, STATE Cochise, Arizona

DRILL HOLE 1
FINAL DEPTH 2764 ft.

PAGE 1 of 2
DATE 10-18-78
LOG BY BJD

DEPTH FROM	DEPTH TO	ROCK	MINERALIZATION	ALTERATION	REMARKS
0	2103	?	?	?	Drilled previously
2103	2115	congl.	traces of py in occ. quartzite fragments, one 1/16" wide cpy vn in ls fragment	None	Cretaceous Bisbee Formation
2115	2147	sandstone	fn gr diss pyrr < 1/2%, from 2144 2147 rare trace of fn gr diss py, pyrr, cpy & sph?	moderate silicification	Laminated, bedding 45° to core axis Cretaceous Bisbee Formation, rock poorly broken
2147	2159	siltstone	fn gr diss py on rare fractures occ. tr sph on fractures, total sulfide 2 1%	weak bleaching and silicification	lower contact 45° to core axis, rock poorly broken, Cretaceous Bisbee Formation
2159	2175	sandstone	fn gr py on fractures and occ. diss in rock, rare speck of cpy, some honeycolored sph on fractures also some blackjack, total sulfide ±1% py : sph 10:1	moderate silicification, some chlorite on fractures	Laminated, Cretaceous Bisbee Formation
2175	2176.5	Fault	2% xlyn py diss in gouge	—	—
2176.5	2196.5	Sandstone	occ. rare trace of fn gr diss py, cpy and very rare speck of galena total sulfide content trace; @ 2195 1.5' of massive xlyn py with some Rhodochrosite	moderate silicification, occ light green sericite on fractures	Rock poorly broken - Cretaceous Bisbee Fm
2196.5	2218	Siltstone	fn gr diss py & rare trace sph total sulfide 1%, py : sph 5:1	moderately silicified - weakly bleached	Beds 45° to core axis, Rock more massive, mottled pink and greens - Cretaceous Bisbee Fm
2218	2252	Sandstone	1 1/2% fn gr diss py, occ vuggy calcite veinlets	Rare 1/8"-1/4" wide fractures with clay alt. & trace of sericite?	massive, gray, Cretaceous Bisbee Fm
2252	2263	Siltstone	Barren	weak silicification	Laminated, beds 45° to core axis, KB
2263	2266	Fault	Barren	—	—
2266	2281	Sandstone	rare trace of fn gr diss py & cpy	—	Badly broken - KB
2281	2301	Andesite	fn gr diss py ± 2%	Epidote clots, feldspar clouded	Tertiary andesite dike?
2301	2326.5	Mudstone	Barren	calcite and occ epidote along fractures	Red mudstone - KB

AMERICAN SMELTING & REFINING CO.
GEOLOGIC LOG

PROPERTY Charleston Pb mine
MINING DISTRICT Tombstone
COUNTY, STATE Cochise Arizona

DRILL HOLE 1
FINAL DEPTH 2764 ft

PAGE 2 of 2
DATE 10-18-78
LOG BY BJD

DEPTH FROM	DEPTH TO	ROCK	MINERALIZATION	ALTERATION	REMARKS
2326.5	2329	Sandstone	Barren	moderately well silicified	massive, upper contact gradational, Kb
2329	2334.5	mudstone	Barren	None	Red mudstone - Kb
2334.5	2382	Sandstone	fn gr diss hematite	None	massive, gray fn gr, Kb
2382	2482.5	mudstone	Barren	None	massive, below 2427' rock become mottled with white calcite clots - Kb
2482.5	2508	mudstone	very fn gr diss specks of py <½%	weak bleaching, chlorite and Epidote filled fractures, moderate silicification	appears to be same rock as interval above moderately well broken - Kb
2508	2514	mudstone	Barren	None	massive, Red mudstone - Kb
2514	2573	mudstone	very fn gr diss speck of py <1%. more py diss on fractures	weak bleaching, moderate silicification, some chlorite on fractures	moderately well broken, alternating bands of sandstone, fn gr, and mudstone - Kb.
2573	2577	Sandstone	fn gr xlyn py diss throughout <½%	moderate silicification	fn gr SS, rock somewhat arkosic - Kb
2577	2639.5	mudstone	very fn gr diss specks of py throughout rock and on fractures <1% total sulfide	weak silicification, some vuggy calcite filled veinlets, chlorite and epidote in some fractures	appears very similar to interval 2514-2573', beds dip 35° to core axis
2639.5	2764	mudstone	Barren	traces of epidote along occ fractures	Red mudstone, massive - Kb.
			Bottom 2764 feet		

AMERICAN SMELTING & REFINING CO.
GEOLOGIC LOG

PROPERTY Charleston Pb Mine
MINING DISTRICT Tombstone
COUNTY, STATE Cochise, Arizona

DRILL HOLE 5-A
FINAL DEPTH 1405 ft

DATE 10-19-78
LOG BY RLD

DEPTH FROM	DEPTH TO	ROCK	MINERALIZATION	ALTERATION	REMARKS
0	631	?	?	?	Drilled previously
631	647	Andesite	Barren	None	trace of magenitite, Bronco volcanics
647	675	Andesite	medium to fn gr diss xlyn py ±2%	moderate to strong clay, some vuggy calcite filled fractures	Rock shattered, Bronco volcanics
675	700	Andesite	Barren	Very weak clay	massive red andesite, similar to interval 631-647
700	711	andesite	medium to fn gr diss xlyn py ±2%	moderate to strong clay, calcite along some fractures	massive, vague impression of flow banding @ 65° to core axis, Bronco Volcanics
711	714	Fault	3% py diss in gouge & Fault Bx matrix	None	fragments of Hb in fault Breccia
714	733	Dacite Porphyry	rare trace of very fn gr py diss. along occ fractures	weak clay, weak chlorite	massive dacite porphyry - Bronco volcanics
733	748	Andesite Porphyry	Barren	None	massive, fresh Bronco volcanics
748	759	Dacite Porphyry	Barren	None	massive, fresh Bronco volcanics
759	772.5	Andesite Porphyry	Barren	None	Some talc and occ. Hb phenos. Massive Bronco vol
772.5	779	Dacite Porphyry	Barren	None	massive, fresh as interval 748-759', Bronco volcanics
779	784	Fault	Barren	None	—
784	785	Andesite Porphyry	Barren	None	Same as interval 759-772.5', Bronco volcanics
785	811	Dacite Porphyry	1% very fn gr diss py	Hb replaced by chlorite, diss calcite in groundmass, weak clay	massive - Bronco Volcanics
811	820	Andesite	Trace very fn gr diss py	None	Somewhat felted texture, massive, Bronco volcanics
820	824	Fault	2% xlyn py diss in gouge	None	—
824	845	Andesite	Barren	Some talc and calcite on fracture	Badly broken - Bronco volcanics
845	847	Fault	Barren	None	—
847	867	Andesite	Barren	talc and calcite on fractures	Same as interval 824-845' except much more massive - Bronco volcanics.

AMERICAN SMELTING & REFINING CO.
GEOLOGIC LOG

PROPERTY Charleston Pb mine
MINING DISTRICT Tombstone
COUNTY, STATE Cochise, Arizona

DRILL HOLE 5-A
FINAL DEPTH 1405 ft

DATE 10-19-78
LOG BY BJD

DEPTH FROM	DEPTH TO	ROCK	MINERALIZATION	ALTERATION	REMARKS
867	894	Dacite Porphyry	trace fn gr diss py, usually with chlorite that replaces Hb	chlorite after Hb & on fractures weak clay	very badly Broken - Bronco volcanics
894	901	Fault	Barren	None	—
901	915	agglomerate	Barren	None	andesite fragments in Sandy, volcanic matrix - Bronco vol
915	957	Andesite	Barren	None	massive fresh Red andesite - Bronco volcanics
957	984	agglomerate	Barren	None	Same as interval 901-915' - Bronco volcanics
984	1017	Siltstone	very fn gr xlyn py diss <1%	weak silicification	massive - Kb
1017	1025	Sandstone	Barren	None	Massive, fn gr maybe a Sandstone lense in Siltstone - Kb
1025	1050	siltstone	Barren	None	Rock, somewhat fissel - Kb
1050	1063	Sandstone	Barren	None	fn gr, massive, - Kb
1063	1065	Fault	Barren	None	—
1065	1070	Siltstone	Barren	None	same as interval 1025-1050' - Kb
1070	1076	Sandstone	Barren	None	same as interval 1050-1063' - Kb
1076	1084	Fault	Barren	None	1/2" gouge zone down center of core, half of core siltsto other half Sandstone
1084	1112	Siltstone	rare trace of very fn gr py on fractures	some calcite filled fractures	moderately broken, - Kb
1112	1129	mudstone	Barren	None	poorly broken, contains some qtz pebbles and calcite blebs - Red mudstone - Kb
1129	1135	Sandstone	Barren	xlyn calcite along fractures	occ. qtz pebbles scattered throughout fn gr SS - Kb
1135	1181	Sandstone	Barren	None	Sandstone grades back & forth between fn gr clean Sand & Sandy mudstone - Kb
1181	1205	Sandstone	rare trace of very fn gr xlyn py	chlorite surrounding occ. qtz pebbles	fn gr, moderately well broken - Kb

AMERICAN SMELTING & REFINING CO.
GEOLOGIC LOG

PROPERTY Charleston Pb Mine
MINING DISTRICT Tombstone
COUNTY, STATE Cochise, Arizona

DRILL HOLE 5-H
FINAL DEPTH 1405 ft

DATE 10-19-78
LOG BY BJD

DEPTH FROM	DEPTH TO	ROCK	MINERALIZATION	ALTERATION	REMARKS
1205	1224	congl.	Tr py in monzonite fragment elsewhere barren	wk chlorite & xlyn sericite in monz fragment - no other alteration	fragments of Kb and medium gr. monzonite, could be Pe fragment, congl. - Kb
1224	1242	mudstone	Barren	None	Laminated, beds dip 50° to core axis - Kb
1242	1305	siltstone	occ rare specks of very fn gr xlyn py	None	massive siltstone with chert blebs - Kb
1305	1315	shale	rare trace of fn gr xlyn py	calcite filled fractures	badly broken, fossil black shale, appar contact 55° to core axis - Kb
1315	1321	siltstone	trace fn gr xlyn py	None	massive, [illegible] - Kb
1321	1323	Fault	Barren	None	—
1323	1337	shale	Barren	calcite filled fractures	as interval 1305-1315' except no sulfides - Kb
1337	1344	Fault	veins of py up to 1/2" wide in gouge	None	—
1344	1375	Shale	rare fine gr py along bedding [illegible]	None	moderately well broken. Black silty shale - Kb
1375	1379	Fault	xlyn py disseminated [illegible]	None	—
1379	1382	Shale	Barren	None	as interval 1344-1375 except no sulfides - Kb
1382	1405	Sandstone	fn gr disseminated xlyn py	chloride along occ. fractures	fn gr, somewhat friable, some [illegible] blebs & lenses, arkosic - Kb
			Bottom 1405 ft.		

The Northern Miner, V. 79, N. 41, Dec 13, 1993, p. 3.

SUMMARY REPORT

CSAMT SURVEY

ROBBER'S ROOST PROJECT
Cochise County, Arizona

for
Excellon Resources, Inc.

Issue date: January 5, 1994
Zonge Job # 9362

Zonge Engineering & Research Organization, Inc.
3322 East Fort Lowell Road, Tucson, AZ 85716 USA
Phone (602) 327-5501 Facsimile (602) 325-1588

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SUMMARY REPORT

CSAMT SURVEY

ROBBER'S ROOST PROJECT

Cochise County, Arizona

for

Excellon Resources, Inc.

EXECUTIVE SUMMARY

On October 28, 1993 Zonge Engineering and Research Organization mobilized a four-person crew to Tombstone, Arizona to perform a controlled source audio-frequency magnetotelluric (CSAMT) survey at the Robber's Roost Project in Cochise County, Arizona for Excellon Resources, Inc. The crew acquired data at 28 stations along a single line for a total of 5,500 feet of coverage during two production days. The line was repeated on December 14 and 15, 1993 after it was established that coherent radio noise had contaminated the original data set. The line location is shown on Plate 1, and data plots are included in the back pockets of this report.

This report briefly summarizes the results of the CSAMT survey only. Some correlation is included with geologic information provided by James Briscoe of JABA, Inc., but a detailed analysis of geology, drilling results, and geophysical data is not included.

Several interesting features are evident in the data (see Plate 2). The geologic layering in the area (Mesozoic sedimentary units overlying Paleozoic limestones) is seen as a low resistivity layer overlying a high resistivity layer across much of the line. A significant fault with as much as 1000 feet of offset is seen near station 2500. Southeast of this fault, a resistive layer interpreted to be Paleozoic limestones is substantially closer to the surface than northwest of the fault. The shallow data suggest lower resistivities at or near the surface northwest of the fault relative to southeast; this may be correlated to a change from phyllic alteration (on the northwest) to propylitic alteration (on the southeast) reported by James Briscoe.

Northwest of station 1500, resistivity curves appear strongly affected by localized three-dimensional effects, and modeling is very difficult. A strong, near-surface conductor is suggested in the vicinity of stations 900 and 1100. Examination of resistivity curves suggest a significant change between stations 1300 and 1500, but it is difficult to evaluate the nature of this contact without additional data to the northwest.

PROJECT LOGISTICS

Survey Summary: The four-person crew arrived in Tombstone, Arizona on October 28, 1993 with Tim Nordstrom operating as crew chief. The transmitter dipole had been installed in advance of the crew as part of a semi-permanent CSAMT transmitter intended for use on future CSAMT surveys in the general vicinity of Tombstone. Data acquisition began on October 29 and was completed the following day. No down time was incurred from either equipment or weather problems. The data were very repeatable, but processing and modeling suggested that the data had been influenced by a coherent high-frequency noise source (presumed to be from the nearby Fort Huachuca military base). The crew returned to Tombstone on December 14 and repeated the line, using an active preamplifier filter on the electric field dipoles, as well as a different transmitter dipole location chosen to maximize signal strength. Data were again very repeatable, and no influence from high-frequency radio noise is seen in the data.

Survey Parameters: For the CSAMT survey, a station spacing and electric-field dipole size of 200 feet was used along the line. Data were gathered in sets of six stations simultaneously by reading six electric-field dipoles parallel to the transmitting dipole plus the horizontal magnetic field perpendicular to the transmitter in the center of the six-dipole spread. Magnetic-field curve shapes were checked regularly to ensure that the magnetic field was varying smoothly and predictably along the line. Data were acquired at 14 discrete frequencies from 1 Hz up to 8192 Hz in binary increments.

Field Instrumentation: The receiver used for this survey was a Zonge GDP-16 multi-purpose receiver. This receiver is a backpack-portable, 16-bit, microprocessor-controlled receiver capable of gathering data on eight channels

simultaneously. The electric-field signal was sensed at the receiver site using nonpolarizable ceramic porous-pot electrodes connected to the receiver with insulated 14-gauge wire. The magnetic field for the CSAMT survey was sensed with a ferrite-core magnetic-field antenna, also manufactured by Zonge Engineering.

The signal source for the survey was a Zonge GGT-30, which is a constant-current, 30 Kw transmitter. The transmitter was controlled by a Zonge XMT-16 transmitter controller, which contained a crystal oscillator identical to the one in the receiver. The receiver and the transmitter controller oscillators were synchronized each morning prior to data acquisition. The power source for the transmitter was a Zonge ZMG-30 motor-generator set, capable of generating 30 kilowatts of power.

DISCUSSION OF THE DATA

Data Quality: Signal quality was relatively good on this survey. Standard Zonge field procedure requires that the receiver operator make multiple measurements of each data point, while monitoring real-time standard-error values displayed on the screen of the receiver. Multiple blocks of the data are also displayed graphically as resistivity-versus-frequency curves (plotted on a log-log scale), with error bars denoting data scatter. The data for this survey generally repeated within 5%.

Cultural Contamination: There were relatively few cultural features (i.e., fences, powerlines, pipelines, and other man-made conductive objects) intersecting the lines on this project. Two small powerlines intersected the line at station 300, a cased drillhole is located at station 4100, a downed barbed-wire fence was crossed at station 2500, and shafts or adits were seen at stations 2650 and 4000. The influences of these features are discussed below in the "CSAMT Data" section. Data gathered on October 29 and 30 were influenced by high-frequency coherent radio noise, but the active high-frequency filter system used on the electric-field dipoles produced good quality data on December 14 and 15.

CSAMT Static Corrections: Static-shift problems are usually caused by small features (small relative to the minimum depth of investigation) near the surface, which tend to shift or offset the entire resistivity curve. This artificially produces a pseudosection which appears to be dominated by vertical features, with large changes in resistivity from station to station. Near-surface features causing the shift may hide deeper features, and shifted resistivities can cause errors in depth calculations (since the depth of investigation is dependent upon resistivity). Interpretation of the data set has been based on the static-corrected results, as

well as the raw Cagniard resistivity, impedance phase, and curve shape changes in the individual electric-field and magnetic-field measurements. The static-correction uses the impedance phase data to shift the resistivity curve, since the impedance phase data are not influenced by static shifts.

CSAMT Smooth-Model Inversion: The smooth-model inversion program used for modeling the data in this report is a robust method for converting CSAMT measurements to profiles of resistivity versus depth. Static-corrected apparent resistivities and impedance-phase data for each station are used to determine the parameters of a layered earth model. Layer thicknesses are fixed by calculating source-field penetration depths for each frequency. Layer resistivities are then adjusted iteratively until the model CSAMT response is as close as possible to the observed data. The algorithm for calculating the CSAMT response of a layered model includes the effects of finite transmitter-receiver separation and a three-dimensional source field. Accurate impedance magnitude and phase values are calculated for all frequencies and transmitter-receiver separations. The result of the smooth-model inversion is a set of estimated resistivities which vary smoothly with depth, giving the gradational result seen in the color data plots in this report. The smooth-model inversion does not require any a priori estimates of model parameters, thus the results are unaffected by any data processor's bias.

Data Presentation: The raw CSAMT Cagniard resistivity and impedance phase data are also included for reference in the form of black-and-white pseudosections with stations along the top of the plot, and decreasing frequency down the side of the plots. Although depth of investigation increases with decreasing frequency, depth is also a function of resistivity, thus these plots are not true cross-sections.

The results of processing and modeling the data are shown in the color cross-section with stations across the top and increasing depth down the side (Plate 2). In this plot, low resistivities are shown with "warm" colors (orange, red) and high resistivities are shown in "cool" colors (blue, green). Note that the vertical exaggeration on this plot is 2:1. It is important to note that the smooth-model inversion program shows gradational changes in resistivity, rather than abrupt, blocky changes. Interfaces between layers are usually picked on the basis of changes in curve shape; the multiple contour lines and colors should not necessarily be interpreted as a large number of layers, and the gradational nature of these plots should be kept in mind when interpreting the data.

<u>CSAMT Data: Line 1</u> Plate 2 shows the smooth-model inversion results for Line 1. Two powerlines intersected the line at station 300, and the data at that station have been deleted from the plot due to unrealistic results. Other cultural features did not appear to influence the data.

Over most of the line, resistivity layering is low-over-high, as expected from the Mesozoic sediments overlying Paleozoic limestones. In the shallow data, resistivities from station 1500 to 2700 are generally lower than from 2700 to the end of the line at 5500. This is evident in the static-corrected resistivity pseudosection, and weakly evident in the smooth-model results. This change in resistivity may be associated with a change in alteration noted by James Briscoe from phyllic to propylitic.

Electric field curve shapes from station 1500 to 5500 are generally similar, although a significant change, interpreted to be a fault, is seen at approximately station 2500. Southeast of this fault, high resistivities appear shallower than

northwest of the fault. On both sides of the fault, layering appears to be approximately horizontal. In the smooth-model results, the offset is 1000 feet, but this should be considered a tentative interpretation until drilling results can be used to establish fixed layers for modeling. The layering is complex, and other models can be generated which also fit the data.

Within this region from station 1500 to 5500, several narrow zones of increased resistivity are seen, giving the appearance of narrow, vertical dikes or silicified zones. Without additional information, it is not possible to determine whether or not these features are simply local variations in resistivity or separate features (such as dikes or silicified zones). These narrow features are seen at stations 3100, 3500-3700, 4100, and 4700.

A second fault or contact is evident at station 1300, where curve shapes change substantially. Northwest of 1500, curve shapes indicate strong three-dimensional effects; as a result, the interpretation of this section of the line is only very general. Station 300 has been deleted from the plot due to powerline effects, but powerline noise does not seem to be the cause of the unusual resistivity curves at the other stations. Below approximately 3000 feet, the smooth-model results suggest that resistivity decreases with depth rather than increasing as seen on the southeast of 1500. This may be a combination of an artifact of modeling and three-dimensional effects. Very low resistivities are indicated in the near-surface around stations 900 and 1100. Station 100, which is the northwest end of the line, exhibits very high resistivities in the shallow data, but it is difficult to interpret another contact on the basis of a single station.

SUGGESTIONS FOR FUTURE WORK

The CSAMT method appears to have provided good quality data at a reasonable speed and should prove to be a useful exploration tool in this environment. This data set should now be examined with respect to drillhole results and known subsurface information in order to more completely evaluate the results of the survey.

Future CSAMT work in this area should be tested using smaller dipoles with closer station spacings, due to what appear to be changes in resistivity over small distances. This would allow better delineation of some of the features seen along Line 1. An additional nearby line, parallel to Line 1, would also be very useful in establishing trends and evaluating some of the localized, single-station features.

Additional line segments northwest of station 1500, possibly with multiple transmitter locations, would be very useful in evaluating this complicated, three-dimensional area. Extending coverage northwest would be important in understanding the structure in this area; southwest of this area are drill holes which show a substantial thickness of volcanic rocks over the Bisbee Group, and the contact with Paleozoic rocks is at depths in excess of 4000 feet. This implies that there is another offsetting structure northwest of the one identified at station 2500.

Norman Carlson
Chief Geophysicist

Mark Thoman
Chief Geologist

Static Correlation
Resistivity

Line 1
ROBBER'S ROOST
for
Excellon Resources, Inc.

Field Job 9362
ZONGE ZPLOT 7.10

CSAMT SURVEY DATA
STATIC CORR. RESISTIVITY

(Amtrad: 100-1300/ZSTATIC: 1500-5500)

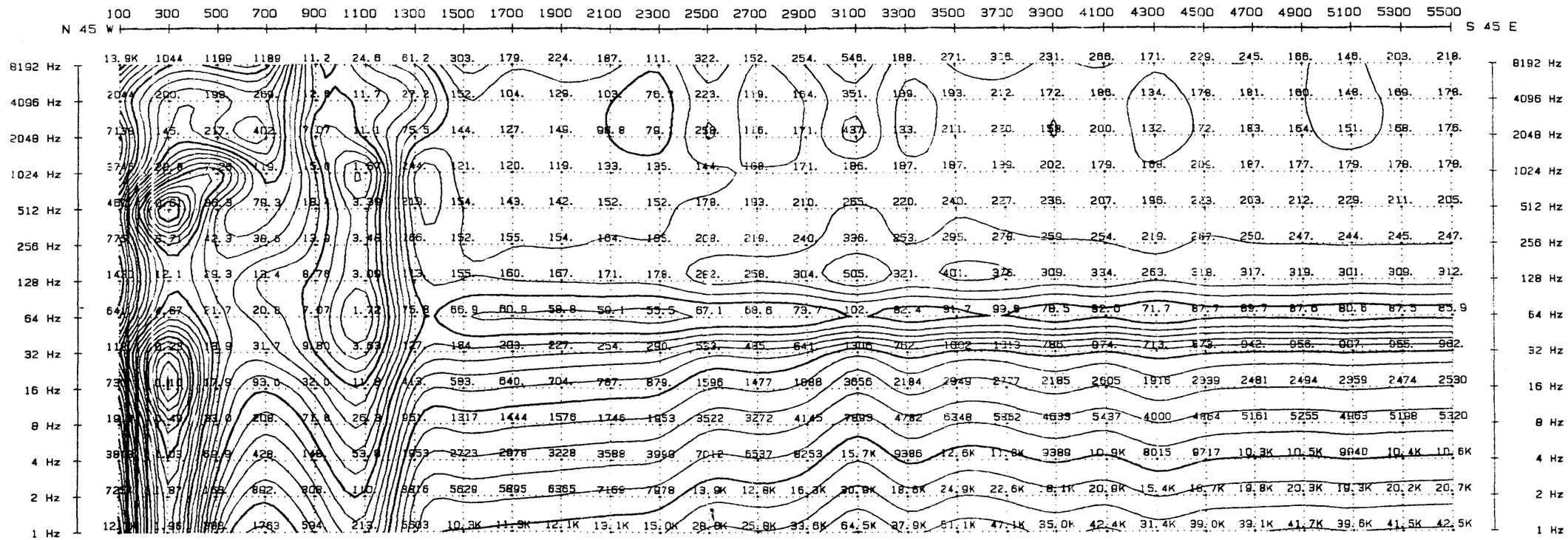
RECEIVER DATA
Length = 200 ft Line = N 45 W
Spacing= 200 ft Dipole= S 45 E

Surveyed= DEC 93

TRANSMITTER DATA
Length = 4400 ft
Orient. = S 37 E
Distance= 24700
Rx to Tx= SW

[Plot limits] and LOGARITHMIC CONTOURS
(Interval: 0.20)

[95.3m]	6.31	631.	63.1K
.100	10.0	1000	[64.5K]
.158	15.8	1585	
.251	25.1	2512	
.398	39.8	3981	
.631	63.1	6310	
1.00	100.	10.0K	
1.58	158.	15.8K	
2.51	251.	25.1K	
3.98	398.	39.8K	



Cagniard
Resistivity

Line 1
ROBBER'S ROOST
for
Excellon Resources, Inc.

Field Job 93622
ZONGE ZPLOT 7.10

CSAMT SURVEY DATA
CAGNIARD RESISTIVITY

values in ohm-meters

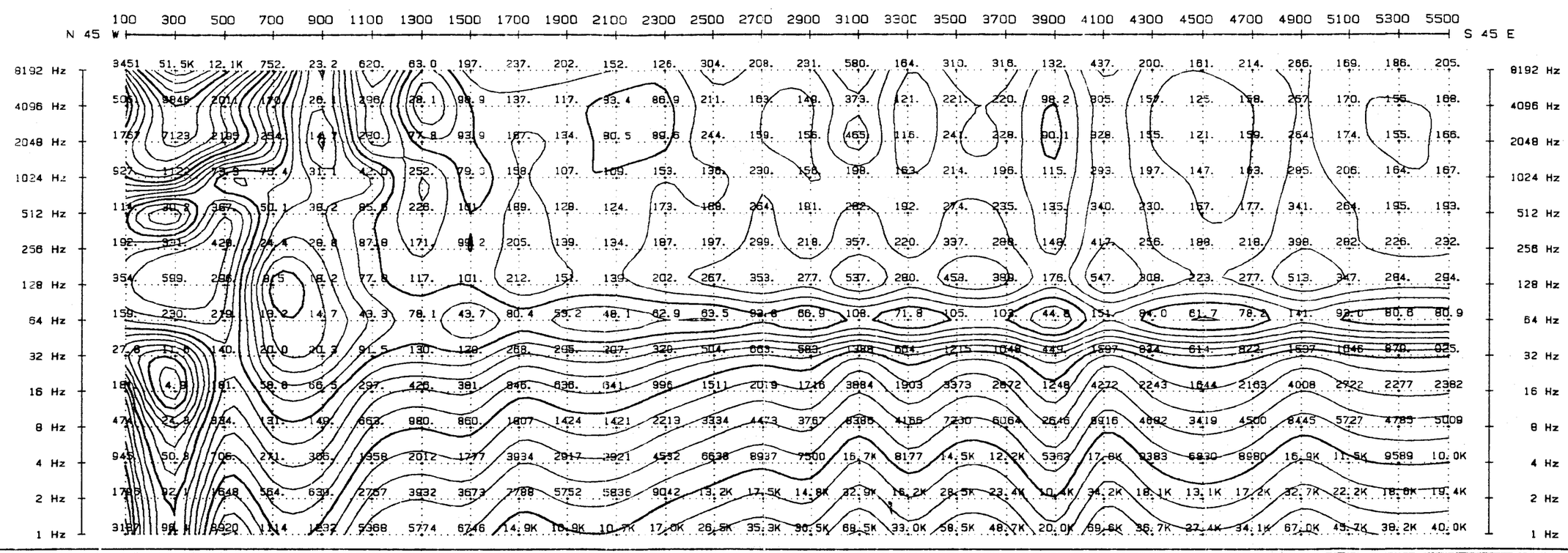
RECEIVER DATA
Length = 200 ft Line = N 45 W
Spacing= 200 ft Dipole= S 45 E

Surveyed= DEC 93

TRANSMITTER DATA
Length = 4400 ft
Orient. = S 37 E
Distance= 24700
Rx to Tx= SW

[Plot limits] and LOGARITHMIC CONTOURS
(Interval: 0.20)

[4.70]	398.	39.8K
6.31	631.	63.1K
10.0	1000	[69.8K]
15.8	1585	
25.1	2512	
39.8	3981	
63.1	6310	
100.	10.0K	
158.	15.8K	
251.	25.1K	



Impedance Phase

Line 1
ROBBER'S ROOST
for
Excellon Resources, Inc.

Field Job 9362
ZONGE ZPLOT 7.10

CSAMT SURVEY DATA
IMPEDANCE PHASE

values in milli-radians

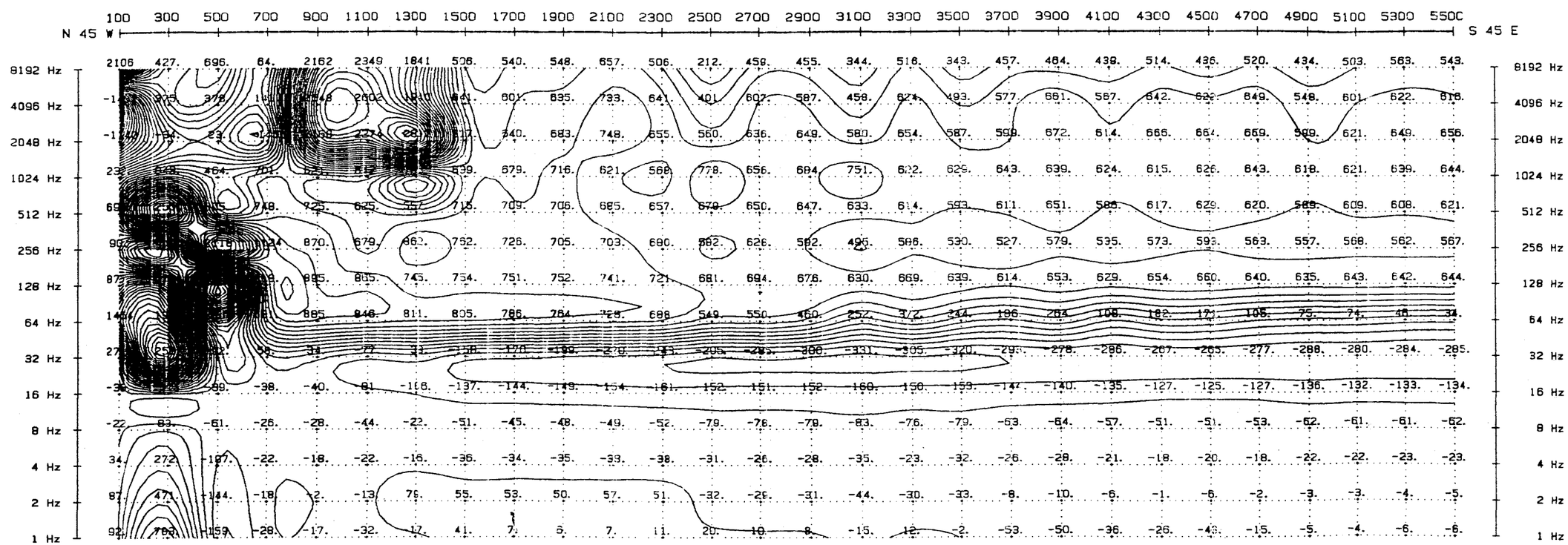
RECEIVER DATA
Length = 200 ft Line = N 45 W
Spacing= 200 ft Dipole= S 45 E

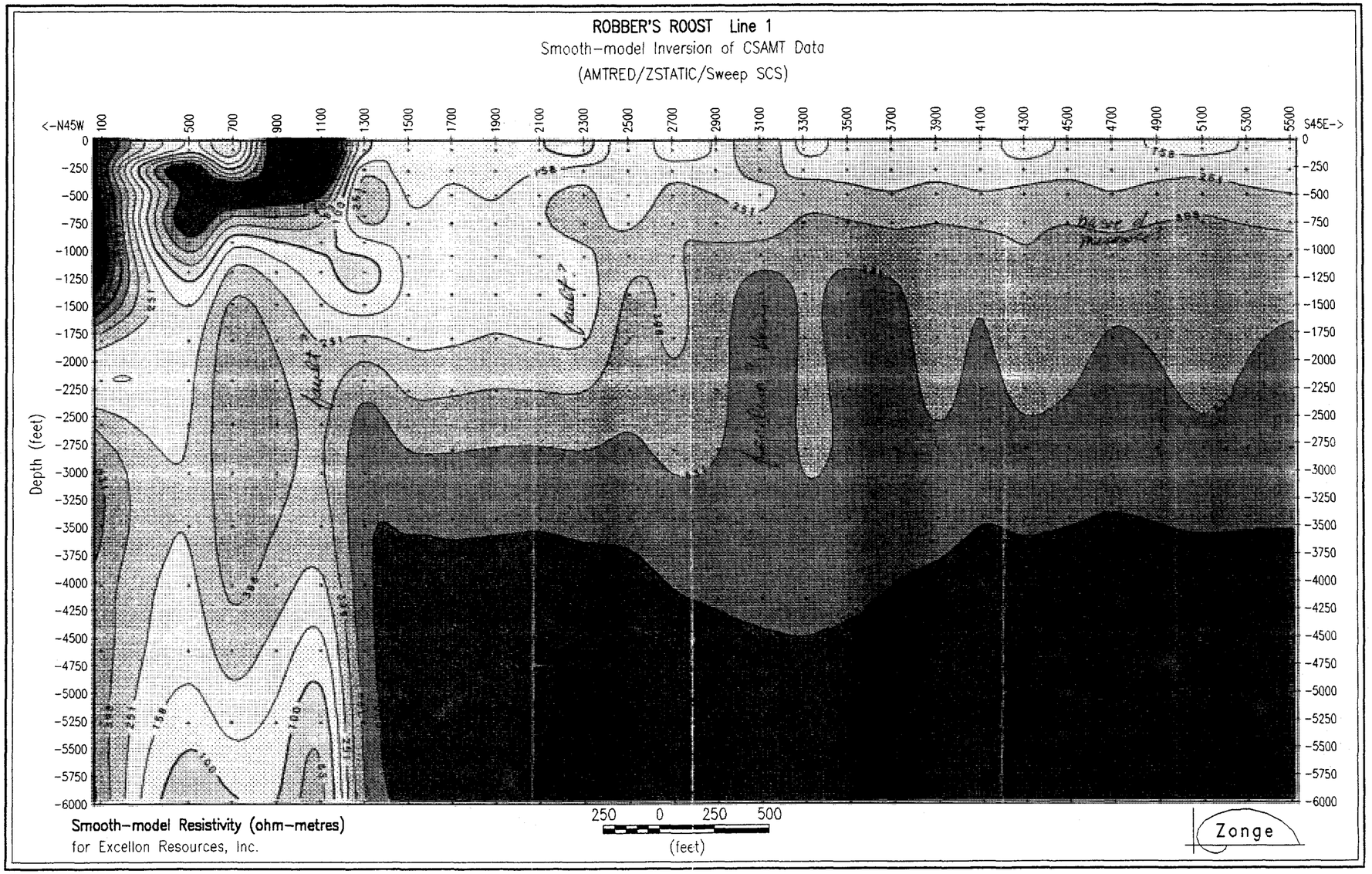
Surveyed= DEC 93

TRANSMITTER DATA
Length = 4400 ft
Orient. = S 37 E
Distance= 24700
Rx to Tx= SW

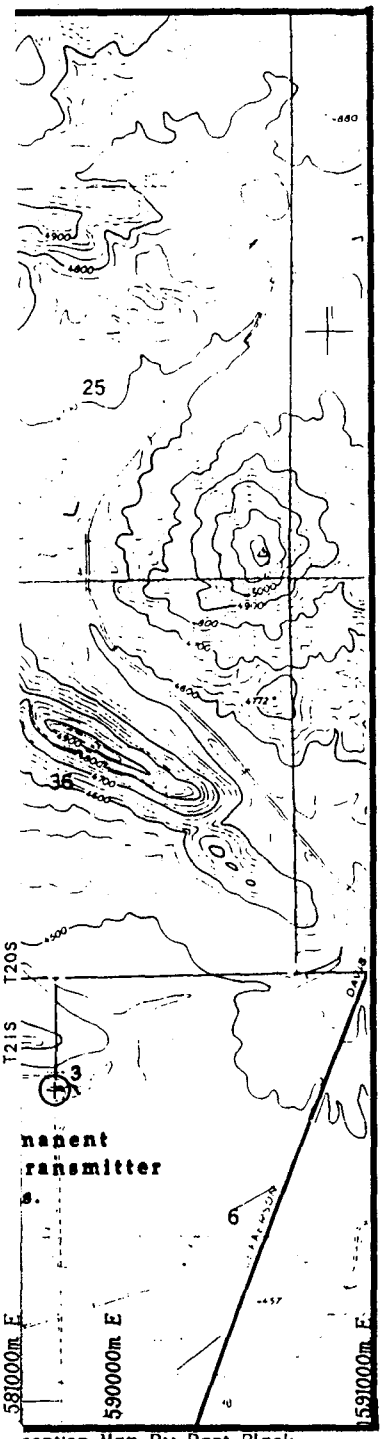
[Plot limits] and ARITHMETIC CONTOURS
(Interval: 100.00)

[-2189]	-1200	-200.	800.	1800	2800
-2100	-1100	-100.	900.	1900	2900
-2000	-1000	0.00	1000	2000	[2940]
-1900	-900.	100.	1100	2100	
-1800	-800.	200.	1200	2200	
-1700	-700.	300.	1300	2300	
-1600	-600.	400.	1400	2400	
-1500	-500.	500.	1500	2500	
-1400	-400.	600.	1600	2600	
-1300	-300.	700.	1700	2700	





Smooth-model Inversion of CSAMT Data



ocation Map By Bart Black

N

Scale 1:24,000

0 1000 2000
FEET

0 500 1000
METERS

Location Map

Plate I

CSAMT Soundings

Dipole Spacing 200 ft

CSAMT Pot Location

Robber's Roost Project

T.20 S., R.22 E.
Sections 25-30 and 31-36

T.21 S., R.22 E.
Sections 1-6

Cochise County, Arizona

October, 1993

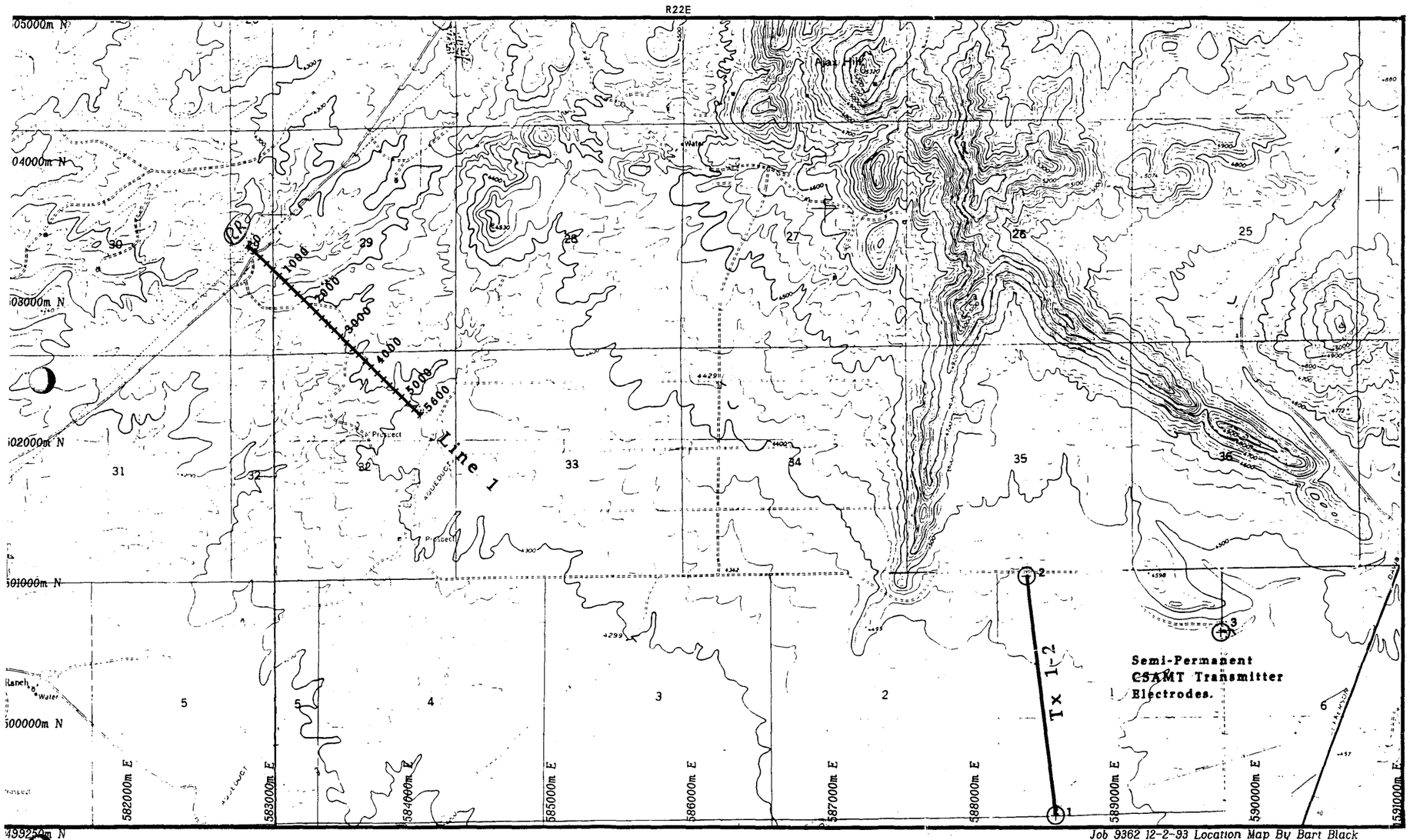
for

Excellon Resources Inc.

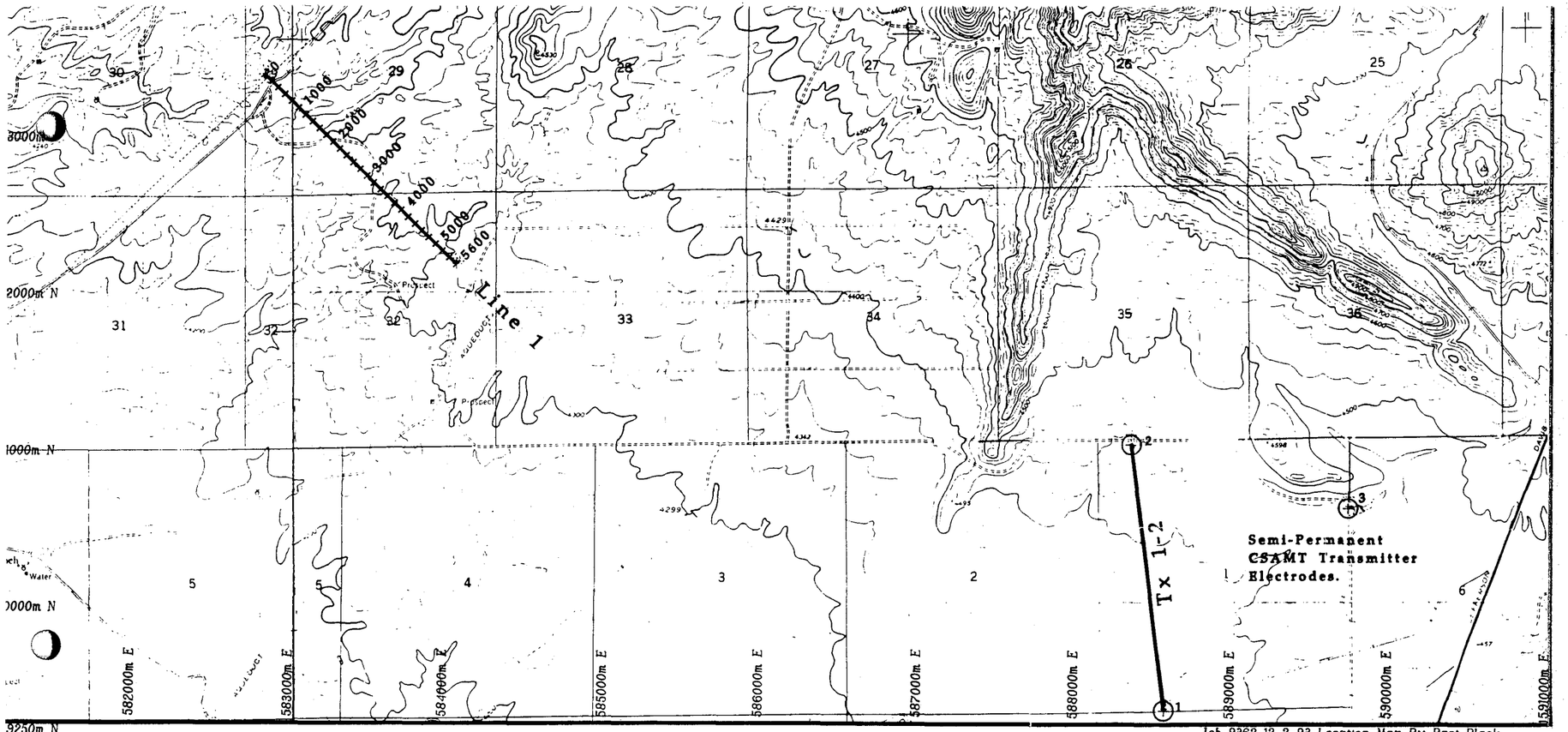
by

ZONGE ENGINEERING
& RESEARCH ORGANIZATION
3322 E. Fort Lowell Road
TUCSON, ARIZONA 85716

Grid: UTM Zone 12
Grid Declination 0° 30' East
Base Map USGS Provisional Edition 1978
Tombstone, and Fairbank, Arizona
Magnetic North Declination 12° 30' East



Job 9362 12-2-93 Location Map By Bart Black


Line 1
1000
2000
3000
4000
5000
5600
Tx 1-2
Semi-Permanent
CSAMT Transmitter
Electrodes.
2000m N
1000m N
9250m N
582000m E
583000m E
584000m E
585000m E
586000m E
587000m E
588000m E
589000m E
590000m E
591000m E
Job 9362 12-2-93 Location Map By Bart Black

FILE Project

JABA INC.
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January 8, 1994

Mr. A. Douglas MacKenzie
President
Excellon Resources Inc.
Suite 200-20 Adelaide St.E.
Toronto, On Canada M5C 2T6

Dear Douglas:

Re: My evaluation of the Zonge Inc. CSAMT Geophysical Survey Line 1, Harry Downey Property, Robbers Roost Area, Tombstone Mining District, Cochise Co., Arizona U.S.A.

The Zonge performance in scheduling and meeting our deadlines for State Prospecting Permit assessment work was pretty abysmal. For what ever reason they claim to have not understood our deadline requirements. However, I called them, urging them on 28 times from Oct. 28 until receipt of the final report Jan. 5, 1994, and during that period was shuttled around thru 5 different geophysicists and technicians. In all fairness however, Zonge had to completely redo the survey, through to no fault of their own, because of disruption of the data from radio signals from Fort Huachuca, the US Army Electronic Proving Grounds - see Zonge report. They discovered the effects on the first survey when trying to interpret the data. There was no charge to Excellon.

The Smooth - model Inversion of CSAMT Data - Plate 2 corresponds closely to what I had surmised might be the sub-surface geologic situation.

The sharp break at station 1,300 feet suggests the edge of the porphyry copper system. The only question appears to be depth - how deep to mineralization and will the grade make it ore at that depth. Could the intense low resistivity from about 400 to 1300 feet represent a chalcocite blanket or perhaps chalcopyrite in a receptive horizon? An IP (Complex Resistivity) survey along the same line might give an answer. But it might be more definitive and cost effective to drill a hole into the anomaly, which seems to lie at a depth of 250 to 1,000 feet except between stations 800 feet and 1,300 feet where it is more shallow. Of course it could be just phyllic alteration without economic mineralization.

COPY

James A. Briscoe, Registered Professional Geologist, Arizona #9424,. California #518

The high resistivity zone at 0 to 100 feet may be the indurated and resistant Robbers Roost Breccia pipe itself - though it could also be an andesite dike. Additional line would have to be extended beyond 0 to the northwest to test more of the breccia pipe.

The very low resistivity "horns" between stations 300 feet and 1,200 feet at a depth of 4,000 feet could represent strong calc-silicate associated copper mineralization in Paleozoic limestones. Could the low resistivity zones extending above the "horns" be similar mineralization that could be exploited at a more shallow depth?

The fault suggested by Zonge's interpretation of the displacement of the near surface, low resistivity feature (the interface between the Cretaceous Bisbee formation and the Paleozoic limestones) at about station 2,300 feet may be visible at the surface on color aerial photography.

The vertical tabular features represented by the lobes at stations 3,100, 3,500-3,700, 4,100 and 4,700 are particularly interesting. Zonge's interpretation attributes them to resistant zones either silicified (or silicated?) veins or dikes. No dikes crop out in this area, though they could exist in the sub-surface. If the low resistivity layer from the surface to 500 - 750 feet between stations 2,700 and 5,500 is the Cretaceous Bisbee sediments, then the tabular features could represent replacement veins in the underlying Paleozoic limestones, terminating at the base of the impermeable Bisbee mudstones. This is what appears to happen in large degree in the Tombstone (Contention) area. These tabular replacement? zones if accurately represented by the CSAMT data could be significant targets on their own. This part of the crossection may represent classic replacement mineralization in limestone around a porphyry copper center.

I find this data highly encouraging. Extention of this line to the northwest where it would cross the porphyry copper system at approximate right angles to its long axis would give us a chance to see symmetry, if it exists and get a better handle on the system in areas of exposed porphyry copper alteration. Complex resistivity IP according to Zonge would enhance interpretation and perhaps enable them to identify what types of sulfides are present in various areas. It would also be helpful to run a parallel line across the deep drill holes that exist further to the southwest. Re-examination of color air photos and photogeologic maps and re-interpretation of geology taking the geophysics into consideration is in order.

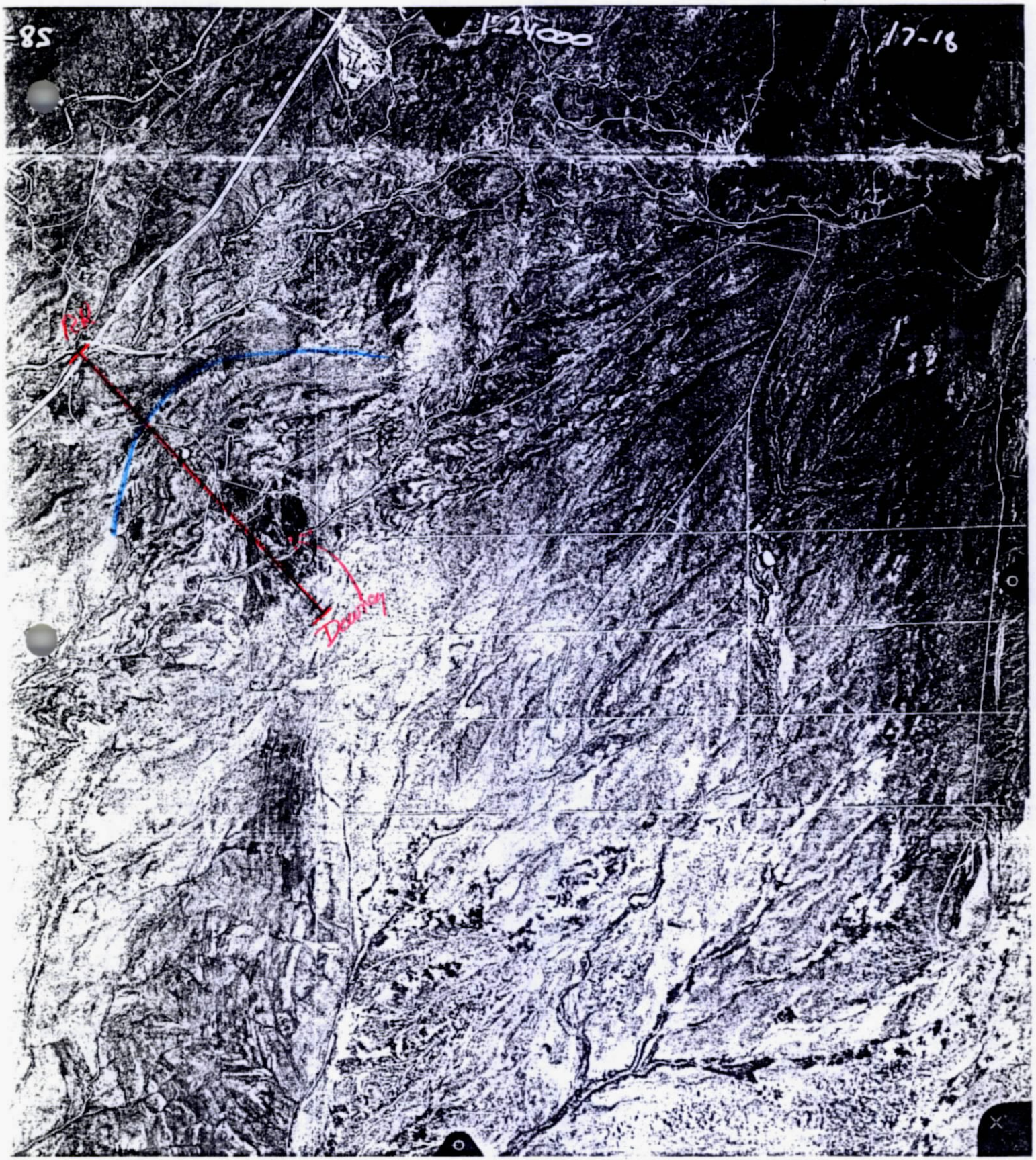
The primary reason for this line in this position was to provide for State Prospecting Permit assessment work. I believe we got a lot of " bang for the bucks" invested.

Very truly yours;

James A. Briscoe

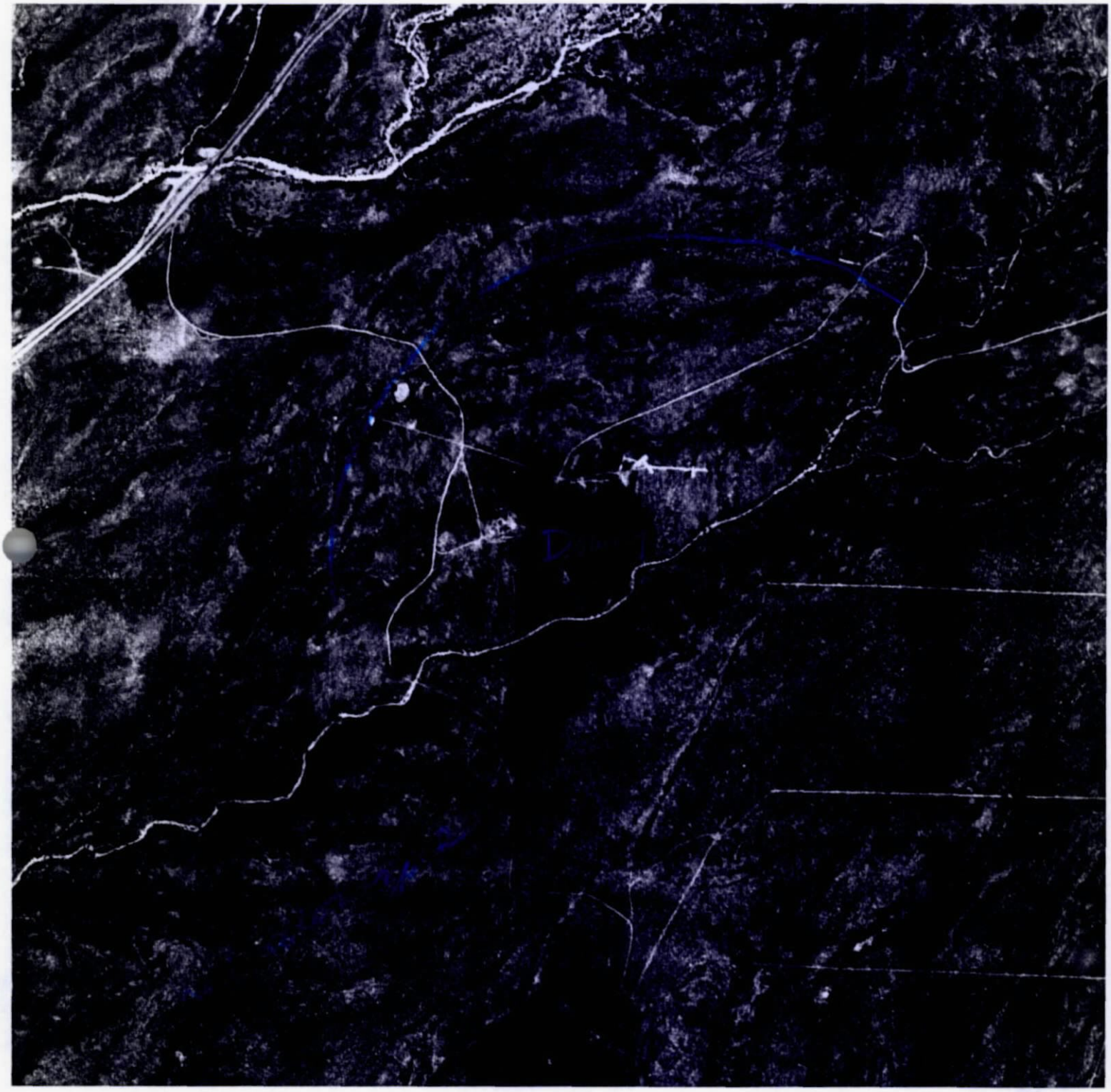
ADM01/06/94

To accompany Zonge report of January 5, 1997



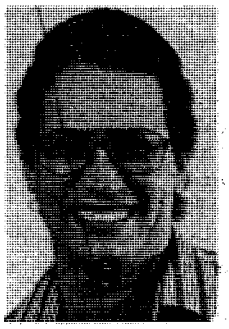
Zonge Resistivity CSAMT Line

from Downey



print of color photo

from Downey



Durham

Montoya

Durham, Montoya advance in Morenci engineering

Thomas D. Durham and Jaime L. Montoya have been promoted in the engineering department of Phelps Dodge Morenci Inc.

Durham, who was named senior engineer, joined Phelps Dodge Morenci in December 1983 as a mine planning engineer. In 1987 he assumed the additional responsibilities of ore control engineer and held this position until his recent promotion.

Durham received his BS in mining engineering from the University of Arizona in 1982 and took post graduate studies in civil engineering in 1982 and 1983, also at the University of Arizona.

Montoya was named a party chief. A native of Morenci, he joined Phelps Dodge at Morenci in 1975 as a cleanup laborer in the Morenci concentrator. In 1981, he became an apprentice carpenter, a position he held until 1982. Prior to his recent promotion, he was employed as a surveyor with the engineering department.

Brad Sullivan promoted at Chino smelter

James Bradley "Brad" Sullivan has been promoted from pipefitter to smelter field repair shift foreman at the Chino Mines Company smelter at Hurley.

A native of Bisbee, he attended Cochise College in nearby Douglas. He began his career with Phelps Dodge in 1973 as a stockman at the Phelps Dodge Mercantile Company store in Bisbee. He later joined the Phelps Dodge smelter in Douglas as a laborer.

Sullivan became a pipefitter apprentice in 1976, completing the program in 1981, when he was named the "Outstanding Apprentice" for the year.

He was a journeyman pipefitter at the Douglas Reduction Works from 1981 until 1987, when he went to Chino Mines as a smelter maintenance mechanic, the position he held at the time of his recent promotion.

Tombstone drilling looks for copper — not silver

BHP Minerals International Exploration Inc. of Houston is continuing with its exploration project near the historic Arizona silver camp of Tombstone — but its interest is in copper, not silver.

That's according to 2 Toronto-based firms that have a joint venture deal with BHP — Excellon Resources Inc. (EXN) and MVP Capital Corporation (MVP).

The firms announced October 24th that BHP Minerals International Exploration will make the US$25,000 second option payment due November 29th on EXN-MVP's jointly owned Robber's Roost project near Tombstone. The exploration company is an arm of BHP Minerals, headquartered in San Francisco and Melbourne, a division of The Broken Hill Pty. Company Ltd. of Australia.

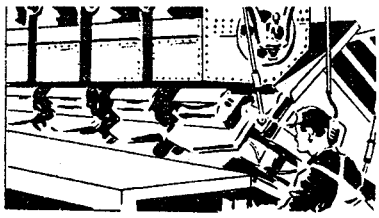
EXN and MVP said BHP has the right to earn up to a 70 percent interest in the Robber's Roost project by spending up to US$3.6 million over 6 years and providing a feasibility study.

"BHP has spent more than its required minimum expenditure of US$150,000 during the first year of the agreement," the Canadian companies said, "and, in order to maintain the agreement in good standing, must have expended a total of US$400,000 by the end of the second year."

EXN and MVP said BHP previously completed geological studies and geophysical surveys that identified a favorable setting and several anomalies. Subsequently, 3 reverse circulation holes were drilled.

"These holes," the October 24th announcement said, "have defined a large pyritic halo providing a vector toward potential copper enrichment zones under leached-capping outcrops near the center of the alteration zone. Additional drilling, done by diamond coring, will target these zones.

"The present program will consist of an additional 3 diamond drill holes," the announcement concluded. "The first of these holes has now been completed and the second hole is in progress."



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