CONTACT INFORMATION
Mining Records Curator
Arizona Geological Survey
416 W. Congress St., Suite 100
Tucson, Arizona 85701
520-770-3500
http://www.azgs.az.gov
inquiries@azgs.az.gov

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AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona
December 9, 1960

MEMORANDUM FOR T. A. SNEDDEN

SILVER BELL
El Tiro-Imperial
Preliminary Geologic Logs

This memorandum accompanies a folder containing prints of Preliminary Geologic Logs of drill holes D8, D10, D11, and D12. A new form has been used in compiling these logs. Those holes drilled before this new form was prepared are being re-logged to conform. These logs will be distributed soon and should be placed in this folder as they become available.

These preliminary logs are being made up with the intention of providing all concerned with a detailed record of the results of each hole as soon as possible. The form has been printed on transparent paper. To gain time, although at the expense of neatness, data are penciled on the transparency as a hole is being drilled. When a hole is completed, prints of the transparency will be made and distributed as soon as possible. These prints should be added to the present folder.

These preliminary logs are more complicated than most logs because mineralogy (especially non-sulphide copper), structure, and lithology are more diverse in the El Tiro-Imperial area than in most disseminated deposits. These are really working logs, and much of the detail on them will be of use only to the geologists and metallurgists actually concerned from day to day with various correlations and studies. However, prints of all logs will be filed in the Tucson and New York offices as a matter of course. The original transparencies will be kept at Silver Bell.

A list of abbreviations has been agreed on and is included at the back of the folder. Although some of the notations on these present logs do not conform exactly, future notes will.

Part of the reason for the complexity of these preliminary logs is that we are planning to punch the basic information for each drill hole on computer cards in such a manner that programs for ore reserve calculations and other statistical studies might eventually be developed. These basic data on the cards will consist of coordinates, elevations, footages, assays, copper mineralogy, rock types, and the like. This information all will be easily obtainable from these preliminary logs.

Another form for a "Composite Log" has been drafted and printed on transparent material. This log is letter-size, and on it a condensed version of the drilling results of each hole will be typed. These logs will show footages, assays, averages, and simplified geology. They will constitute a final, neater record subject to easier reference than the preliminary logs. There will probably be some delay in completing these final composite logs because the work of typing and checking probably will be done periodically whenever convenient.

Kenyon Richard
KENYON RICHARD

cc: DJPope - w/set of logs
CPPollock - w/set of logs
DRJameson - w/2 sets of logs
Tucson file - 2 sets of logs

ABBREVIATIONS

Used on El Tiro-Imperial
and Mission Drill Logs

Rock Types

Al	Alluvium
Ccg	Caliche Conglomerate
Sed	Sedimentary
Arg	Argillite
S-Arg	Sandy Argillite
C-Arg	Calcareous Argillite
Ark	Arkose
Qtzt, Qt	- Quartzite
Cgl	Conglomerate
Ls	Limestone
Ss	Sandstone
Sh	Shale
Sltst	Siltstone
Met	Metamorphic
Mb	Marble
Tac, Tt	- Tactite
DHF	Diopside Hornfels
AHf	Actinolite Hornfels
Hf	Hornfels
Volc	Volcanic
Ig	Igneous
Dior	Diorite
Gb	Gabbro
Ap	Andesite porphyry
An	Andesite (post mineral)
Mz	Monzonite porphyry
Ak	Alaskite
Da	Dacite
Dp	Dacite porphyry
Mp	Metaporphyry
Fp	Felsite porphyry
Fr	Feldspathized rock
Qf	Quartz feldspar rock

Formations

Pif	Pima formation
Pgf	Papago formation
Kf	Kino formation

Structures

BR	Bedrock
frac	fracture
vlt	veinlet
vn	vein
gg	gouge
bx	breccia
flt	fault
peb	pebble
diss	disseminated
ct, cnt	- contact
mtx	matrix
br	broken
sh	shear (ing) (ed)
jt	joint
por	porphyritic
fr, frag	- fragment
bd, bed	- bedding, bedded

Minerals

Cup	Cuprite
CuSi	Chrysocolla
CuOx	Copper oxide
CuCo3	Malachite Azurite
Nat Cu	Native Copper
Suls	Sulphides
Cpy	Chalcopyrite
Cc	Chalcocite
Bn	Bornite
Cov	Covellite
Lim	Limonite
LLm	Live Limonite
Py	Pyrite
Hem	Hematite
Mag	Magnetite
Spec	Specularite
Sph	Sphalerite
Gal	Galena
Moly	Molybdenite

ABBREVIATIONS - Continued

Minerals - continued

Fl	Fluorite
Gar	Garnet
Feld	Feldspar
Qtz	Quartz
Biot	Biotite
Chl	Chlorite
Serp	Serpentine
Ep	Epidote
Act	Actinolite-tremolite
Diop	Diopside
Asb	Asbestos (asbestiform)
Wol	Wollastonite
Cal	Calcite
CO3	Carbonate
WO3	Tungstate
CaSiO3	Lime Silicates
Bar	Barite
Gyp	Gypsum
Smiths	Smithsonite
Calc	Calcareous
Si	Silica

Others

hor	horizontal
vert	vertical
sp	sparse
sc	scarce
r	rare
tr	trace
abun	abundant
num	numerous
sct	scattered
st	strong
mod	moderate
wk	weak
v	very
silf	silicified
sil	siliceous
cs	coarse
fg	fine-grained
mg	medium-grained
cg	coarse-grained
sd	sandy
slty	silty
PM	post mineral
min	mineral
xtl	crystal
rext	recrystallized
RB	Rock Bit
RoBit	Rotary Bit
trans	transitional
poss	possible
pat	patches
alt	altered, alteration
dk	dark
lt	light
blk, bl	- black
wht, wh	- white
gr	gray
brn	brown
pk	pink
grn	green
yel	yellow

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO-SILVER BELL UNIT

Notes:

(1) Est. % Cu represented by each mineral

(2) Est. mineral %; or, as follows. Trace (Tr), Sparce (Sp) < 5 %
Moderate (Md) 5 - 50 %
Stong (St) + 50 %

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D-4
Page 1 of 2 Pages
Coll. Elev. 2939.9 Final Depth 367.9
Coords N 36,660 E 18,584
Inclination Vert.
Logged by SVP & CWH & SAA
Date Start 7-23-60 Finish 8-3-60

	Depth From	Depth To	Int'vl	Elev	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov	Sp Gr	Cu (1) Chrys	Pitch	Black	Blue Green	Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag	Hem	Spec	Other (2) Galena	Sphal	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn Qtz	CLART. CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
	0.0	14.3	14.3		—		—		RB	—																										Rock fill. Old mine dump. Bedrock @ ± 12'
NC 2.700"	14.3	24.5	10.2		0.08				64	2.60	.03	.01	.03	.01				Tr	Tr						Tr				20	Tr		SP	Dp			Dp, wk wit, wk Lim. Numerous qtz veins.
	24.5	35.0	10.5		.09				50	2.61	.02	.01	.04		.02														SP							Dp as above, vein tr. Tr blk CuOx
	35.0	42.5	7.5		.10				81	2.59	.03	.02	.05																10	SP						As above. Fr 41.8' to end brn clay ggs. w/ wk blk CuOx
NX 1.875"	42.5	43.2	0.7		—		—		0	—																										Clayey to NX, set casing. No core recd
	43.2	56.1	12.9		.06				91	2.52	.01	.02	.03					SP											30	SP		SP				Dp w/ num. qtz. Mostly brn & gry clays, some sericite
	56.1	68.4	12.3		.07				94	2.56	.02	.02	.03											Tr				Tr	5							Lt gr, wk sr. St thin qtz veins @ 20° [illegible]
	68.4	77.4	9.0		.11				91	2.60	.02	.02	.08		.05			5	SP										SP							Dp. Fr 70.0-76.1 Lim intercepts, some qtz. Tr [illegible]
	77.4	86.1	8.7		.45	14.3 @ .45	.35	14.5' @ .35	88	2.76	.05	.03	.05	.22	.10			SP						2037					10							Dp as above. [illegible] to dk gr, finely grany, chlor, w/ appar. lg tests, w/ [illegible]
	86.1	91.9	5.8		.46		.36		88	2.58	.05	.05	.05	.21	.10			SP	Tr					2037					5	SP		SP				as above. Sp CC, wk-mod per [illegible] Tr blk CuOx
	91.9	101.0	9.1		.11				85	2.56		.01	.03	.05	.02									Tr					SP							Lt gr, fine-gr wit. Mod [illegible]
	101.0	116.6	10.6		.05				78	2.60			.05		Tr			Tr											Tr							As above
	116.6	121.3	9.7		.08				80	2.51			.03	.03	.02															Tr						Dp as above, [illegible] Sp CC, [illegible]
	121.3	128.1	6.8		.11				82	2.51		.01	.02	.05	.03				Tr					Tr												[illegible] fr. Fr 126.0' to end, gen clay gg w/ [illegible]
	128.1	139.0	1.9		.10				7	2.49			.03	.05	.02														SP							Clay gg as end of above run. Only 2 recd.
	139.0	145.8	5.8		.10				53	2.52		01	03	.04	.02			SP						Tr					10							Dp, v fibr, ggy & clay-like. St. fra Fe Ox, Sp CC
	145.8	149.8	4.0		.06				84	2.56		.02	.04		Tr														15							Dp, wk-mod wit, Bands fr. Wk bx. Blk Fe & CuOx on shears, Sp CC
	149.8	154.6	5.8		.09				100	2.55		.02	.05		.02														20							Dp as above. Sp zones fr 148.2-149.3 & 150.0-154.6 Blk CuOx
	154.6	154.7	7.1		.20				94	2.59		Tr	.05	.10	.05			Tr											30			Tr				Dp wk wit, w/ incr bx. Mod blk Fe & CuOx. Sp. Mal, CC, Cpy.
	154.7	161.3	6.6		9.17		.03		100	2.83			03		.14	4.00			SP	5				.012	15	10	75		SP				Hf	154.7	Flat?	Hf, chlor, sp veins. CT. Recent oxidation. St-Int. Cpy & Py as [illegible] w/ bx.
	161.3	166.1	4.8		5.07		.06		79	2.90			.06		.10	4.80	.11			SP				.004	10	10	80									Hf, in part chlorite. Min as above. No bx. Some qtz.
	166.1	176.0	9.9		1.12	32.0' @ 1.91	.04	32.0' @ .06	98	3.15			.04		.05	.90	.13							.010	10	15	75									Hf as above Tr fr 167.0-167.8. Top CT @ 35° St Cpy & Py [illegible]
	176.0	180.7	9.7		.78		.03		88	3.53			.03		.05	.65	.05							.005	15	30	55		Tr				Tt	172.7	Good	Hf as above, w/ qtz incr. to CT. Tr mom. St Py & Cpy [illegible]
	180.7	188.1	7.4		.52		.02		94	2.65			.02			.50		Tr		Tr				.012	15	25	60		SP			SP				Tt. Py incr, Cpy decr. At 186.0 leaching incr.
	188.1	190.1	2.6		.50		.38		92	2.98		.08	.10	.20		12		SP	Tr					.005	5	10	40			Tr			Do	189.2	60°	Tt incr mineral [illegible] & CuOx. Dp Quest qtz, sc. fels. wk sili. & CuOx
	190.1	196.5	5.8		.17				100	2.58			.05	.10		.04									Tr				Tr	SP		Tr				Dp as above. Wk mineral suls & ox's
	196.5	202.2	5.7		.09				100	2.56			.04	.05																						As above.
	202.2	215.2	13.0		.14				96	2.58			.05	.05		.04			Tr						Tr											Dp as above, V.F.G. Sp. Mal on shears.
	215.2	220.6	5.4		2.28		.02		100	2.87			.02			2.26		Tr	SP					.05 .020	20	10	70			Tr			Hf	215.4	?	Hf w/ mag. Int. Py, St Cpy, Sp Zn
	220.6	231.2	10.6		2.01		.08		94	2.66			.08			1.93				Tr				.05 .011	10	10	70		10							Hf soft & alt. fr 222.6-223.7. Soft, ggy & muggy fr 223.0-223.2.
																																				After 223.7 py decr. Cpy remains St-Int. Qtz incr. Tr Mag.
	231.2	237.1	5.9		.57		.10		89	3.21			10			.47			SP	Tr				.02 .032	10	20	70		SP	Tr						Tt w/ Ca Sics to 236.3 where Hf again. St-Int Py, wk-mod Cpy, Sp @ 237.4
	237.1	246.5	9.4		1.28	52.3' @ 1.92	.05	52.3' @ .07	98	3.09			05			1.23								.003	10	30	60		Tr				Tr	244.8	Good	Hf gr-grn, St Py, Cpy. Blebs of mag. qtz incr to CT.
	246.5	255.0	8.5		1.52		.09		98	2.73			.09			1.43								.008	10	30	60			Tr			Hf	251.1	Good	Tt w/ St py, Cpy, & mag. Hf lt. gr, w/ v/st Cpy, mag.
	255.0	265.4	10.4		3.23		.05		88	2.73			05			3.18								.008	10	25	65									Hf w/ sc tra qtz. St Py, St-Int, Cpy. Mod mag.
	265.4	267.5	2.1		2.45		.10		97	3.93			.10			2.33				25	10			.002	5	15	40		SP							Hf as above. Core about 50% Sulf, much of which is Cpy
	267.5	277.4	9.9		.21				98	2.61			.02	.03		16		Tr	Tr					Tr	Tr				Tr				Dp	267.5	90°	Dp, lt gr, hard, dense, wk py, Sp Cpy Sp. lt. col. Lim on seams. Dk. inch @ 70°
	277.4	289.0	11.6		.14				95	2.63				.02		.12																				Dp as above, w/ car set at shears @ 85°
	289.0	300.3	11.3		.13				91	2.59			.02			.11													SP							" " " , [illegible] groups of 1 & 1/4" felds. pieces.
	300.3	316.6	16.3		.12				95	2.63			.02			.10										Tr			Tr							" " " , Sp molyb on some SS qtz veins. Tr height Lim on shears.
	316.6	324.6	13.6		.10				91	2.69						.10		Tr								SP										Dp as previous run, wk to Lim @ 315.2. At 317.2 a 1.0' dk gr.
																																				lg. dike w/ vitreous [illegible]. Dips @ 30° Sp w/ Sp. MoS2
	324.6	334.0	9.4		.07				95	2.63						.07			Tr							Tr			Tr							Dk, lt. gr, hard, dense, wk py, Sp Cpy, Tr MoS2. High angle seams.
	334.0	347.2	13.2		.07				98	2.62						.07																				Dp as above except fr 339.9-339.8 where num. incr. & sh. alt. occurs.
	347.2	356.0	8.8		.11				97	2.56						.11										Tr										" " "

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO - SILVER BELL

Notes:

(1) Est. % Cu represented by each mineral

(2) Est. mineral %; or, as follows
Trace (Tr); Sparce (Sp) < 5 %
Moderate (Md) 5 - 50 %
Strong (St) + 50 %

Note (3)
Tr - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Unclif igneous

Hole No. D-141
Page 1 of 1 Pages
Collar Elev 3050.77 Final Depth 277.3
Coords. N 37,845.84 E 18,570.54
Inclination Vert
Logged by FTG - CWH
Date: Start 1/21/63 Finish 1/26/63

	Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov	Sp. Gr.	Cu (1) Chrys.	Pnch	Black	Blue Green		Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb.	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz.	QUARTZ	CHLORITE	JAROSITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
	0.0	5.0	5.0						Rock	Bit																													Rock Bit
NC 2.400	5.0	13.6	8.6		11		.07		84	2.69			.01	.10					Tr			Tr					70			Sp			Tr		Mb	5.0	-	Mb; leached, Tr CuOx
	13.6	23.8	10.2		23		.20		94	2.65	.09		.01	.10			.03		1	Tr							65	5	20	1			1		Hf	20.5	grad	Mb; as above to 20.5 then Hf; sp clay - jaro in veins Tr CuOx
	23.8	34.3	10.5		.96		.83		81	2.42	.40		.01	.42			.13		1								10	25	45	5		10	1		Sltst	32.8	15°	Hf; leached; med clay - jaro. Hf Tr. Med CuOx to 32.8 then Sltst, blea
	34.3	43.9	9.6		.12	39.9 @ .71	.05	39.9 @ .12	97	2.63		.01	.07				.01		Sp								5	35	Sp	Sp	Tr	40			Tt	38.0	brkn	Sltst, bleached, brkn to 38.0, then Tt; leached, sp clay
	43.9	53.7	9.8		.22		.17		92	3.39	.01		.05	.05			.05		1									10	15	1	1	10	Sp					Tt, leached, st gar grad to sp clay alt Tr suls, CuOx
	53.7	63.7	10.0		1.51		.57		91	3.02	.44		.05	.10			.92		Tr	Tr							1	50	34	5	Sp	1	Tr					Tt; leached; gg patches, sp clay alt Sp suls - CuOx
	63.7	72.5	8.8		.27		.24		95	2.42	.05	.05	.04	.10			.03		Sp								1	65	15	1	1	1	1					Tt, leached, st gar grad to mod clay Tr CuOx
	72.5	81.5	9.0		.40		.40		91	2.43	.25		.05	.10													10	50	1	20	Tr	5						Tt, leached, med clay alt Sp CuOx Mod Hf
	81.5	86.3	4.8		.36		.32		88	2.76	.20		.07	.05			.04		1								1	25	15	50		Sp			Hf	81.5	grad	Hf; leached; med clay alt Sp Sltst
NX 1.875	86.3	95.9	9.6		.14		.07		92	2.86			.01	.06			.07		1	Tr							10	15	50	15		Tr		5				Hf; sp clay - jaro. Mod patches gar
	95.9	105.3	9.4		.05		.01		95	3.02				.01			.04		1	1							15	25	50	5	Sp			Tr				Hf; sp clay alt. Mod patches gar. Sp suls
	105.3	112.2	6.9		.58		.29		93	3.00	.20		.01	.07			.30		1	1							10	30	45	5	1		Sp					Hf; mod clay alt Tr CuOx
	112.2	121.0	8.8		.71	81.5 @ .73	.50	41.5 @ .41	51	3.16	.35		.02	.13			.21		1	1							5	10	35	Sp	1	40			Qtzite	117.0	brkn	Hf; sp clay alt, Tr CuOx to 117.0, then Qtzite; st leached areas.
	121.0	129.4	8.4		.59		.51		67	3.04	.05		.01	.45			.08		1	1							5	35	10	1		45			Tt	124.5	brkn	Qtzite; brkn, leached to 124.5, then Tt, leached, sp clay Mod CuOx
	129.4	137.9	8.5		1.10		.35		67	3.18	.05	.04	.06	.20			.75		70	1								10		Sp		15						Tt; as above to 130.5, then int lim alt. Mod CuOx
	137.9	146.8	8.9		.65		.38		69	2.58	.03	.05	.05	.25			.27		10	1								5		1	Tr	10			Mz	139.5	brkn	Tt; int lim (formerly int suls) dec w sp CuOx to 139.5, then Mz; mod clay
	146.8	153.0	6.2		.21		.17		91	2.60	.05		.01	.11		.03	.01		Tr	1										Tr	1			Tr				Mz; leached, sp clay Tr CuOx.
	153.0	162.4	9.4		.37		.29		96	2.57	.03		.01	.25		.05	.03		1	1										1	1			1				Mz, as above
	162.4	171.8	9.4		.58	191' @ .9'	.40	191' @ .32	96	2.58	.05		.01	.34		.12	.06		1	1										1	1		Tr	1				Mz; " "
	171.8	181.5	9.7		.41		.25		92	2.61	[illegible]		.01	.21		.10	.06		1	1										1	1			1				Mz; " "
	181.5	186.3	4.8		.21		.10		86	2.58	[illegible]		.01	.09		.07	.04		1	1										1	1	20	1	1				Mz; med silicif.
	186.3	197.9	11.6		.14				88	2.57	[illegible]		.01	.07		.04	.02		1	1										1	1	10	1	1				Mz as above of all alt, gen leaved [illegible]
	197.9	205.7	7.8		.13				97	2.61			.01	.06		.05	.01		1	1										1	1	85	Sp	1	Qt	197.9	brkn	Qt, [illegible] 212 ft. mostly silic. sltst w [illegible]
	205.7	214.1	8.4		.07				84	2.61				.03		.04			1	1										1	1	85		1					Qt, [illegible]
	214.1	219.0	4.9		.06				94	2.61				.02		.04			1	1										1	1	90		1					Qt, as above, wt. no apparent [illegible]
	219.0	227.5	8.5		.12				95	2.61				.07		.05			1	1										1	1	90		1					Qt, as above, [illegible]
	227.5	237.0	9.5		.26				90	2.58			.01	.10		.10	.05		1	1						SP, SP				5	1	90	5	1	Sltst	232.5	grad	Qt as above, [illegible]
	237.0	246.5	9.5		.14				76	2.63			.01	.06		.07			1	1										Sp	1	85	Sp	1	Qt	236.5	grad	Sltst. blk, hard. Qt, [illegible]
	246.5	256.2	9.7		.15				93	2.63			.01	.05		.06	.03		1	1										1	1	90		1					Qt as only a few ft. [illegible]
	256.2	261.0	4.8		.18				93	2.63			.01	.06		.08	.03		1	1										1	1	90		1					Qt, as above.
	261.0	269.5	8.5		.17				91	2.66			.02	.07		.02			1	1										1	1	90		1					Qt, " "
	269.5	277.3	7.8		.08				90	2.57			.02	.02		.04			1	1										1	1	90	Tr	1					Qt, " "

Av Rec = 88%

END OF HOLE

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Notes:

(1) Est. % Cu represented by each mineral

(2) Est. mineral %; or, as follows: Trace (Tr); Sparce (Sp) < 5 %; Moderate (Md) 5 - 50 %; Strong (St) + 50 %

Note (3): Tt - Tactite; Hf - Hornfels; Mb - Marble; Qt - Quartzite; Bx - Breccia; Da - Dacite; Mz - Monzonite; An - Andesite

Note (4): V - Vein; F - Fault; D - Dike; C - Contact; Ig - Undif igneous

Hole No. D-168

Page 1 of 2 Pages

Collar Elev 2971.83 Final Depth 467.7

Coords N 35,568.14 E 19,168.62

Inclination Vert

Logged by FTG - CWH

Date: Start 9/20/63 Finish 10/14/63

	Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu N S	% Cu Avg	% Core Recov	Sp. Gr.	Cu (1) Chrys.	Pnch	Black	Blue Green		Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem.	Spec.	Other (2) Galena	Sphal.	Molyb.	Calcite	Garnet	Silicates	Sericite	Clay	Un. Qtz.	QUARTZ	CHLORITE	JASPILITE	FLUORITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
	0.0	7.0	7.0		—			—	—	—																														ROCKBIT
NC 2.400	7.0	15.6	8.6		.52	15.4' @ .51	.39	15.4' @ .39	84	2.58	.30	.01	.05	.03		.13			SP										SP	S	Tr	SP		S		Dp	7.0	-	Dp; leached; sp silicif. Sp al alt sed incl (Hf?)
	15.6	22.4	6.8		.49		.40		99	2.57	.32	.01	.03	.04		.09			1										1	S	1	1		SP					Dp; leached, sp-mod silicif. Possib sp adv Cu. Sp CuOx
	22.4	30.7	8.3		.24		.21		90	2.55	.15	.01	.03	.02		.03			1										1	SP	1	1		Tr					Dp, leached, sp silicif, broken patches. Tr CuOx
	30.7	38.2	7.5		.19				100	2.54	.10	.01	.01	.06		.01			1										Tr	1	1	Tr		1					Dp; leached, sp alt
	38.2	47.1	8.9		.20				89	2.58	.07	.01	.02	.07		.03			1										1	1	1	1		1					Dp; as above
	47.1	54.4	7.3		.20				99	2.56	.07	.01	.02	.07		.03			1										1	1	1	1		1					Dp; as above
	54.4	62.9	8.5		.11				99	2.56	.03	.01	.01	.04		.02			1	Tr									1	1	1	1		1					Dp; as above
	62.9	70.8	7.9		.25				97	2.56	.05	.01	.01	.08		.10			1	1									1	S	1	1		1					Dp, leached w sp sulf. Sp clay alt. Tr CuOx
	70.8	78.6	7.8		.14				93	2.54	.04	.01	.01	.04		.04			1	1									SP	S	1			1					Dp; as above
	78.6	87.6	9.0		.18				86	2.29	.07	.03	.03	.03		.02			45	1									S	15	1			S					Dp; leached; st clay alt to 82.3 then mass sul. gossan. 100 % lim-hem
	87.6	96.6	9.0		.30		.07		84	2.53	.02	.01	.02	.02		.23			15	1									SP	10	1			SP					Dp; mass lim-hem (sed incl?) to 89.6 then Dp; mod clay alt, tr sulf
	96.6	104.7	8.1		1.50		.07		92	2.64	.03		.01	.03		1.20	.23		5	1									S	15	1			Tr					Dp; mod-st clay alt. Mod sulf
	104.7	112.7	8.0		.10		.01		95	2.61						.10			Tr	1									Tr	SP	1								Dp; sp clay alt grad to mod clay - shearing. Sp sulf
	112.7	121.0	8.3		.14				96	2.59						.10	.04		1	1									1	1	1			Tr					Dp; sp clay - silicif. Tr sulf. lim on shears
	121.0	127.3	6.3		.15				75	2.59						.11	.04		1	1					Tr				1	1	1			1					Dp; as above
	127.3	132.0	4.7		—		—		—	—																														STOPE
	132.0	138.6	6.6		.13				35	2.53						.13			Tr	Tr									S	30	1			Tr					Dp, brkn w 2 ft int clay - bx, then sp clay, sulf
	138.6	147.3	8.7		.07				44	2.56						.07			1	1									Tr	SP	1			1					Dp; brkn, sp alt. Tr sulf
	147.3	156.3	9.0		.18				36	2.52		.01	.03	.08		.06			1	1									S	20	1			1					Dp; brkn w gyx patches to 150.8, then int Dp bx grad to mass sul. lim
	156.3	165.6	9.3		.23				78	2.24		.01	.04	.09		.09			S	1		Tr							10	SS	1			SP					Dp; lim after mass sulf. (leached sed?) to 158.0 then st clay - gro alt SIBLK CuOx
NX 1875	165.6	175.1	9.5		7.55		4.19		25	3.07	100	.02	.04	3.13		1.86	1.50		15	1		S				10.5	S	10	40			15	Tr		Tt	165.6	brkn	Tt, vuggy grnd, brkn, mod hem - blk, clay - cpy pods grad to st lim - clay CuOx
	175.1	185.9	10.8		1.65		1.28		29	2.60	20	.01	.02	1.05		.25	.12		10	1	10								S	30			Tr	1		Mz	175.1	brkn	Mz; vuggy grnd; brkn; mod clay alt grad to mass lim gossan (at leached sed?)
	185.9	194.8	8.9		1.82	42.4' @ 2.50	.26	62.4' @ .98	93	3.48			.01	.25		1.00	.56		5	5	15		10				50					5				Tt	185.9	brkn	Tt, dense, st par, pods massive mag, px. Tr CuOx
	194.8	204.8	10.0		.35		.03		94	3.87							.35		SP	25	15		15				40					Tr							Tt, as above w st mass mag - px, w incr. specs hem - py
	204.8	211.0	6.2		1.01		.27		94	3.55			.02	.25			.74		1	10	10		5				60	SP		10			Tr						Tt, massive mag - spec hem - px grad to sp clay alt, mod CuOx
	211.0	219.3	8.3		2.65		.37		100	2.81				.37		2.00	.28		1	Sp		Sp					5	60		5	Sp	15	15					Tt, dense, mod silicif. Sp sulf
	219.3	228.0	8.7		2.10		.05		95	3.16				.05		.20	1.25				5				2-4	110	25	50		Sp	1	5	5					Tt, dense, st silicif; st sl - cpy. 1.5 ft patch Mz
	228.0	237.6	9.6		nil				87	2.68							N.I		Tr	Tr							100	Tr	Tr		Tr					Mb	228.0	brkn	Mb, sp clay alt
	237.6	245.1	7.5		.11				100	2.69							.11			1							100	1	1		1								Mb, sp. clay alt
	245.1	254.0	8.9		.10				75	2.55							10		Tr	1							30	1	1		SP		Tr			Mz	248.7	brkn	Mb; to 248.7, then Mz, mod. feldspathic?, tr sulf
	254.0	262.5	8.5		.03				94	2.70							.03		1	1							70	S	10		1			1		Mb	255.4	brkn	Mz, fresh, tr CuOx & py. Mb, wh to m blue patches. Tr sul.
	262.5	270.1	7.6		.08				90	2.70							.08		1	1		Tr		Tr	Tr	Tr	45	30	10		S			SP					Mb, wh to - blue. Fe (red) stained at cond. Some chlor. on frac's
	270.1	279.3	9.2		.11				90	3.41							.11			S		1				22	15	30	10		SP			30		Tt	274.8	Grad.	Mb m incr Fe Ox; sp cpy blebs. Tr m cond - st py & spec. Mod cpy
	279.3	284.1	4.8		.10				97	3.45							.10			15		1				25	5	70	5		Tr								Tr m st. py, wk mod sphal, wk cpy.
	284.1	288.3	4.2		.15				90	2.93							.15			SP		1				35	35	45	5		S					Mb	284.1	Grad	Mb m deep patches of Fe Ox staining. wk-mod sphal & py, & cpy
	288.3	297.5	9.2		.03				89	2.69							.03			Tr							90		5		Tr								Mb, white, barren, m patches of chlor.
	297.5	307.9	10.4		.30				100	2.77							.30			SP					Tr	Tr	40	35	15		S			SP					Mb, white, m patches of chlor & tactite. Tr sphal.
	307.9	316.7	8.8		.14				85	3.38							.14			Tr						1	1	SP	85	10				SP		Tt	307.9	brkn	Tt, dense, tr cal - chlor veing
	316.7	326.3	9.6		.20				94	2.88							.20			1						1	1	S	75	10				S					Tt, as above Tr fg Mz?
	326.3	335.3	9.0		.35				100	2.93							.35			1						1	1	S	80	10				SP					Tt, as above grad to dense buff Tt?
	335.3	344.9	9.6		.06				83	3.17							.06			1							1	80	10	35	SP			Tr		Mb	335.8	grad	Tt, as above to 335.8, then Mb; mod clay alt
	344.9	352.5	7.6		.02				100	2.75							.02			1								95			Tr			1					Mb, dk gy w wht blebs
BX 1932	352.5	363.0	10.5		7.73	19.9' @ 4.56	.05	19.9' @ .03	92	2.80						2.00	5.70	.03		15							35	30	5		5					Tt	356.0	grad	Mb, as above to 356.0, then Tt, grad to mass sulf to 362.0, then mod clay alt
	363.0	372.4	9.4		1.02		.01		95	2.89						.10	.92			SP							5	10	85		SP			Tr		Hf	364.5	grad	Tt, st sulf to 364.5, then Hf, dense; sp clay on fract
	372.4	381.6	9.2		.02				100	2.57							.02			Tr							5	5	90		S			1					Hf, dense w patches mod clay alt. Pods Mb

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Notes:

(1) Est. % Cu represented by each mineral

(2) Est. mineral %; or, as follows: Trace (Tr); Sparce (Sp) < 5 %
Moderate (Md) 5 - 50 %
Strong (St) + 50 %

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D-168
Page 2 of 2 Pages

Collar Elev. 2971.85 Final Depth 467.7
Coords. N 35,568.14 E 19,188.62
Inclination Vert
Logged by FTG - CWH
Date: Start 9/20/63 Finish 10/14/63

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green		Cc.	Cpy.	Born	Fe (2) Lim.	Py.	Mag.	Hem.	Spec.	Other (2) Galena	Sphal.	Molyb.	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz.	QUARTZ	CHLORITE		(3) Rock Type	Structures (4) Depth	True Dip	Remarks
381.6	392.0	10.4		.10				90	2.81							.10			Tr							5	5	80					5					Hf, mod clay alt grad to sp clay - chlor vning
392.0	400.3	8.3		.21				100	2.79							.21			1							35		50					5					Hf, sp chlor vning to 396.5, then Mb; tr clay - $CaSO_4$
400.3	409.5	9.2		.06				100	2.62							.06			1							50		40					5		Mb	396.5	grad	Mb, partly silicated, areas sp clay - chlor vning
409.5	415.3	5.8		.12				94	2.70							.12			1							15		70					5		Hf	411.5	grad	Mb, sp clay to 411.5, then Hf, sp chlor vning
415.3	421.0	5.7		.43		.02		100	2.70							.43			1							5		85			SP		SP					Hf, gray w tr chlor vning
421.0	429.0	8.0		-	.280 @	-	.280 @	-	-							—																						STOPE
429.0	433.9	4.9		.41	.77	.02	.03	98	2.73	.10						.31			Tr							5	10	80					SP					Hf, gray w tr chlor vning
433.9	443.3	9.4		1.17		.05		94	2.98							1.17			SP							5	15	70		5			1					Hf; sp clay, sp suls
443.3	453.1	9.8		.07				88	2.88							.07			Tr							SP				5	Tr		Tr		Dp	443.3	brkn	Dp; mod clay alt w fresh pods. Patches mod feldspath
453.1	460.3	7.2		.08				96	2.68							.08			1							Tr				Tr	1		1					Dp; patches w sp clay - silicif mixed w wk alt Dp. Tr suls
460.3	467.7	7.4		.07				92	2.67							.07			1											1	1		1					Dp; wk alt w pods mod feldspath Tr suls
						Av	Rec. =	87 %																														
				END	OF	HOLE																																

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Notes:

(1) Est. % Cu represented by each mineral

(2) Est. mineral %; or, as follows: Trace (Tr); Sparce (Sp) < 5 %; Moderate (Md) 5 - 50 %; Strong (St) + 50 %

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D-169
Page 1 of 2 Pages
Collar Elev 2922.95 Final Depth 468.0
Coords N 35,303.01 E 19,206.74
Inclination Vert
Logged by ETG - CWH
Date: Start 10/1/63 Finish 10/14/63

	Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green		Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem.	Spec.	Other (2) Galena	Schal.	Molyb.	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz.	QUARTZ	CHLORITE	MICASITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
	0.0	4.0	4.0		—		—		—	—																													ROCKBIT
NC 2.400	4.0	14.3	10.3		.12				41	2.42	.07		.02	.03					SP								5		5	20					And	4.0	–	And, brkn, dk grn rk grad to buff w concentric lim rings (worth And?)
	14.3	22.0	7.7		.09				85	2.41	.02		.01	.06					1								Tr		5	50				Tr	Mz	20.2	–	And; post min dike; dense, buff w lim rings to 20.2, then Mz; st clay alt
	22.0	28.6	6.6		.05				72	2.50		.01	.01	.03					1								1		5	50				1				Mz, st clay alt Possib ads Cu on fspars, leached
	28.6	36.2	7.6		.04				68	2.41			.01	.03					1								1		5	40				1				Mz, mod alt, st clay, leached.
	30.2	41.8	11.6		.03				67	2.54			.01	.02					1								1		5	30			Tr	1				Mz; as above. A few grn-stained folds.
	41.8	58.4	10.6		.05				57	2.43			.01	.04					1			Tr						15	5	20			1	1	Tt	57.7	?	Mz, as above, wk less alt towards cr. Tt hem at cont grn,
	58.4	61.6	3.2		.03				82	2.51			.01	.02					1			SP						90		5								Tt; dense massive grn; dist Fe Ox mottling everything.
	61.6	67.5	5.9		-				0	—																												No core recovery
	67.5	78.7	11.2		.07				64	—			.01	.06					SP										10	60				5	Mz	67.5?	?	Mz, st. leached, dist Jar & clay, badly broke.
	78.7	85.6	6.9		.15				73	2.41		.01	.01	.13					1										5	20			Tr	SP	And	83.4	brkn	Mz, leached, wk Jar, mod clay, core more solid. And leached.
	85.6	90.8	5.2		.16				98	2.44		.01	.03	.12					1										5	40			5	5				And, leached, alt. w clay & Jar. bot 1.8' comp broke, st. FeOx
	90.8	100.2	9.4		.21				85	2.52		.01	.05	.15					5								35		SP	5			SP	Tr				And; brn w mod clay alt. 4 ft pod bx Mb, grad from st clay-blkex
	100.2	110.3	10.1		.07				82	2.46		.01	.02	.04					5								Tr		1	10				1				And; brn w sp clay alt Patches lim rings
	110.3	120.6	10.3		.94		.83		85	2.90	.15	.01	.03	.64			.11		SP	Tr							15	30		5		10	Tr		Mb bx	114.5	10°	And, grad to grn at 114.5, then Mb bx w silicif frags + vcr gg grad to Mb
NX 1.835	120.6	129.0	8.4		.04				94	2.71				.04													95			SP			1		Mb	120.6	brkn	Mb, dk gy w. sal. ming.
	129.0	138.3	9.3		.03				95	2.66				.03					5								55			5			SP		And	135.3	brkn	Mb; as above w patches mod clay to 138.3, then And; brkn. dk grn, sp cal.
	138.3	147.6	9.3		.06				99	2.70				.06					Tr								90	5		SP			Tr		Mb	138.5	brkn	And, mod clay alt to 138.5, then Mb; dk gy w wht patches. Sp Hf
	147.6	156.0	8.4		.06				100	2.72				.06					1								90	5		SP			1					Mb, sp clay alt w pods Hf. 1 ft patch And w vert ct in Mb.
	156.0	165.9	9.9		.02				93	2.67				.02					SP								50			5			1		And	159.4	40°	Mb; as above to 159.4, then And; lim stain on fract.
	165.9	174.8	8.9		.02				94	2.64				.02					1								Tr			SP			1					And; lim stain out from fract Tr diss + vn cal. bxr clay alt at 174.0
	174.8	185.4	10.6		.03				78	2.68				.03					5								70			5			1		Mb	175.5	brkn	And, post min dike to 175.5, then Mb; sp clay alt. Tr sliver pods
	185.4	194.0	8.6		.02				99	2.71				.02					Tr								90			5			1					Mb; white grad to dk gy w white blebs + veins
	194.0	202.7	8.7		.05				93	2.62				.02		.03			1								10			SP			1		And	195.3	bx	Mb; as above to 195.3, then And; post min dike, lim on fract
	202.7	211.5	8.8		.02				98	2.56				Tr		.02			1								Tr			1			1					And; post min dike, lim on fract. Diss cal in dk grn matrix
	211.5	220.4	8.9		.03				96	2.56				.01		.02			1								1			1			1					And; as above w gay seams
	220.4	228.6	8.2		.02				100	2.62						.02			1	Tr							1			1			1					And; as above
	228.6	238.3	9.7		.02				95	2.61						.02			1								10			1			1		Mb	236.1	45°	And; as above to 236.1, then Mb; lt gy.
	238.3	247.5	9.2		.07				97	2.53						.07			1								20			1			1		And	240.8	80°	Mb, as above to 240.8, then And; thin lim-clay seams Cal blebs
	247.5	256.8	9.3		.04				96	2.61						.04			1								Tr			1			1					And; post min dike; as above
	256.8	265.0	8.2		.14				99	2.61						.14			1								20	Tr		1			1		Mb	262.8	80°	And; as above to 262.8, then Mb; areas sp clay.
	265.0	274.1	9.1		.02				96	2.66						.02			1								80	SP		1			1		And	270.7	60°	Mb, tr clay to 270.7 then And; tr lim-clay on fract. Sp cal blebs at ct
	274.1	282.7	8.6		.01				100	2.60						.01			1								Tr			1			1					And; post min dike, dk grn-gy
	282.7	291.9	9.2		.05				97	2.69						.05			1								.85	Tr		1			1		Mb	283.1	75°	And, as above to 283.1, then Mb; sp clay alt
	291.9	301.0	9.1		.10				99	2.54						.10											65			Tr			1		And	297.5	75°	Mb; tr alt to 297.5, then And; dk grn soft
	301.0	309.2	8.2		.04				95	2.50						.04											Tr			1			1					And; post min dike; sp clay alt, tr diss cal
	309.2	318.7	9.5		.01				88	2.46						.01											1			SP			1					And; as above w lim-clay-gy seams.
	318.7	327.9	9.2		.04				91	2.51						.04			Tr								1			1			1					And; as above w pods qtz
	327.9	337.0	9.1		.05				71	2.55						.05			1								1			5			1					And; as above
	337.0	346.5	9.5		.08				90	2.48						.08			1								1			Tr			1					And; post min dike, med. gy color.
	346.5	354.3	7.8		.04				100	2.52						.04			1								1			1			1					And; post min dike w qtz pods grad to mod lim staining
	354.3	364.0	9.7		.01				88	2.49						.01			1								1			1			1	Tr				And; mod lim stain grad to dk grn
	364.0	371.0	7.0		.01				88	2.49						.01			1								1			1			1					And; post min dike; sp lim on fract.
	371.0	381.0	10.0		.01				75	2.56						.01			1								1	10		1	Tr	10	1		Hf	373.8	brkn	And, post min dike to 378.8, then Hf; dense, st. silicif.
	381.0	385.6	4.6		.08				97	2.69							.08		1								5	15				50						Hf, dense, st $CaSiO_3$-silicif.
	385.6	394.3	8.7		.06				98	2.72							.06		1								5	15				50	Tr					Hf, dense, mod silicif. Tr suls

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Notes:

(1) Est. % Cu represented by each mineral

(2) Est. mineral %; or, as follows: Trace (Tr); Sparce (Sp) < 5 %; Moderate (Md) 5 - 50 %; Strong (St) + 50 %

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D-169
Page 2 of 2 Pages
Collar Elev. 2922.95 Final Depth 468.0
Coords. N +35,303.01 E 19,206.74
Inclination Vert
Logged by FTG - CWH
Date: Start 10/1/63 Finish 10/14/63

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green		Cc.	Cpy.	Born	Fe (2) Lim.	Py.	Mag.	Hem.	Spec.	Other (2) Galena	Sphal.	Molyb.	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz.	QUARTZ	CHLORITE		(3) Rock Type	Structures (4) Depth	True Dip	Remarks
394.3	403.5	9.2		.07				95	2.68							.07		Tr	Tr							5		20		Tr		SO	Tr					Hf, dense; mod silicif. Tr suls.
403.5	413.5	10.0		.05				79	2.55							.05		1	1							SP		SP		5		SP	1		Mz	404.5	broken	Hf, as above to 404.5, then Mz; sp silicif; pods st clay 2 ft And dike
413.5	422.9	9.4		.05				96	2.62							.05		1	1							Tr				SP	Tr		1					Mz; mod silicif, incip feldspath Tr diss cal
422.9	430.9	8.0		.04				98	2.61							.04		1	1							1				1	1		1					Mz; dense w silicif feldsp phens? Tr suls
430.9	438.2	7.3		.27				93	2.79							.27			1							SP		15		Tr	1		1		Hf	434.8	broken	Mz; as above to 434.8, then Hf, dense, mod silicif; tr suls.
438.2	447.2	9.0		.14				37	2.70						.02	.12			1							5		20		1	1		1		And	443.3	?	Hf, dense w tr suls to 443.3, then And, post min dike
447.2	457.5	10.3		.02				98	2.55						.02			Tr	1							Tr				1			1					And, post min dike; dk green
457.5	468.0	10.5		.01				56	2.51						.01			1	1							Tr				1			1					And, as above
						Av	Rec. =	85%																														
					END	OF	HOLE																															

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Notes:

(1) Est. % Cu represented by each mineral

(2) Est. mineral %; or, as follows: Trace (Tr); Sparce (Sp) < 5 %; Moderate (Md) 5-50 %; Strong (St) + 50 %

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D-170
Page 1 of 2 Pages
Collar Elev. 2937.98 Final Depth 550.9
Coords N 135,599.55 E 18,801.96
Inclination Vert
Logged by FTG - CWH
Date: Start 10/15/63 Finish 11/6/63

	Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov	Sp. Gr.	Cu (1) Chrys.	Pinch	Black	Blue Green		Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem.	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	SERICITE		(3) Rock Type	Structures (4) Depth	True Dip	Remarks
	0.0	12.4	12.4		—		—		—	—																														ROCKBIT
NC 2400	12.4	18.9	6.5		.39				88	2.73	.30	.01	.01	.07					Tr							5	50	10		SP		X	Tr			Tt	12.4	-	Tt, leached, mod silicif
	18.9	27.2	8.3		.11				92	2.80	.07		.01	.03												10	40	25				20		Tr					Tt, leached, sp clay - mod silicif grad to Tt? w st silicif
	27.2	34.9	7.7		.10				92	2.66	.08		.01	.01												5	40	5				40							Tt (?) st silicif w qtz pods
	34.9	43.3	8.4		.09				96	2.60	.08		.01													SP	5	SP		Tr		80				Qtzite	34.9	grad	Qtzite; grad from Tt w indef st. Mod yellow (jara) blebs
	43.3	52.1	8.8		.13				99	2.62	.12		.01													Tr	5	5				80							Qtzite; qtz grains w Fe_2O_3 cementing. Patches w sp gar - CuO_x
	52.1	60.6	8.5		.28				98	2.60	.25		.01	.02												10	15	15		20		25				Tt	55.5	grad	Qtzite; as above to 55.5, then Tt, leached, mod clay alt w silicif pods
	60.6	69.5	8.9		.18				94	2.78	.17		.01													15	45	15		15		10							Tt, leached, mod clay grad to mod silicif (Qtzite?)
	69.5	78.0	8.5		.20		.09		100	3.09	.03			.06		.04	.07			Tr						10	40	30		5	5	5	Tr						Tt, dense, mod qtz vning
	78.0	84.5	6.5		.56		.45		80	3.19	.05		.01	.39		.04	.07									10	50	20		5	Tr	10		Tr					Tt, leached, sp clay grad to st clay - lim w sp CuO_x
	84.5	90.2	5.7		.26		.22		93	3.01	.18	.01	.01	.02		.01	.03									5	30	50		5			SP			Hf	84.5	grad	Hf, dense, sp clay alt w sp CuO_x vning
	90.2	99.3	9.1		.38				97	2.81	.08	.01	.01	.02		.06	.20									15	10	40		5			5	Tr					Hf, leached, patches med yaro clay alt w sp chrys. Pods st chlor w Cu
	99.3	108.6	9.3		.21				90	3.00	.06			.01		.02	.12									15	10	60		5		5	SP						Hf, leached, sp chlor vning grad to dense, st $CaSiO_3$
	108.6	117.0	8.4		.22		.16		92	3.07	.14		.01	.01			.06									10	15	60		5			Tr						Hf, leached, sp clay alt w ggx patches
	117.0	125.9	8.9		.50	.56	.44	.35	91	2.63	.40		.01	.03			.06									10	50	20		15			1	Tr		Mz	119.0	broken	Hf, leached, med clay chlor to 119.0, then Mz, st clay grad to sp St clay at ct
	125.9	133.4	7.5		.63		.24		98	2.47	.22		.01	.01		.30	.09									10	50	20		5			1	5					Mz; broken, leached, st clay alt grad to st gar - clay alt of Mz. Sp chry - cpy
	133.4	142.4	9.0		.24		.06		90	3.35	.02		.01	.03		.14	.04									5	40	40		5			SP	SP		Hf	139.0	broken	Mz (?) st gar - clay alt w sp chry to 139.0 then Hf, sp clay alt w sp CuO_x suls
	142.4	150.6	8.2		.62	2.26	.01	2.26	100	2.70	.03	.01	Tr			.45	.13									10	20	55		SP			5						Hf, mod clay alt w chry - suls grad to sp - mod chlor vning w sp suls in chlor
	150.6	160.0	9.4		2.05	1.24	.06	.14	100	2.58						.80	1.25									15	10	60		10			SP						Hf, sp chlor vning to 157.0, then mod - st clay alt w st diss cc, cpy
	160.0	170.0	10.0		1.00		.29		100	2.53	.26		.01	.02		.15	.56		Tr							10	5	65		10			5	Tr					Hf, st clay - suls to 162.5, then sp clay - chlor vning. Patches leaching
NX 1875	170.0	174.1	4.1		.28		.14		99	3.24	.12		.01	.01		.05	.09									5	30	50		5			SP	S					Hf, sp diss chlor in Hf - Mb? bx w incr. Tt. Tr suls
	174.1	175.8	1.7		.36		.02		52	2.65						.04	.32									10	5	75		SP			5						Hf, mod chlor vning
	175.8	178.9	3.1		—		—		—	—																														Cavity
NC 2700	178.9	184.0	5.1		.17				93	2.56							.17			Tr						10	15	60		SP			5						Hf, mod chlor - cal vning
DX 1873	184.0	188.0	4.0		.18				92	2.56							.18									10	10	70		1			SP						Hf, sp - mod chlor vning - clay alt
	188.0	197.5	9.5		.24		.08		96	2.81	.07		.01				.16		Tr							10	10	65		1			5	SP					Hf, mod chlor vning w white patches w tr CuO_x. Tr suls in chlor vn
	197.5	206.9	9.4		.60		.01		93	2.97	.01						.60									10	15	65		1			5	1					Hf, mod chlor vning. Pods Tt w tr chry. Tr suls in chlor
	206.9	215.5	8.6		.34		.01		97	2.56							.34									10	10	70		1			5	Tr					Hf, mod chlor vning. Mod diss suls
	215.5	224.5	9.0		.09				100	3.03	.05	Tr					.04		Tr							5	80	10		1				1		Tt	216.1	63°	Hf, sp clay - mod diss suls to 216.1, then Tt, patches mod clay. Tr CuO_x
	224.5	233.2	8.7		.18				98	3.09	.13	.01	.01				.03									5	70	20		1				1		Hf	230.7	broken	Tt, dense, sp clay w yellow gar to 230.7 then Hf, sp clay - CuO_x suls
	233.2	241.3	8.1		.67		.02		97	2.75							.67									25	65		Tr			10							Hf, mod chlor w mod diss suls grad to sp chlor vning
	241.3	245.3	4.0		.10				81	2.91	.05		.05						Tr							20	25	50		1			5	Tr		Tt	243.5	broken	Hf, sp - mod clay alt w sp. CuO_x to 243.5, then Tt, vuggy, sp clay
	245.3	254.9	9.6		1.00		.92		82	2.91	.82		.10			.08										5	60	20		15					Tr				Tt, mod clay alt w chry (ads Cu) in clay patches. Mod blk ox specks
	254.9	264.2	9.3		.27		.25		84	3.25	.20		.05			.02										25	50	20		5				1					Tt, mod clay alt w sp cal vning. Tr CuO_x
	264.2	272.9	8.7		.08				99	3.06	.05		.03			Tr	Tr									25	50	20		Sp						Hf	264.6	broken	Tt, as above to 264.6, then Hf, sp gar vning
	272.9	282.3	9.4		.30				85	3.03	.20		.03			.01	.06									25	15	40		20				Tr					Hf, as above to 279.3, then incr yaro alt w chry staining
	282.3	290.7	8.4		.77		.73		59	3.01	.70		.03			.04										25	Sp	55		20				1					Hf, dense, buff, sp yaro - chry on fract
	290.7	299.1	8.4		.21		.19		99	2.98	.18		.01			.02										30	Tr	50		20									Hf, as above
	299.1	306.4	7.3		.10				85	2.92	.04		.02			.04	Tr			Tr						30	5	50		15									Hf, patches mod clay alt. Mixed Mb
	306.4	313.8	7.4		.12				80	2.74	.10					.01	.01									50	Sp	35		15				Tr					Hf, sp chlor - clay vning w mixed Mb
BX 1752	313.8	323.2	9.4		.15				95	2.58	.07						.08									25		55		SP			10						Hf, as above
	323.2	332.3	9.1		.17				93	2.87							.17									20		60		5			10						Hf, sp - mod chlor vning
	332.3	341.0	8.7		.27				100	2.51							.27									10		75		SP			10						Hf, dense, patches mod chlor vning
	341.0	350.3	9.3		.17				100	2.57							.17									10	SP	85		1			SP						Hf, dense wit patches mixed w sp chlor vning
	350.3	359.2	8.9		.33				95	2.66	.10						.23									10	1	85		1			1						Hf, sp chlor vning
	359.2	369.3	10.1		.26				98	2.72							.28									15		75		1			5						Hf, sp chlor vning w white pods

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO- SILVER BELL UNIT

Notes:
(1) Est. % Cu represented by each mineral
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Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D-170
Page 2 of 2 Pages
Collar Elev. 4337.96 Final Depth 550.9
Coords N. 135,299.55 E 13,301.96
Inclination Vert
Logged by FTS - CWH
Date: Start 10/18/63 Finish 11/6/63

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green		Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem.	Spec.	Other (2) Galena	Sphal.	Molyb.	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz.	QUARTZ	CHLORITE	JAROSITE		(3) Rock Type	Structures (4) Depth	True Dip	Remarks
369.3	379.0	9.7		.10				88	2.69	.01						.09		Tr	Tr							10	SP	65		10		S						Hf, st Cal. st chlor st cal valts. Leached zone 1½' long
379.0	388.7	9.7		.08				87	2.98							.08			1							10	5	75		SP		S						Hf as above. Almost a blue l.s. leached zone ½' long
388.7	398.9	10.2		.33		.03		93	2.63							.33			1							10	SP	75		SP		S						Hf as above, no leaching
398.9	409.1	10.2		.80		.03		90	2.91							.80			SP							10	20	60		S		SP	Tr					Hf, as above, tr Sp.
409.1	419.0	9.9		.32		.02		100	2.70							.32			1							10	5	70		S		S						Hf, " "
419.0	425.8	6.8		.24				98	2.60							.24			Tr							10	10	70		SP		S						Hf, " "
425.8	434.6	8.8		.15				100	2.53							.15			1							10	5	70		1		S						Hf, grad almost to Mb w. blk chlor vning
434.6	443.7	9.1		.30				98	2.74							.30			SP							10	5	70		1		S	Tr					Hf, sp chlor vning in gy-wht rk w. sp sulf. assoc w. chlor.
443.7	453.2	9.5		.03				99	2.67							.03			1							10	SP	80		1		SP						Hf, sp chlor vning
453.2	461.7	8.5		.34				93	2.76							.34			1							10	1	80		1		1						Hf, sp chlor vning w. wht patches of $CaSiO_3$
461.7	471.2	9.5		.24				92	2.57						.04	.20			1							10	1	80		1		1						Hf, sp chlor - alunite(?) vning.
471.2	479.3	8.1		.23				100	2.51							.23			1							10	1	80		1		1						Hf, sp chlor vn - pods in mixed Hf - Mb
479.3	488.7	9.4		.10				100	2.51							.10			1							10	1	80		1		1						Hf, sp chlor vn.
488.7	499.5	10.8		.27				93	2.63							.27			1							10	1	80		1		1						Hf, sp chlor vn w. brkn areas
499.5	504.7	5.2		.37				98	2.53							.37		Tr	Tr							15	1	75		5		1	Tr					Hf, mod blk chlor vning
504.7	513.9	8.3		.27				95	2.56							.27			1							10	1	80		SP		S	1					Hf, mod chlor vning w. brkn patches
513.9	522.2	9.2		.32				96	2.67	.05						.27		Tr	1							10	1	80		SP		SP	1					Hf, sp-mod chlor vning w. tr chry. devl in vset clay (alun) valts.
522.2	531.1	8.9		.34				90	3.00							.34			1							15	10	70		1		1						Hf, sp chlor vning Mod Mb
531.1	540.1	9.0		.16				98	2.56							.16			1							25	5	60		S		Tr	Tr					Hf, mod - st clay alt grad to mod Mb
540.1	550.9	10.8		.13				93	2.60							.13			1							20	SP	60		SP		SP	SP					Hf, pods mod clay - jaro. Pods Mb.
						Av.	Rec. =	93%																														
					END	OF	HOLE																														

PRELIMINARY GEOLOGIC LOG
(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Notes:
(1) Est. % Cu represented by each mineral
(2) Est. mineral %; or, as follows: Trace (Tr); Sparce (Sp) < 5 %; Moderate (Md) 5 - 50 %; Stong (St) + 50 %

Note (3): Tt - Tactite; Hf - Hornfels; Mb - Marble; Qt - Quartzite; Bx - Breccia; Da - Dacite; Mz - Monzonite; An - Andesite

Note (4): V - Vein; F - Fault; D - Dike; C - Contact; Ig - Undif igneous

Hole No. D-17C
Page 1 of 3 Pages
Collar Elev. 2939.96 Final Depth 490.0
Coords. N 35,446.86 E 18,998.76
Inclination Vert
Logged by FTG - CWH
Date: Start 10/15/63 Finish 10/31/63

	Depth From	Depth To	Int'vl	Elev.	% Cu Total	Avg.	NS	Avg	% Core Recov	Sp. Gr.	Chrys	Pitch	Black	Blue Green	Covellite	Cc.	Cpy.	Born	Lim.	Py	Mag	Hem	Spec.	Galena	Sphal	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn Qz	Quartz	Chlorite	Jarosite	Barite	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
	0.0	30.7	30.7		—		—		—	—																														ROCKBIT
NC 2.400	30.7	37.4	6.7		.03				100	2.70				.03					Tr								95				SP						Mb	30.7	-	Mb, dk banding, tr lim on fract
	37.4	44.9	7.5		.12				91	2.68				.12					|								90		SP		SP									Mb, as above
	44.9	53.1	8.2		.08				96	2.70	.07			.01					|								85	SP	5		|									Mb, as above w tr Hf pods
	53.1	62.4	9.3		.24		.13		93	2.70	.02	.01	.01	.09	Tr	.06	.04	.01	|	Tr				Tr	Tr		70	15	10		|						Tt	62.2	bx	Mb, 2 ft pod Tt w mod CuOx - suls, dk banding to 62.2, then Tt, leached bx
	62.4	70.4	8.0		.82	13.1' @	.59	13.1' @	94	3.55	.30	.02	.01	.26		.13	.20		|	|				Pb 59	Zn .60		30	50	SP		|						Mb	69.4	brkn	Tt, dense, mod gn-px - CuOx w per CuOx to 69.4, then Mb, med gy
	70.4	75.5	5.1		.40	.66	.33	.49	90	2.78	.03	.01	.01	.28			.07		5	|							55	10	10		10				SP					Mb, dk pods w 2 ft pod Tt - st leaching.
	75.5	84.9	9.4		.07				100	2.69				.07					SP								90	5	SP		SP				|					Mb, alter dk gy + wht. Tr alunite? vnlts
	84.9	94.2	9.3		.06				97	2.71				.06					|								85	SP	5		5				|					Mb, dk gy to wht 6" pod Tt w st CuOx
	94.2	103.1	8.9		.12				99	2.70	.08			.04					|								80	SP	10		SP				|					Mb, dk gy to wht. Pods Tt w st lim-CuOx Tr clay vnlts w ads Cu
	103.1	111.0	7.9		.29				93	2.71	.18			.02			.09		Tr	Tr							85	5	5		|				Tr					Mb dk gy to wht w tr clay vnlts w ads Cu
	111.0	115.0	4.0		.07				100	2.72				.07					|								95				Tr				|					Mb, gy grad to wht on fract.
NX 1.875	115.0	124.2	9.2		.84	18.4' @	.15	18.4' @	99	2.70	.13			.02			.69		|								90	5	Tr		|				|					Mb gy w patches sp gar.
	124.2	133.4	9.2		.40	.62	.29	.22	95	3.34	.04			.25			.11		|	Tr							25	55	15		|				|		Tt	126.4	40°	Mb, gy w pods Tt to 126.4, then Tt, massive w sp CuOx
	133.4	142.8	9.4		.20		.10		94	2.65				.10			.10		|	|							20	40	5		|		20		)					Tt, mod clay w silicif patches to 140.8 then Tt,(?) st silicif. Tr ign?
	142.8	152.9	10.1		.35		.04		88	2.64	.04					.10	.21		|	|						5	50	5		|		30	Tr						Tt(?), st silicif w patches gar. Tr suls. Possib ign?
	152.9	161.6	8.7		.45		.06		100	2.79	.02		.01	.03		.07	.32		|	|		Tr				Tr	15	20	50		SP	SP	Tr	|						Tt, (?), st silicif grad to sp silicif w mod qtz vning
	161.6	171.1	9.5		1.99		.02		94	2.66						.70	1.14	.15	SP	SP						|	10	30	40		5	Tr		5						Tt, mod chlor - qtz vning grad to mod diss + sul vning
	171.1	180.2	9.1		3.36		.01		92	3.39						.30	3.06			5						|	5	30	25		SP	SP	5	15						Tt, dense w diss suls grad to pods blk chlor - py w pods st cpy
	180.2	189.9	9.7		5.24	82.5' @	.06	82.5' @	78	3.13						1.00	3.94	.30		5					Zn .23		5	50	15		|	|								Tt, dense w mod silicif, pods Hf. Pods mass cpy - py
	189.9	200.1	10.2		9.63		.05		85	3.51						1.00	8.53	.10		10				Pb .21	Zn .20	.53	SP	50	5		|	|		5						Tt, dense, mass gar. Approx 3 ft mass cpy - py w sp sl
	200.1	209.5	9.4		1.00	2.78	.04	.03	88	3.13						.15	.85			SP							10	15	60		|	|		5			Hf	200.1	grad	Hf, mass chlor - suls grad to sp chlor vning. Sp diss suls
	209.5	218.9	9.4		.61		.04		98	2.77							.61			Tr							10	20	60		|	|		SP						Hf, sp clay - chlor vning. Sp diss suls. Incr gar.
	218.9	226.4	7.5		.40		.01		92	3.22							.40			|						10	15	65	Tr	|	|		5						Hf, dense w sp clay - chlor vning. Sp diss suls as minute grains.
	226.4	235.4	9.0		.97		.01		100	2.59						.15	.82			|							10	15	60		|			10						Hf, mod blk chlor vning. Mod diss suls
	235.4	244.9	9.5		.38		.02		92	3.03							.38			|						10	10	70		|			5						Hf, dense, sp diss suls w ggy patches. Patches mod chlor
	244.9	254.0	9.1		.24		.01		93	2.97							.24			|		Tr				Tr	10	15	65		5			SP						Hf, dense, buff w patches mod clay alt. Sp suls.
	254.0	260.3	6.3		.43		.02		98	2.83							.43		Tr	|						|	10	10	50	5	5			10			And	258.3	50°	Hf, sp chlor - diss suls grad to st chlor to 258.3, then And, post min dike
	260.3	267.4	7.1		.16		.05		71	2.82							.16		|	|							5	10	70		SP			5		Tr	Hf	262.5	brkn	And, post min dike w mod clay to 262.5, then Hf, sp chlor - clay incr Tt.
	267.4	277.2	9.8		.63		.02		90	3.05							.63		|	|							5	20	65		SP			5	Tr		And	276.2	brkn	Hf, mixed Hf-Tt w mod clay alt to 276.2, then And, post min dike
	277.2	286.6	9.4		.06				99	2.53						.06			|	|							Tr				Tr			Tr						And, post min dike; tr diss cal
	286.6	296.2	9.6		.04				91	2.58						.04			|	|							1	5			|			|			Tt	295.8	brkn	And, post min dike to 295.8, then Tt, brkn; mod clay alt
	296.2	305.8	9.6		.02				99	2.35							.02		|	|						Tr	5	15	70		SP			SP			Hf	300.0	grad	Tt, sp clay alt to 300.0, then Hf, dense, sp clay chlor. Tr ign text(?).
	305.8	315.5	9.7		.03				92	3.29							.03			|							5	30	55		|			|			Tt	314.0	grad	Hf, tr chlor - clay seams to 314.0, then Tt, sp clay alt.
	315.8	320.3	4.8		.09		.01		89	3.19							.09			|						Tr	SP	70	15		Tr		5	Tr						Tt, dense to 320.0, then Dp(?), ign text ck, dense w gar alt?
	320.3	329.6	9.3		.08				97	3.08							.08			|							10	10	80		|			SP			Hf	327.7	grad	Tt, Dp? text ck grad to Tt w tr chlor vn to 327.7, then Hf, gen dense.
	329.6	338.5	8.9		.59	26.4' @	.07	26.4' @	90	3.47							.59			|							10	5	60		|			15						Hf, dk gy - grn w pods Tt to 337.5, then st diss suls
	338.5	346.4	7.9		.31	.59		.09	96	3.39							.31			|							10	15	60		|			15			Tt	338.5	brkn	Tt, dense, massive; patches mixed Tt - Hf
	346.4	356.0	9.6		.82		.10		82	3.42			.02				.80			|							20	10	65		|			5			Hf	346.4	grad	Hf, dense w diss suls grad to Hf-Mb w chlor - gar vn w incr clay.
	356.0	365.3	9.3		.53		.21		90	2.72	.15	.02	.02	.02			.32		Tr	|							50	20	30		SP				Tr					Hf, mod clay alt Tt 356.0-358.5 w sp CuOx grad to Hf w gar pods + vnlts
	365.3	374.8	9.5		.17				99	2.72							.17			|							40	5	50		Tr			5						Hf, sp clay alt w tr chlor vning
	374.8	383.6	8.8		.25				97	2.65						Tr	.25			|							20	15	60		SP	SP		Tr						Hf, mod clay vning dipping about 54°. Tr suls.
	383.6	393.5	9.9		.08				86	2.60						.07	.01		Tr	|							Tr	5	15		Tr			|	Tr		And	385.0	brkn	Hf, mod clay alt to 385.0, then And, post min dike, mod cal vning at st
	393.5	402.0	8.5		.04				98	2.59						.04			|	|							|				|			|	|					And, post min dike, tr lim on fract. Tr diss + vn cal.
	402.0	410.6	8.6		.11				81	2.56									|	|							|		5		5			|	|		Hf	410.0	brkn	And, post min dike w pods Hf to 410.0, then Hf, st clay alt
	410.6	419.9	9.3		.14		.03		80	3.27							.44			|							15	10	70		SP			|						Hf, sp clay - chlor vning. Pods Tt

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Notes:

(1) Est. % Cu represented by each mineral

(2) Est. mineral %; or, as follows: Trace (Tr); Sparce (Sp) < 5 %; Moderate (Md) 5 - 50 %; Strong (St) + 50 %

Note (3)
Tt - Toctite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D-171
Page 2 of 2 Pages
Collar Elev 2939.96 Final Depth 490.0
Coords. N 35,446.86 E 18,798.76
Inclination Vert
Logged by FTG - CWH
Date: Start 10/15/63 Finish 10/31/63

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg	% Cu NS	% Cu Avg	% Core Recov	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green		Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE			(3) Rock Type	Structures (4) Depth	True Dip	Remarks
419.9	428.7	8.8		.22		.03		85	3.40							.22			Tr							10	15	70		SP			SP						Hf, dense, buff-wht w pods Tt grad to med chlor vning
428.7	438.3	9.6		.18				89	2.59							.18										10	5	75		Tr			S						Hf, sp clay - chlor vning Pods Tt
438.3	447.4	9.1		.21				100	2.70							.21										60	SP	25		S			SP			Mb	440.2	broken	Hf, as above to 440.2, then Mb; sp clay, pods Hf, with Tt
447.4	456.4	9.0		.33				93	3.09							.33										25	20	45		S			Tr			Tt	448.4	grad	Mb; incr gar to 448.4, then Tt; mod clay alt, w/k dev gar sand Sp sulf
456.4	464.7	8.3		.04				73	3.23	.03						.01										20	55	5		15			S						Tt, mod clay alt. Tr pores text
464.7	471.4	6.7		.39				98	2.78						.04	.35										15	10	60		S			S			Hf	467.0	grad	Tt, dense, mod SiO_2 to 467.0, then Hf, mod chlor vning, Sp. diss. sulf
471.4	481.0	9.6		.20				100	2.63							.20										10	5	65		S			10						Hf, mod chlor vning w. pods Tt
481.0	490.0	9.0		.19				100	2.62							.19										15	5	65		S			10						Hf, mod chlor vning w. mod Mb
						Av.	Recr	93%																															
					END	OF	HOLE																															

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Notes:

(1) Est. % Cu represented by each mineral

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Note (3)
Tt - Tactite
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Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D-172
Page 1 of 1 Pages
Collar Elev. 2866.67 Final Depth 346.4
Coords. N 135,455.52 E 18,593.63
Inclination Vert
Logged by FTG - CWH
Date: Start 11/1/63 Finish 11/25/63

	Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green		Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem.	Spec.	Other (2) Galena	Sphal.	Molyb.	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz.	QUARTZ	CHLORITE	JAROSITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
	0.0	9.1	9.1		-			—	-	-																													ROCKBIT
NC 2.408	9.1	19.3	10.2		.28				81	2.47	.20	.01	.01	.06					Tr								.25		.45	SP	.15				10	Hf	9.1	—	Hf; leached, vuggy, patches st clay. Mixed Mb. Vague Mz text
	19.3	27.8	8.5		.35		.22		100	2.23	.17	.01	.01	.03		.13			1								.40		.30	SP	.15				5	Mb	19.3	grad	Mb; leached, sp clay - jaro alt. Mixed since Hf. Sp CuOx
	27.8	36.8	9.0		.38		.55		95	2.34	.48	.01	.01	.05		.33			5								.20		.45	S	.15				5	Hf	28.0	grad	Mb; leached, mixed Hf - Mb to 28.0, then Hf, mod - st lim - clay alt
	36.8	46.1	9.3		.65	37.8'	.65	32.2'	99	2.21	.42	.01	.02	.20					5								.25		.50	S	.15				SP				Hf; leached, st clay - lim alt. Sp col veining. Sp CuOx
	46.1	56.0	9.9		1.49	1.01	.92	.72	78	2.42	.70	.01	.01	.20		.57			5	Tr		Tr					.15		20	15	30				5				Hf; leached; st clay - jaro alt grad to int clay alt. Mod CuOx
	56.0	65.0	9.0		.99		.75		80	2.56	.53	.01	.01	.20		.24			5								.10		.40	SP	20		20	Tr	SP	Qtzite	59.7	brkn	Hf; leached, int clay - lim, then st clay - jaro - lim - CuOx to 59.7 then Qtzite
	65.0	74.1	9.1		.21		.16		64	2.56	.14		.01	.01		.05			Tr								Tr				SP		95		Tr				Qtzite; leached, pods clay, tr CuOx on fract
	74.1	82.6	8.5		.10				81	2.60	.10								1								1				Tr		95		1				Qtzite, leached, brkn, patches mod clay, tr jaro on fract.
	82.6	90.7	8.1		.04				55	2.56	.04								1								1				1		95		1				Qtzite; brkn; tr clay on fract
	90.7	100.5	9.8		.05				61	2.62	.05								1								1				1		95		1				Qtzite, brkn
	100.5	105.5	5.0		.14				62	2.63	.14								1								1				1		95		1				Qtzite; brkn, tr blk ox on fract
	105.5	115.0	9.5		.04				76	2.61	.04								1								1				1		95		1				Qtzite; brkn, tr blk ox on fract
	115.0	125.7	10.7		.03				69	2.61	.03								1								1				1		95		1				Qtzite; brkn, tr blk ox - jaro on fract
	125.7	134.8	9.1		.04				92	2.62	.04								1								1				1		95		1				Qtzite, as above
	134.8	143.9	9.1		.04				25	2.60	.04								1								1				1		95		1				Qtzite; as above
NX 1.875	143.9	152.0	8.1		.05				69	2.62	.05								1								1				1		95		1				Qtzite; as above
	152.0	161.2	9.2		.10				56	2.62	.10								1								1			Sp				Tr	1	Mz	152.0	brkn	Mz; brkn, leached, sp clay alt. Tr CuOx
	161.2	170.9	9.7		.09				67	2.64	.09								1								1				1				1				Mz; brkn, leached; sp clay - feldspath. Tr CuOx
	170.9	175.2	4.3		.10				68	2.64	.10								1								1				1				1				Mz; leached, mod feldspath, Tr CuOx
	175.2	182.5	7.3		.05				34	2.64	.05								1								1				1				1				Mz; leached, mod clay all. Tr CuOx
	182.5	192.5	10.0		.02				50	2.59			.02																	Tr		95			1	Qtzite	182.5	brkn	Qtzite; brkn, tr col x Qtzite bx
	192.5	200.7	8.2		.03				58	2.58	.03																			1		95			1				Qtzite; brkn, tr jaro on fract.
	200.7	210.1	9.4		.01				34	2.59	.01																			1		95			1				Qtzite, as above
	210.1	217.5	7.4		.01				78	2.60	.01																			1		95			1				Qtzite; as above
	217.5	227.1	9.6		.02				77	2.61	.02																			1		95			1				Qtzite, brkn, blk FeOx on fracts. Tr. Jar.
	227.1	236.2	9.1		.04				74	2.63	.04																			1		95			1	Mz	236.0	brkn	Qtzite, as above to 236.0, then Mz; leached, sp clay - jaro alt
	236.2	245.1	8.9		.03				84	2.64	.03																			1		95			1	Qtzite	242.0	brkn	Mz; leached, sp clay - jaro alt to 242.0, then Qtzite; brkn tr blk ox
	245.1	255.5	10.4		.02				62	2.63	.02																			1		95			1				Qtzite; brkn, tr jaro - blk ox on fract
	255.5	265.3	9.8		.02				71	2.65	.02									Tr										1		95		SP		Mz	256.6	brkn	Qtzite, as above to 256.6, then Mz, leached, sp clay - mod
					-				-	-																										Qtzite	264.3	brkn	silicif to 264.3, then Qtzite, brkn, tr blk ox on fract
	265.3	270.6	5.3		.03				75	2.61	.03																			Tr		95			1				Qtzite, brkn.
	270.6	277.1	6.5		.04				69	2.64	.04																1			S		90			1				Qtzite, brkn patches w. mod clay alt
	277.1	285.8	8.7		.05				72	2.64	.05									Tr						SP				SP		90		Tr		Mz	279.6	brkn	Qtzite, as above to 279.6, then Mz; mod silicif grad to mod clay - jaro alt
	285.8	294.1	8.3		.04				98	2.66	.04															Tr				Tr		95			1	Qtzite	289.0	brkn	Mz; sp clay alt to 289.0, then Qtzite; tr jaro on fract
	294.1	299.0	4.9		.05				85	2.65	.05									Tr								1			1		95		1				Qtzite, tr jaro - blk ox on fract
	299.0	308.9	9.9		.07				69	2.64	.07									1								1			1		95		SP				Qtzite; sp jaro - blk ox on fract
	308.9	317.6	8.7		.07				92	2.73	.07									1								1			1		95		1				Qtzite, as above
	317.6	326.2	8.6		.11				84	2.62	.11									1								1			1		95		1				Qtzite, as above w. fracts w. st lim
	326.2	335.9	9.7		.03				84	2.63	.03									1								1			1		95		1	Qtzite bx	335.0	grad	Qtzite, as above grad to Qtzite - lim bx at 335.0
	335.9	346.4	10.5		.01				85	2.63	.01									SP								1			SP		95		Tr				Qtzite bx, bx frags set in lim matrix. Bx weak grad to Qtzite

Av. Rec. = 71 %

END OF HOLE

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Notes:

(1). Est. % Cu represented by each mineral

(2) Est. mineral %; or, as follows: Trace (Tr); Sparce (Sp) < 5 %; Moderate (Md) 5-50 %; Strong (St) +50 %

Note (3)
Tt - Toctite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D-173
Page 1 of 1 Pages
Collar Elev. 2939.67 Final Depth 398.4
Coords N 35,598.19 E 15,938.30
Inclination Vert
Logged by FTG - CWH
Date: Start 11/7/63 Finish 11/21/63

	Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green		Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem.	Spec.	Other (2) Galena	Sphal.	Molyb.	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz.	QUARTZ	CHLORITE	JAROSITE	FLUORITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
	0.0	40.5	40.5		–			–	–	–																														ROCKBIT
NC 2,400	40.5	48.0	7.5		.10				100	2.69				.10					Tr								95			Tr							Mb	40.5	--	Mb, dk gy + wht Mixed Mb - Ls?
	48.0	57.1	9.1		.08				82	3.19				.08					1								95	Tr	SP											Mb; as above w vnlts + pods Tt - Ca SiO3 w. sp CuOx
	57.1	65.3	8.2		.02				97	2.71				.02					1								95		Tr	Tr			Tr							Mb, mixed dk gy + wht.
	65.3	74.5	9.2		.02				100	2.70				.02					1								95		1	1			1							Mb; as above
	74.5	83.8	9.3		.09				98	2.70		.02	.01	.06					1								90	5	1	SP										Mb; as above w tr gar - CuOx vning
	83.8	93.0	9.2		.37		.36		100	2.81		01	.03	.32		.01			1								45	45	5	SP				Tr		Tt	85.5	brkn	Mb; as above to 85.5, then Tt; mod CuOx w mixed Mb - Hf pods
	93.0	99.9	6.9		2.41	15.2	2.30	15.2	93	3.05	.10	.01	01	2.18		.11			1								25	65	5	1										Tt; leached; sp clay w st CuOx. Pods Mb.
	99.9	105.0	5.1		.63	14.4	.58	14.2	92	3.23	.07		.01	.50		.05			1								15	75	5	1				Tr						Tt; leached; grad to mass gar w mod CuOx
	105.0	108.2	3.2		.64		.38		83	3.38	.05		.01	.32		.26			1								15	75	SP	5										Tt, leached; mod clay alt of mass gar rk Mod CuOx
NX 1,375	108.2	116.3	8.1		.30		.29		94	3.12	.08		.01	.20		.01			1								10	80	Tr	5				Tr						Tt; as above
	116.3	123.8	7.5		.41		.27		96	2.57	.22		.05			.14			1								5	45	Tr	Sp			Tr			Mz	119.3	brkn	Tt; leached w tr sulf, clay alt to 119.3, then Mz; leached; mod silicif.
	123.8	132.4	8.6		.08				97	2.59	.05		.02			.01			1								Sp			1			1							Mz; leached; sp clay - chlor grad to sp clay - silicif
	132.4	143.3	10.9		.05				73	2.56	.01		.03			.01			Sp								1			2a			1							Mz, leached, sp silicif grad to brkn, st clay - lim grad to sp clay alt
	143.3	152.5	9.2		.04				91	2.56	.01		.02			.01			Tr								1			5			1	Tr						Mz; leached; sp clay - chlor grad to sp silicif - jaro
	152.5	160.0	7.5		.19				97	2.75	.01		.01			.01	.16		1	Sp							10	30	60	Sp			Sp			Hf	153.2	brkn	Mz; as above to 153.2 then 3 ft Tt grad to Hf, dense, sp chlor vn
	160.0	168.7	8.7		.05				96	2.63			.01				.04		1	Tr							Tr	5	40	1		50	1	Tr						Hf, dense; sp silicif Tr chlor vn. Possib st alt Siltst?
	168.7	176.8	8.1		.11				100	2.59			.01				.10		1								1	Tr	40	1		50	1	1						Hf dense; mod silicif Tr chlor vn
	176.8	186.7	9.9		.03				87	2.53			.01				.08		1								SP	1	40	1		50	1	1						Hf; dense, mod silicif w yellowish patches Tr CuOx
	186.7	195.7	9.0		.06				94	2.64			.01				.05		1								1	1	40	1		50	Tr	1						Hf, as above w incr silicif
	195.7	204.1	8.4		.18				97	2.67							.18		1								1	1	50	1		40	1	1						Hf, mod silicif - sp chlor vn.
	204.1	212.6	8.5		.29				96	2.66						.03	.26		1								1	1	50	1		40	1	1		Hf	208.4	45°	Hf, as above to 5 ft, then tuff, slightly sheared
	212.6	220.7	8.1		.27				95	2.72							.27		1								1	15	50	1		30	1	1		Hf	212.6	50°	Hf, mod silicif, wk chlor on shears.
	220.7	230.1	9.4		.22				94	2.67							.22		1								1	10	60	1		25	1	1						Hf, as above, leached w dark lim
	230.1	236.4	6.3		.22				95	2.82							.22		1								1	15	70	1		10	SP							Hf, tr jaro & start, tr sp sulf, Best as above
	236.4	245.0	8.6		.17				96	2.98							.17										5	15	70	1		SP								Hf; dense, sp silicif Tr gar - st
	245.0	254.3	9.3		.13		.03		87	3.18					03		.10									SP	15	5	70	5			SP	Tr						Hf, as above grad to pods med clay - jaro alt
	254.3	263.5	9.2		1.04		.03		85	3.41							1.04			SP							15	5	70	5			5							Hf; sp clay w pods blk chlor w mod sulf grad to mx Tt + Hf
	263.5	272.9	9.4		.58		.01		85	3.32							.58			Tr				SP			10	5	70	5			5		Tr					Hf; sp - mod clay alt w chlor - cal vning Mod diss sulf
	272.9	282.0	9.1		.42	34.5	.05	34.5	95	3.03						.12	.30										10	10	65	5	5		SP							Hf; dense, mod clay alt grad to st clay alt w incr gar. Sp diss spy
	282.0	290.4	8.4		.57	.58	.03	.02	98	2.59						.30	.27		SP	SP							15	5	60	10	5		1							Hf; st clay w wk vuggy text assoc w mod cc - spy, then incr Tt; 6" And dike
	290.4	299.6	9.2		.41		.01		99	2.90						.10	.31		Tr	Tr							10	5	70	SP			5							Hf; patches st clay - lim in dense, sp clay - diss sulf. Pods Tt
	299.6	308.8	9.2		.44		.01		100	2.76						.10	34										10	10	70	1			SP							Hf; wk vuggy text w mod clay alt grad to sp clay - sulf. Pods st gar
	308.8	317.6	8.8		.26		02		91	3.17							.26										10	5	70	1			5							Hf; sp clay alt w pods brkn Tt grad to sp chlor + clay vning Tr sulf
	317.6	326.3	8.7		.49		.03		99	2.58							.49										10	Tr	80	1			5							Hf; mod chlor - cal vning w irreg pods chlor. Tr sulf
	326.3	333.3	7.0		.11				87	2.62						.05	.06										5	1	40	Tr			SP			And	330.0	78°	Hf; sp chlor vning to 330.0, then And; post min dike. Col clay vnlet
	333.3	342.6	9.3		.10				84	2.53						.10			Tr								Tr			1			Tr							And, post min dike; tr cal, tr lim on fract
	342.6	350.8	8.2		.03				100	2.55						.03			1								1			1			1							And, post min dike; tr cal vning
	350.8	360.5	9.7		.11				90	3.22							.11							Tr			5	5	75	5			5			Hf	351.0	70°	And; post min dike to 351.0, then Hf; mod chlor vn grad to sp clay alt
	360.5	369.3	8.8		.24		02		99	2.73							.24										10	5	75	5			SP							Hf; gy - wht w sp clay alt grad to med chlor - alun? vning. Tr sulf w chlor
	369.3	379.6	10.3		.20				86	2.53							.20							Tr			5	5	80	SP			1							Hf; mod clay alt w sp chlor vning Pods Tt. Sp sulf
	379.6	388.8	9.2		.26				100	2.47							.26		Tr								10	5	70	5			1			Mz	387.6	brkn	Hf; mod clay alt w sp diss sulf to 387.6, then Mz, dense; st clay alt
	388.8	398.4	9.6		.08				95	2.57							.08										5	5	60	5	10		1							Mz; st clay alt grad to white w st silicif
							Av.	Rec. =	93%																															
						END	OF	HOLE																																

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO- SILVER BELL UNIT

Notes:

(1) Est. % Cu represented by each mineral

(2) Est. mineral %; or, as follows: Trace (Tr); Sparce (Sp) < 5 %; Moderate (Md) 5 - 50 %; Strong (St) + 50 %

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D-174
Page 1 of 1 Pages
Collar Elev 2935.43 Final Depth 345.3
Coords N 35,449.37 E 18,805.07
Inclination Vert
Logged by FTG - GWH
Date: Start 11/22/63 Finish 12/7/63

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue-Green	Red Cu Oxides	Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb.	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz.	QUARTZ	CHLORITE	JAROSITE	MAURENITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0.0	80.8	80.8																																					Rockbit
NC 2.40 80.8	87.9	7.1		.16				94	2.64		.01	.03	.06		.06			Tr								5		SP	5	Tr		Tr			Mz	80.8	-	Mz; wk alt to 86.8, then And; post min dike w wk bx. Mod cal vn
				—		—		—	—																										And	86.8	brkn	And; post min dike, clay-gg patches. Sp cal vn
87.9	96.5	8.6		.24		.01		97	2.53						.24			Tr							SP		Tr	SP			SP							And, post min dike; sp clay alt v
96.5	100.6	4.1		5.12		4.70		76	2.36	3.45		.25	1.00		.42			1							Tr		1	5			1	SP						And; post min dike as above w. st chrys veining
100.6	110.5	9.9		11.55		10.61		80	2.81	8.61	.05	.45	1.50		.94			SP			SP					5	25	5	SP	5		1	Tr		Tt	105.8	brkn	And, post min dike as above to 105.8, then Tt; leached, st lim-CuOx-clay
110.5	119.4	8.9		.23		.25		84	3.44	.20		.01	.04		.03			Tr								10	55	20	Tr	SP		10	1						Tt; chlor-cal bx grad to dense, st gar w tr CuOx
NX 119.4 128.2	128.2	8.8		6.17		5.88		99	2.83	5.37		.01	.50		2.9			Sp			Tr					5	85	10		5	Sp		1					Tt; leached; st gar w. st lim-CuOx
128.2	137.6	9.4		12.60		12.05		99	2.46	7.04		.01	5.00		.61			1			1					Tr	10	Sp		20		1	1					Tt; leached, mod clay alt w. st lim-CuOx
137.6	147.6	10.0		12.54	89.5 @	16.48	89.5 @	80	3.33	8.00	.01	.01	7.00	6.46	.96	.10		5			Sp					Sp	50	1		20		Tr						Tt; leached, st gar-clay-lim. Gossan after mass. sulf w mod hem-grad to dense st clay alt w st CuOx
147.6	157.5	9.9		3.19	5.95	2.96	5.56	83	2.69	1.46			.50	1.00	.23			Sp			Tr					Tr	45	Tr		30		25		10		Dp	155.0	brkn	Tt; leached, int clay alt (HF?) to 155.0, then Dp (?), pods int garo-CuOx. Dp? is int silicif w sp cup vnlts (Possib Qtzite?)
157.5	166.7	9.2		.66		.60		94	2.60	.10		.04	.46		.06			SP								Tr		5	SP	10		80		SP					Dp; (?) int silicif w. patches sp clay. Mod CuOx
166.7	177.0	10.3		.35		.30		93	2.61			.01	.29		.05			15									15		20	Tr	45		5					Dp; (?) int silicif w pods? sed? incl w st clay-lim alt + sp CuOx
177.0	186.0	9.0		.49		.38		50	2.63	.10	.02	.10	.16		.11			10	Tr		Tr						5		15		60		SP					Dp; (?) int silicif, resemb Qtzite, but pods int clay-lim gygs incl in ign rk
186.0	196.5	10.5		.10		.10		63	2.61	.09		.01						Tr					Tr?			Tr				Tr		85		Tr	Tr				Dp; similar to above, but no sp. text. Tr Chrys
196.5	206.6	10.1		.05				79	2.29			.01	.04					1								5		15		1		75		1					Dp (?) int silicif w. pods (inclusions?) Hf, Tr CuOx
206.6	213.2	6.6		.12				92	2.53	.11		.01						1								10		70		1		15	Tr	1		Tt	208.7	brkn	Dp (?) int silicif to 208.7, then Tt; sp clay-CuOx to 211.6, then Hf,
—				—		—		—	—																											Hf	211.6	grad	dense, pale chlor-cal veining
213.2	221.0	7.8		.06				100	2.78				.06					Tr								SP		90		Tr		5	Tr	Tr					Hf; tr chlor-cal veining w inter silicif
221.0	231.0	10.0		.05				84	2.91	.02						.03		1		Tr						1		65		1	Tr	SP	SP			Mz	225.6	brkn	Hf; sp-mod silicif to 225.6, then Mz; possib incp feldspath w sp silicif?
231.0	241.0	10.0		.07				98	2.63	.07								1												1	1		1	Tr					Mz; possib incp feldspath w tr gray-blk ox on fract
241.0	250.5	9.5		.07				90	2.62	.07								1								Tr		30		1	1		1	1		Hf	247.0	brkn	Mz; as above to 247.0, then Hf; dense, brn, mod silicif.
250.5	259.8	9.3		.01				94	2.70	.01								1								SP		80		1		10	Tr						Hf; wk chlor-cal grad to buff-wht, mod silicif
259.8	264.1	4.3		.02				99	2.70	.02					Tr			1		Tr						1		80		1		10	1						Hf; lt white w sp pale chlor vn, mod silicif. Fg. regular text.
264.1	273.1	9.0		.01				95	2.84	.01								1		1						1		80		1		10	SP						Hf; dense; white w sp chlor vn. Patches wk silicif.
273.1	282.6	9.5		.02				95	2.93	.02								1		1						1		85		1		10	Tr						Hf; mod clay alt grad to sp silicif grad to dense, white; st $CaSiO_3$
282.6	291.8	9.2		.08				95	3.02	.08								1		1						1		85		SP		5	SP						Hf; dense; white; st $CaSiO_3$, sp chlor vn
291.8	301.0	9.2		.20		.02		93	2.97	.02					.10	.08		1		1						1		85		1			5						Hf; dense, st $CaSiO_3$ w tr chlor-cal veining grad to mod silicif
301.0	309.8	8.8		.61	12.5 @ 64	.37	12.5 @ .47	100	2.61	15	.01	.01	20		.15	.09		1		1				Tr		5		5	SP		1		90	Tr		Qtzite	301.2	grad	Hf; mod silicif w chlor vn to 309.2, then Qtzite; possib int silicif Hf to 309.2,
																																				Tt	309.2	irreg	then Tt, int dk brn gar w mod CuOx. Tt rel to Qtzite? clearly grad Dp??
309.8	318.5	8.7		.68		57		95	2.63	18	.02	.02	35		.05	.06		Tr		Tr						SP	10	SP		SP	SP	85				Qtzite?	311.2	brkn	Tt, int gar w qtz pods to 311.2, then Qtzite?, patches mod CuOx. So tr sign?
318.5	327.8	9.3		.05				85	3.55	.05								1		1						5	85	5		1		Tr		Tr		Tt	318.8	brkn	Qtzite, sp CuOx - yaro on fract to 318.8, then Tt; sp clay - st gar - mod
—	—	—		—		—		—	—																											Hf?	326.3	grad	CuOx to 326.8, then Hf; ? dense; gy, mod silicif Possib qtz eyes
327.8	337.6	9.8		.20				90	2.81	.10						.10				Tr						SP	15	60		1		15	Tr	Tr		Mz?	336.4	grad	Hf; pods Tt, dense, mod silicif to 336.4, then Mz; st silicif; blea on frac
337.6	345.3	7.7		.11				96	2.77							.11				1						1		?				30	1	1					Mz?; st silicif w blea on fract. Sp sulf. Possib Dp?
						Av	Rec. =	89%																															
					END	OF	HOLE																																

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO- SILVER BELL UNIT

Notes:

(1) Est. % Cu represented by each mineral

(2) Est. mineral %; or, as follows: Trace (Tr); Sparce (Sp) < 5 %; Moderate (Md) 5 - 50 %; Strong (St) + 50 %

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D-175
Page 1 of 1 Pages

Collar Elev 2933.45 — Final Depth 352.7
Coords. N +35,296.76 — E 18,997.89
Inclination Vert
Logged by ETG - CWH
Date: Start 11/26/63 — Finish 12/14/63

	Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green		Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb.	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	JASPER	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
	0.0	42.0	42.0																																				ROCKBLT
NC 2.40	42.0	52.0	10.0		.07				73	2.60	.05	.01	.01						Tr								Tr		Tr	SP			SP		Mz	42.0	-	Mz, leached, sp clay alt w vesp feldspath
	52.0	61.6	9.6		.06		.01		66	2.67						.06			1	Tr										Tr			Tr		Hf	61.0	20°	Mz, med gx w st par devel. of 1st + 2nd Gpars to 61.0, then Hf, st silicif
	61.6	69.5	7.9		.50		.31		93	2.61	.29	.01	.01			.15	.04		1	1							10	5	30	Tr	SP		SP	1	Tr	Hf bx	61.6	grad	Hf bx; Hf frags w. mod parc in silica matrix (Dp?) Mz silicif of Hf.
	69.5	78.5	9.0		.28				88	2.63	.12	.01	.01			.08	.06		1	1							5	SP	35	1	SP		55	SP	1				Hf bx, mod clay-parc frags w sp mod silicif Mz frags floating in silica matrix
	78.5	86.0	7.5		.17				88	3.11	.10	.01	.01			.02	.03		1	1							5	10	40	1	1		40	1	1				Hf bx, frags ½" - 7" decr in no. to 84.5, then Hf frag 2 ft thick
NX 1.875	86.0	90.2	4.2		.17				86	2.60	.10	.01	.01			.02	.03		1	1							5	SP	30	1	1		60	1	1				Hf bx; clay-parc Hf frags in silica matrix.
	90.2	100.9	10.7		.09				84	2.60	.05	.01	.01				.02		1	1							5	1	30	1	1		60	1	1				Hf bx; clay-parc frags w sp ads Cu w tr Mz frags in silica matrix
	100.9	109.7	8.8		.10				89	2.62	.06	.01	.01				.02		1	1							5	1	30	1	1	Tr	60	1	1				Hf bx; as above w. frags to 8" length. Silica matrix is 60% of core
	109.7	120.6	10.9		.28				83	2.62	.14	.01	.01			.03	.09		1	1							5	1	50	1	10	1	30	1	1				Hf bx; prob bx w incr size frags; 4 ft clay-chlor Hf w sp suls + CuOx
	120.6	130.5	9.9		.06				83	2.60	.05		.01						1	1							SP		SP		SP		90	Tr	1				Hf bx, 10% Hf frags, 1% Qtzite frags. Matrix w vague dk blebs - silicif Hf?
	130.5	140.2	9.7		.01				73	2.75	.01								1	1							SP		5		1		90	1	1				Hf bx, w 30% Hf frags w sp clay-parc. Matrix int silicif Mz ??
	140.2	149.3	9.1		.02				50	2.60	.02								1	1							1		5		1		90	1	1				Hf bx, 80% qtz matrix w possib Qtzite frags Tr Hf - Mz frags
	149.3	158.0	8.7		.01				49	2.60	.01								1	1							5		55		1		55	1	1				Hf bx; as above w tr med feldspath ½" Mz frags
	158.0	167.0	9.0		.05				91	2.61	.05								1	1							SP		20		Tr		70	5	1				Hf bx, pods Hf w sp chlor, sp, st feldspath Mz frags
	167.0	174.1	7.1		.02				99	2.60	.02								1	1							1		SP		1		90	SP	1				Hf bx, 80% qtz matrix w wk epid Hf, Tt, + Mz frags + Qtzite pebbles
	174.1	183.4	9.3		.03				91	2.62	.01			.02					1	1							1		1		1		90	1	1				Hf bx; 85-90% qtz matrix w sp ¼" chlor-epid frags. Possib Qtzite frags
	183.4	192.0	8.6		.14				95	2.80	.02			.03			.09		1	1							5	Tr	60		1		30	1	1				Hf bx, 2 ft Hf frags w sp chlor wn - sp suls; tr cc; all in qtz matrix
	192.0	201.0	9.0		.04				93	2.61	.01			.03					1	1							Tr		SP		1		95	1	1				Hf bx; sp dk chlor Hf frags, sp Qtzite frags in qtz matrix
	201.0	210.3	9.3		.12				96	2.60	.02			.02		.04	.04		1	1							SP		20		1		70	1	1				Hf bx; mod Hf frags - to 8" - w sp spp - cc in qtz w mod limin fract
	210.3	220.3	10.0		.02				100	2.59				.01			.01		1	1							1		10		1		85	1	1				Hf bx, as above. Small dk Hf frags have vague rim; large frags are well defined
	220.3	227.3	7.0		.04				91	2.63	.01		.01	.02					1			Tr					1		20		1		70	1	1				Hf bx; >1" Hf - Qtzite frags in silica matrix
	227.3	236.6	9.3		.04				62	2.62			.04						1			1					1		15		1		80	5	1				Hf bx; >2" Hf frags - Qtzite pebbles in silica matrix Tr cal veining Tr CuOx
	236.6	245.7	9.1		.04				64	2.62			.04						1								5		20		1		70	5	1				Hf bx; Hf frags in silica matrix. Possib Bnd Pbx mod? Tr CuOx
	245.7	254.2	8.5		.03				99	2.60	.01	Tr	.02						1								5	Tr	60		15		20	SP	1				Hf bx; clay-diopside Hf frags up to 1 ft length w mod ads Cu
	254.2	262.6	8.4		.11				83	2.53			.04			.07?			1								SP		55		20		20	5	1	Mz	262.2	broken	Hf bx, 40% Hf - 5% feldspath Mz frags to 262.2, then Mz, mod silicif
	262.6	270.7	8.1		.01				94	2.64			Tr				.01		1	Tr							Tr		Tr		SP	Tr		Tr					Mz, dark gx, wk alt, tr suls; tr bn an fract
	270.7	278.9	8.2		.12				65	2.65			.01			.11			1	1											1	1		1					Mz; sp clay - bleach. Sp leach of suls
	278.9	288.8	9.9		.10				53	2.69			.01			.09			1	1											1	1		1					Mz; as above w st par text
	288.8	298.0	9.2		.08				57	2.66			.01			.07			1	1											1	1		1					Mz, as above
	298.0	307.8	9.8		.06				40	2.69			.01			.05			1	1							Tr				1	1		1		Hf	307.5	broken	Mz; sp silicif + as above to 307.5, then Hf, tense sp clay alt. Sp cc-epy
	307.8	316.9	9.1		.25				92	3.08							.25			1							5	SP	85		1			5					Hf, blue-gray, Page Tunnel Type. Sp suls.
	316.9	327.3	10.4		.17				70	2.95							.17			1							5		85		5			SP					Hf, as above to 319.6, then dense, gra-gray, argillitic.
	327.3	335.4	8.1		.44		.03		74	2.69							.44			1		Tr					5		80		5			5					Hf, dense, argillite, to 330.5 then grays to 332.6, mod lim
	335.4	343.2	7.8		.28		.05		80	2.73							.28			1							10		80		SP			5					Hf, blue-gray, chlor, wk a few spots of arg. Hf. Sp suls.
	343.2	352.7	9.5		.20				100	2.59							.20			1							15		75		1			5					Hf, as above.
							Av	Rec. =	79%																														
						END	OF	HOLE																															

PRELIMINARY GEOLOGIC LOG
(Subject to Revised Logging)
ASARCO - SILVER BELL UNIT

Note (3): Tt - Tactite; Hf - Hornfels; Mb - Marble; Qt - Quartzite; Bx - Breccia; Da - Dacite; Mz - Monzonite; An - Andesite

Note (4): V - Vein; F - Fault; D - Dike; C - Contact; Ig - Undif igneous

Hole No. 0-1986 RE-ENTRY
Page 1 of 2 Pages
Collar Elev 2820.59 Final Depth 908.8
Coords. N 38,102.17 E 15,751.91
Inclination VERTICAL
Logged by N.R.N + R.E.
RE ENTRY Date: Start 4-1-68 Finish 4-29-68

RE-ENTRY

Depth From	Depth To	Int'v	Elev.	% Cu Total	Avg.	NS	Avg	% Core Recov	Sp. Gr.	Chrys.	Pitch	Black	Blue Green	Unidentified Non-Sulfide Mins.	Cc.	Cpy.	Born
315.0	333.9	18.9		1.11		0.02		48	2.47					0.02		1.09	
333.9	342.4	8.5		0.22		Nil		95	2.43							0.22	
342.4	352.5	10.1		0.58		0.02		74	2.93					0.02		0.56	
352.5	362.2	9.7		0.31		Nil		90	2.75							0.31	
362.2	369.7	7.5		0.28		Nil		84	2.70							0.28	
369.7	379.4	9.7		0.35				86	2.63							0.35	
379.4	392.5	13.1		0.32				61	2.53							0.32	
392.5	401.0	8.5		0.18				89	2.70							0.18	
401.0	410.0	9.0		0.16				88	2.61							0.16	
410.0	420.7	10.7		0.19				76	2.49							0.19	
420.7	429.5	8.8		0.17				91	2.68							0.17	
429.5	438.4	8.9		0.20				88	2.77							0.20	
438.4	447.3	8.9		0.19				86	2.62							0.19	
447.3	456.4	9.1		0.11				93	2.55							0.11	
456.4	468.7	12.3		0.14				91	2.72							0.14	
468.7	478.4	9.7		0.10				81	2.71							0.10	
478.4	488.1	9.7		0.09				85	2.72							0.09	
488.1	497.8	9.7		0.13				78	2.62							0.13	
497.8	510.0	12.2		0.45		0.01		71	2.88					0.01		0.44	
510.0	525.3	15.3		0.24				56	2.14							0.24	
525.3	535.3	10.0		0.27				82	2.46							0.27	
535.3	543.6	8.5		0.17				86	2.60							0.17	
543.6	559.8	16.2		0.95	0.12	0.03	.03	40	2.71					0.03		0.92	
559.8	571.3	11.5		0.40		0.02		66	2.51					0.02		0.38	
571.3	581.4	10.1		0.12				72	2.4[illegible]							0.12	
581.4	594.5	13.1		0.05				38	2.4[illegible]							0.05	
594.5	604.5	10.0		0.04				84	2.69							0.04	
604.5	614.5	10.0		0.02				74	2.61							0.02	
614.5	624.2	9.7		0.06				79	2.69							0.06	
624.2	631.1	6.9		0.06				91	2.74							0.06	
631.1	641.4	10.3		0.06				70	2.73							0.06	
641.4	651.4	10.0		0.08				79	2.68							0.08	
651.4	660.0	8.6		0.07				90	2.74							0.07	
660.0	666.3	6.3		0.06				83	2.59							0.0[illegible]	
666.3	675.7	9.4		0.18				82	2.64							0.18	
675.7	690.0	14.3		0.12				65	2.67							0.1[illegible]	
690.0	698.4	8.4		0.36				90	2.64							0.3[illegible]	
698.4	703.8	5.4		0.07				93	2.71							0.0[illegible]	
703.8	706.2	2.4		0.13				88	2.64							0.1[illegible]	
706.2	717.5	11.3		0.11				80	2.64							0.1[illegible]	
717.5	729.9	12.4		0.09				62	2.64							0.[illegible]	
729.9	738.4	8.5		0.07				69	2.80	Ag	Mo	Zn	Pb			0.[illegible]	
738.4	744.8	6.4		0.11				37	2.81	0.15	0016	1.51	1.15			0.[illegible]	
744.8	752.9	8.1		0.08				44	2.71							0.[illegible]	
752.9	760.3	7.4		0.12				95	2.74							0.[illegible]	
760.3	770.0	9.7		0.12				97	2.67							0.[illegible]	

From	Fe (2): Lim. / Py / Mag. / Hem / Spec.	Other (2): Galena / Sphal. / Molyb / Calcite / Garnet / Silicates / Sericite / Clay / Vn. Qtz / Quartz / Chlorite-Gypsum	(3) Rock Type	Structures (4) Depth	True Dip
315.0	- 25% 15% - -	- - - St - ? ? St - ? St	Clay-Chlor Hf gouge		
333.9	- 3% ? - -	- - - Wk - Mod (?) - - Tr ? Mod	Sh.St., Hf + Mz		
342.4	- 5-6% Tr - -	- - - Sp - Wk ? Sp 2-3% ? Mod	Mz + Grn Hf	St. G.G.	
352.5	- 2% - - -	- - - Sp - Sp - Tr 1% ? St	Biot-Chlor Hf	357'-361'	70°
362.2	- 1-2% - - -	- - - Wk - Tr Sp - ? - ? St	Chlor-Serp Hf		
369.7	- 2-3% - - -	- - - Wk - - - ? - - Mod	Biot-Chlor Hf	Bx 378'	
379.4	- 8% - - -	- - - Wk - - - ? - 2% Mod	Mz 382-390		
392.5	- 2% - - -	- - - - - ? - - 5% ? Mod	Mz + Silic Chlor Hf		
401.0	- 1-2 - -	- - - Wk - ? - - <1 10%? Md	Silicified Hf		
410.0	- 1-2 - -	- - - 1% - ? - - <1 Wk Md	Hf		
420.7	- 1-2 - -	- - - 1-3% - >50% - - <1 Wk Md	Hf	Bedding?	60°
429.5	- <1% - -	- - - Sp - 50%? - - Tr Wk			
438.4	- <1% - -	- - - Sp - 50% - - Tr Wk			
447.3	- <1% - -	- - - Wk - 90% - - - - Sp		Gouge zone 449-454	
456.4	- <1% - -	- - - Sp - 50% - - - St			
468.7	- 1% - -	- - - Sp - ? - Sp - Mod ? Wk	Argillite (?)		
478.4	- 1-2% - -	- - - Sp - ? - ? Sp - Mod ? Sp			
488.1	- 1-2% - -	- - - Sp - ? - Sp ? - Wk ? Sp			
497.8	- 2% - -	- - - Wk - ? Sp Wk - ? Wk	Granodiorite Mz 512-522	St. Flt. zone 478-503	≈70°
510.0	- 1-2% Mod - -	- - - Wk - ? Mod Sp - Wk ? Wk	Hf and Mz	Flt. zone 522-752	?
525.3	- 1% Sp - -	- - - Wk Mod Tr ? - Tr - Wk ? Mod			
535.3	- 1% Tr - -	- - - Sp - Tr - Tr 1% Wk ? St Mod	Granodiorite (?) Mz Por.		
543.6	- 4% 8% Tr -	- - - Wk Mod - Mod - Wk - ? Wk Mod St	Hf ? 546'		
559.8	- 1-2% 4% - -	- Tr - Sp - Mod - Sp - Wk Mod			
571.3	- <1% - -	- - - Sp - Wk Mod - Sp Wk 1% ? Wk			
581.4	- 1-2% - -	- - Tr Wk - Wk Mod - Sp 3% Wk ? Mod St			
594.5	- 1% - -	- - Tr - - ? Mod - 1% - ? Mod St			
604.5	- <1% - -	- - Sp Wk - ? Mod - Sp 2% ? Wk			
614.5	- <1% 2% - -	- - - Tr Sp - Mod - - - Wk ? Mod			
624.2	- 0.5% - -	- - - Tr Sp Mod - Tr 1% ? Mod St			
631.1	- 1% - -	- - - Tr Sp - ? - Sp 5% Wk Mod St		Flt (Healed) 640-642	?
641.4	- <1% - -	- - - Tr Sp - ? - - 2% ? Wk			
651.4	- <1% - -	- - - Tr - ? - - Tr Wk ? Sp			
660.0	- 1% - -	- - - Tr - ? - - - ? Wk Mod	Intermixed Mz and Aplite in Hf		
666.3	- 1% - -	- - Sp - 20 Wk Wk - - Wk Md	Mz & Hf		
675.7	- 1-2	Sp - 10? Wk Wk - - Md	"		
690.0	- 1-2	- - - Tr - 10? Sp - 1% ? Mod Sp	"		
698.4	- 2% - -	- - Tr Tr - 10? Sp - Tr ? Mod Md	"		
703.8	- <1% - -	- - - - - Sp - 1% 10% Tr	Biot Mz; Silic Hf 706.2-707.8; Mz 707.6-710.2; Silic Hf 710.2		
706.2	- Tr - -	- - - - 4% - 30% - Tr - 30% Mod Wk			
717.5	- 1-2% - -	- Sp Sp - 20% Wk Tr 1% 20% Wk	Silic Hf - v.f.gr. Qtzite		
729.9	- 2% - -	- - Tr Tr Sp - 10% Sp - 2% 60% Sp Tr	Mz 738.4-744.8		
738.4	- 6% - -	- - - St Mod - 5% -			
744.8	- <1% - -	- - Sp - 10% - - 1% 60% Sp	v.f.gr. Qtzite - Hf		
752.9	- 1-2% - -	Tr Sp - 70% Sp # 5% 15% Wk 2%	Lt. Grn Diop Hf	Qtz 1/4" vns	± 60° and 90°
760.3	- <1% - -	- - - Tr - - Sp Tr 1% 4% Tr	Mz. @ 760.3		

From	Remarks
315.0	Intensely altd Hf. Rk now soft-gougy clay-chlorite matrix containing v.st. Py + Magnetite but almost no visible Cu minerals. Material believed flt. zone material. Calcite as veining
333.9	Intensely brkn and gougy. Mixture of v.f.gr. Blk silic sltst.(?), lt-mod grn sltst. - Hf. and Mz.
342.4	Rk compose of about equal amts of Mz and Grn Hf. Cpy + Py well dissem in Mz. Fract controlled in Hf
352.5	V.f.gr. Biot-chlor-clay(?) Hf. Cut by v. thin seams of Cpy
362.2	St'ly brkn v.f.gr. Hf. Some 1/8" Cpy-Py vns.
369.7	v.f.gr. Black and Green Hf. Somewhat soft. Cut by Py-Calcite + Cpy-Py-veinlets. Moderately brkn
379.4	St brecciation throughout. Gouge 390'-392'
392.5	Mz complexly intermixed and assimilating silic chlor Hf. Mz predominates
401.0	silicified, fine grained, pale green Hf with cpy in thin QTZ veinlets ^ highly broken
410.0	Softer than above, still strongly broken, calcite filling fractures.
420.7	Some silicification, fine grained, dark green, hard; hardness in part due to silicate ^ minerals. Banding (?) may represent bedding
429.5	v.f. gr. lt grey-green Hf. Med hardness. Only v. sparse sulfs along fracts. Chlor assoc.
438.4	As above. Few v. small patches of Cpy. Rk is very f.gr. and compact.
447.3	Rk st'ly brkn. Gouge locally st'ly developed.
456.4	Generally as above. Locally mod Cpy development - v.f.gr. + assoc. w/ chlor.
468.7	This Rk is as above, but probably should more aptly be called argillite
478.4	As above. Sulfs fract controlled and assoc of chlor-serp.
488.1	As above
497.8	Some serpentine veining surrounding flt. zone.
510.0	St'ly sheared brkn and altered intermixed wh'ly limey chlor-clay seds and Mz.
525.3	Complexly intermixed Mz and Hf. Mz assimilating seds. St flt'ing pre + post Mz.
535.3	Rx is mainly a porphyry, Felds with like 2 mm long. Rk is what has been called Mz above, but is probably either granodiorite or syenodiorite. Still assimilating chlor seds.
543.6	St magnetite w/ assoc. Py + Cpy. Hf is grey-green med. hard. Appears to have been a limy arkosic slt. st. Magnetite content drops off from 557' on down
559.8	The Hf appears to be tremolitic. Rx quite brkn + mod-st'ly gougy
571.3	Hard v.f.gr. Hf. v.f.gr. Cpy dissem. Rk quite brkn
581.4	Hf becomes moderately chloritized. Cx content increases with chlor content
594.5	v.f.gr. biot-chlor Hf. Sp sulfs. Locally strongly broken
604.5	v.f.gr. silic Hf. Some weak chloritic
614.5	Grey-Black v.f.gr. Hf. No sulfs of significance.
624.2	v.f.gr. Black Biot-Chlor-Silicate Hf. As above. Quite broken
631.1	As above. Numerous 1/4" white qtz vns. of all attitudes. Some sulfs in center. Large chlor. fracts locally developed. v. sparse acid reactivity
641.4	Rk more light colored (less chlor-biot.). Generally as above
651.4	Rk is now and has been either a v.f.gr. diopside-chlor. Hf. or a v.f.gr. qtzite w/ intermixed diopside + chlor.
660.0	Thin 1" seams of Biot. Mz cut Hf at 660.4 and 665.8'. Aplite between 663-663.6'
666.3	Mz to 670.0; Hf to 672.8; Mz to 675.7; sulfide content of Mz exceeds that of Hf
675.7	Mixed Mz & Hf, with some qtzite, highly broken, occasional massive chlorite and py along contacts. Hf are dense, siliceous and weakly mineralized.
690.0	Generally as above. Sulfs in qtz vns in seds and dissem in Mz. Interval 1/4 Mz 3/4 sed
698.4	60% Mz + 50% Hf-qtzite. Mz irregularly intruding hornfelsic silic. slt. st.
703.8	Somewhat fresh appearing Biot. Mz. Numerous biot. books. Cpy dissem + along fracts. Only Tr. Py.
706.2	Rk types and all as above. Higher Cpy content in Mz or along open fracts in Hf. Calcite as vns.
717.5	As above. Rk is quite fine grained and dense. Generally unfavorable. Cpy + Mo assoc. w/ qtz vn
729.9	Rk appears more and more like a v.f.gr. qtzite.
738.4	St'ly mineralized + altd Mz. Mod-St Py, Sp Cpy, Mod Zns.
744.8	Hornfelsic-quartzite as above. Thin Mz stringer cutting it.
752.9	Lt Green Diop-Chlor Hf. Chlor developing along fracts. Gyp. veining appearing. Only Tr Cpy + Sp Py.
760.3	Rather fresh appearing Mz w/ well dissem sulfs. Some fract. filling also. X-pnoc w St. Present

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D-198E RE ENTRY
Page 2 of 2 Pages
Collar Elev 2820.59 Final Depth 908.8
Coords. N 38,102.17 E 15,751.91
Inclination VERTICAL
Logged by N.R.N. + R.E
Date: Start 4-1-68 Finish 4-29-68

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green		Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	Gypsum	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
770.0	776.3	6.3		.08				94	2.64							.08		-	1%	-	-	-	-	-	Tr	-	-	-	Tr Sp	Tr	1%	4%	Tr		Mz			Mz As Above
776.3	779.6	3.3		.15				87	2.46							.15		-	<1%	-	Tr	-	-	-	Sp	-	60% ?	Tr	?	Tr	?	Wk Mod	3%		Dip-Chlor Hf 776.3			Dip-Chlor Hf. As befor. v.f.gr. dissem Sulfs. Gyp Vns to 3/4". Some Hem. along fracts.
779.6	783.7	4.1		.12				92	2.73							.12		-	1%	-	-	-	-	-	-	Sp	-	60% ?	Tr	Tr	Tr	—	Wk Mod	Tr					Hf as above
783.7	798.1	14.4		.13				95	2.71							.13		-	2%	-	-	-	-	-	Tr Sp	-	-	-	Wk	Wk	2%	4%	Wk Mod	Tr		Mz 783.7			Mz, Mod. alt. Biot to Chlor - felds to Clay - ser. Numerous ser. sulf fracts
798.1	806.9	8.8		.12				98	2.66							.12		-	2%	-	-	-	-	-	Tr Sp	-	-	-	Sp	Wk	-	3%	Wk Mod	Tr					Mz As Above. Felds. altering to green "clay" possibly pyrophyllite
806.9	816.0	9.1		.15				95	2.63							.15		-	2%	-	-	-	-	-	Tr	-	-	-	Sp	Wk Mod	-	3%	Wk Mod	-					Mz As Above. All sulfs well dissem except for one 1/8" filled fract. (65°)
816.0	824.2	8.2		.10				93	2.64							.10		-	3%	-	-	-	-	-	-	-	-	-	Wk	Mod St	2%	5%	Wk Mod					Mz, Alt of P. felds to Pyrophyllite except almost all grains. Increase in ser-py AHL fracts.
824.2	833.1	8.9		.08				94	2.62							.08		-	2%	-	-	-	-	-	Tr	-	-	-	Sp	Wk Mod	-	3%	Wk Mod	Tr					Mz, wk-mod Alt as above. Biots + P. felds moderately altered.
833.1	842.5	9.4		.07				99	2.61							.07		-	2%	-	-	-	-	—	Sp.	-	-	-	Wk Sp	Mod	-	3%	Wk Mod	Sp					Mz, Mod Alt. Most of sulfs well dissem
842.5	851.6	9.1		.09				97	2.52							.09		-	4%	-	-	-	-	-	Tr	-	-	-	St	Mod	-	8% ?	Wk Mod	Sp					Mz, St. Alt. St ser development in broad Halos assoc w/ Py.
851.6	860.6	9.0		.10				98	2.62							.10		-	2%	-	-	-	-	-	Tr	Tr	-	-	Tr Sp	Wk	-	3%	Wk Mod	Sp					Mz, wk-Mod Alt. Sulfs well dissem. Generally as above
860.6	870.0	9.4		.09				96	2.64							.09		-	1-2%	-	-	-	-	-	Tr	Tr	-	-	Tr	Wk	1%	3%	Mod	Sp					Mz, Mod Alt. Occasional 25° py-py valets. Gyp on fracts
870.0	879.3	9.3		.12				96	2.62							.12		-	2%	-	-	—	-	Sp	Tr Sp	Sp	-	-	Sp	St-Mod	4%	8%	Mod St	Sp					Mz, St Alt. Rk has been sheared and now healed. sulfs not assoc w/ qtz vns
879.3	884.8	5.5		.11				89	2.68							.11		-	2%	-	-	-	-	Tr	Sp	Sp	-	-	Wk	St Mod	-	4%	Mod St	Sp					Mz, St Alt. Numerous ser-sulf seams. Increase in calcite down
884.8	893.7	8.9		.16				99	2.64							.16		-	2%	-	-	-	-	Tr	?	Tr	-	-	Wk	Mod St	-	3%	Mod	Tr Sp					Mz, St Alt of felds to pyrophyllite and Biot to Chlor - Hydromica. Sulfs mainly dissem
893.7	902.6	8.9		.10				98	2.62							.10		-	4%	-	-	-	-	-	1% ?	Tr	-	-	St	St	3%	6%	Mod	Tr Sp		Qtz - Sulf Vns	80°	Mz, St Alt As Above w/ St ser also developed. 1/2" qtz-py vns present. w. well dissem sulfs in ser
902.6	908.8	6.2		.10				97	2.73							.10		-	2%	-	-	-	-	-	?	Sp Wk	Tr	-	-	St	St	12%	15%	Mod	Tr				Mz, St Alt. Thicker qtz-py vns bleed by St. ser w/ well dissem Bqc-Py.
E.O.H.																																						

Page 2 of 2 Pages

PRELIMINARY GEOLOGIC LOG
(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. F 153
Page 1 of 2 Pages
Collar Elev 2897.26 Final Depth 507.5
Coords. N 30,528.85 E 23,849.04
Inclination 30°; N30°E
Logged by RE
Date: Start 4-22-68 Finish 5-8-68

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu N S	% Cu Avg	% Core Recov	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Unknown N.S.	Cc.	Cpy.	Covellite Born
0	8.0	8.0							2.6?								
8.0	18.7	10.7		.18				35?	2.60					0.18			
18.7	28.9	10.2		.15				88	2.64					0.15			
28.9	40.1	11.2		.07				84	2.64					0.07			
40.1	48.2	8.1		.05				23	2.49?					0.05			
48.2	56.2	8.0		.03				96	2.61					0.03			
56.2	65.4	9.2		.03				88	2.62					0.03		Tr	
65.4	73.6	8.2		.05				95	2.61					0.04		.01	
73.6	82.9	9.3		.04				88	2.60				.01	0.03			
82.9	93.7	10.8		.09				75	2.63				.02	0.07			
93.7	102.8	9.1		.16				96	2.62					0.05	.02	.03	.06
102.8	111.3	8.5		.12				98	2.55				.03	0.07		.01	.01
111.3	120.2	8.9		.10				91	2.62				.03	0.07			
120.2	129.5	9.3		.04				87	2.61					0.04			
129.5	138.9	9.4		.12				93	2.50					0.12			
138.9	147.2	8.3		.31				83	2.65				.11	0.20			
147.2	159.1	11.9		.22				84	2.75		.10		.07			.05	
159.1	170.3	11.2		.16				62	2.78		.08		.07			.01	
170.3	175.5	5.2		.04				84	2.65				.04				
175.5	185.4	9.9		.05				70	2.60				.05				
185.4	194.5	9.1		.03				88	2.61					.02		.01	
194.5	203.4	8.9		.09				96	2.65				.06			.03	
203.4	213.2	9.8		.08				86	2.59				.04			.04	
213.2	221.0	7.8		.05				96	2.67				.01			.04	
221.0	230.3	9.3		.10				95	2.67				.01			.17	.02
230.3	240.2	9.9		.46		.02		92	2.65					.02		.44	
240.2	247.8	7.6		.24				93	2.47					.01		.23	
247.8	259.9	12.1		.08				95	2.44					.08			
259.9	273.7	13.8		.20				99	2.61					.20			
273.7	282.9	9.2		.40		.03		98	2.53					.03		.37	
282.9	292.5	9.6		1.08		.03		86	2.82					.03		1.05	
292.5	302.1	9.6		.34				95	3.08					.02		.32	
302.1	315.9	13.8		.18				99	2.76							.18	
315.9	325.4	9.5		.11				99	2.80							.11	
325.4	335.1	9.7		.03				95	2.70							.03	
335.1	344.7	9.6		.09				98	2.81							.09	
344.7	355.0	10.3		.03				98	2.63							.03	
355.0	363.3	8.3		.04				98	2.71							.04	
363.3	372.8	9.5		.02				96	2.74							.02	
372.8	382.2	9.4		.06				98	2.71							.06	
382.2	391.4	9.2		.01				94	2.89							.01	
391.4	401.8	10.4		.10				94	3.01							.10	
401.8	411.3	9.5		.54		Nil		91	2.98							.54	
411.3	423.9	12.6		.12				93	3.29							.12	
423.9	433.4	9.5		.14				91	3.01							.14	
433.4	442.7	9.3		.01				100	2.81							.01	

Depth From	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	Biotite
0																	
8.0	md	-	-	Tr	-							wk	wk	1	7	SP	7
18.7	md ST	-	-	-	-							wk md	wk	-	7?	SP	10
28.9	ST	-	-	-	-							wk	wk	Tr	7	SP md	3
40.1	md ST	-	-	-	-							Tr	Tr	-	10	SP md	3
48.2	ST	-	-	wk	-							wk	wk md	3	15?	SP	-
56.2	ST	½	-	-	-							wk	md	2	15	SP	3
65.4	ST	½	-	Tr	-							wk	md	1	15	SP	3
73.6	ST	1	-	-	-							wk	wk	1	15	SP	3-5
82.9	ST	1	-	-	-							wk	wk	1	15	SP	3-5
93.7	ST	½	-	Tr	-						?	wk	wk	1	5-10	10	1
102.8	ST	Tr	-	-	-						-	wk	wk	Tr	5-10	10	3
111.3	ST	Tr	-	-	-							wk	wk	Tr	10	5	3-5
120.2	md ST	½	-	md	-							wk md	wk	3	20	SP	3
129.5	ST	½	-	md	-							wk	wk	2	70	md	SP
138.9	ST	½	-	-	-							Tr	wk	-	<10	25	-
147.2	wk	Tr	-	-	-	-	-	-	60	5	20	-	md	-	-	5	-
159.1	wk	Tr	-	-	-	-	-	-	60	3	25	-	-	-	-	SP	-
170.3	wk	-	-	-	-	-	-	-	Tr	5	85	-	-	-	10	-	-
175.5	ST	-	Tr	-	-	-	-	-	-	5	80	-	-	-	10	-	-
185.4	md	Tr	Tr	-	-	-	-	-	-	5	50	-	Tr	-	20	-	-
194.5	md ST	0.2%	-	-	-	-	-	Tr	Tr	5	60	-	-	2	20	-	-
203.4	ST	0.5%?	-	Tr	-	-	-	+	1%	5	10	-	-	Tr	10	-	-
213.2	ST	0.5%	-	-	-	-	-	-	2	5	80	-	-	-	5	-	-
221.0	wk	0.5%	Tr	-	-	-	-	-	1	5	75	-	-	-	15	-	-
230.3	-	8	2	-	-	-	-	-	5	10	65	-	-	-	10	-	-
240.2	-	2	2	2(?)	-	-	-	-	10	1	80	-	-	-	Tr	-	-
247.8	-	0.5%	-	-	-	-	-	-	2	-	-	-	md	-	Tr	ST	Tr
259.9	-	1%	-	-	Ag	Pb	Zn	Mo	2	-	-	-	md	-	Tr	ST	Tr
273.7	-	8	2	-	.05	.25	.95	.002	40	Tr	35	-	-	-	-	5	-
282.9	-	10	2	-	-				50	10	10	-	-	-	-	Tr	-
292.5	-	11	Tr	-	-	-	-	-	70	10	10	-	-	-	-	Tr	-
302.1	-	Tr	-	-	-				90	2	5	-	-	-	-	-	-
315.9	Tr	Tr	-	-	-	-	-	-	90	Tr	5	-	-	-	-	-	-
325.4	Tr	Tr	-	-	-	-	-	-	95	-	3	-	-	-	-	-	-
335.1	Tr	-	-	-	-	-	-	-	95	Tr	3	-	-	-	-	-	-
344.7	-	-	-	-	-	-	-	-	70	15	12	-	-	-	-	-	-
355.0	-	-	Tr	-	-	-	-	-	85	5	8	-	-	-	-	-	-
363.3	-	-	-	-	-	-	-	-	85	3	8	-	-	-	-	-	-
372.8	-	-	-	-	-	-	-	-	80	10	8	-	-	-	-	-	-
382.2	-	Tr?	Tr	-	-	-	-	-	75	10	8	-	-	-	-	-	-
391.4	-	-	-	-	-	-	-	-	30	30	30	-	-	-	-	-	-
401.8	-	-	-	-	-	-	-	+	10	30	20	-	-	-	-	-	-
411.3	-	-	-	-	-	-	-	-	20	30	40	-	-	-	-	-	-
423.9	-	-	-	-	-	-	-	-	60	5	5	-	-	-	-	-	-
433.4	-	-	-	-	-	-	-	-	40	20	35	-	-	-	-	-	-

Depth From	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0				Cover
8.0	MZ			wkly altd & silicified MZ with large aggregates of 2nd Biotite (?), MnO on fractures
18.7	MZ / SP or Da	25.4 / 28.9		MZ continues to 25.4 where there is an intrusive contact with a dark porphyritic rk, with abundant 2nd. Bi, which appears to be syeno-diorite porphyry, but may also be Dacite.
28.9	An / SP or Da	32.9		Post-Mineral Andesite followed by dark porphyritic rk which now looks more like dacite porphyry.
40.1	SP or Da			Dark porphyritic RK - As above, wk alt, md silicification
48.2	" " "			Gouge 51.0-52.8', RK is more oxidized, with leached QTZ-sulf veinlets and limonite stained Breccia fragments
56.2	SP or Da			Texture same as syenodiorite porphyry. Partially oxidized pyrite mostly in veins. RK Generally bleached with occasional dark zones of biotite.
65.4	SP or Da			Remnant dis. py. Jarosite on fractures
73.6	SP or Da			dis py and cpy frequently occur in aggregates of biotite, st oxidation along fractures but not of groundmass. Tr of epidote
82.9	SP or Da			Occasional dark green inclusions of aphanitic rk with a few Qtz eyes, may be partially assimilated sediments. Dark green fine grained rk (Hf?) to 95.1. Followed by SP or Da to 98.0.
93.7	SP? / Diorite	98.0		Unusual rock below 98.0 has aphanitic light green groundmass with 25% large laths of plagioclase and 10% patches of chlorite and epidote. Few sulfides.
102.8	MZ or SP	108.5		Concentration of biotite showing flowage along contact at 98.0'. RK from 108.5-111.3 has subhedral texture, medium grained, 2nd Bi, may be MZ, Da or SP.
111.3	? / Da or SP	111.3 / 117.5		From 111.3-117.5 RK is medium grained, with qtz and chlorite - may be sed. xenolith. Appears to be Dacite with ≈ 3% secondary biotite. Alternating bands of
120.2	Da	127.5		silicification with remnant py, cpy, cc, and unsilicified lim stained rk. Jarosite on all fractures.
129.5	QTZite	132.2		white QTZite with some large QTZ grains ends in medium grained dk green, chloritic, premineral rk, Jarosite
138.9	SP(?)	141.2		Dk green rock contains chlorite, epidote, partially oxidized sulfides & mal. Limonite stained fault gouge: 146.8-147.2. Followed by Hf & Mbl.
147.2	Hf & Mble			Varies from diopside Hf to impure marble, copper pitch, mal & some cpy are present.
159.1	"			Very fine grained, soft, yellow to green Hf alternating with wollastonite marble
170.3	Hf			Dense diop. Hf, strongly broken. Lim. & MnO on fractures
175.5	"			Dense Hf, varies from silty to siliceous, generally hard but strongly broken st Lim & MnO in fracts.
185.4	Hf / Da	191.8 / 194.9		Dense Hf to gradational contact with Da. Not broken very wk sulfides
194.5	Hf			siliceous Hf with partially leached py & cpy. Tr of moly. stly broken from ≈201 to ≈211
203.4	Hf			Partial oxidation of sulfides, occasional zone of st sulfides remains
213.2	Hf			mineralized BX from 212.? to 218.7. st Lim. & MnO on fractures
221.0	Hf			mineralized silicified BX cuts dense calc-silicate Hf. most cpy along fractures. Appears to have been highly fractured with subsequent mineralization and silicification along fractures. st py & mag
230.3	Hf			
240.2	Hf / Andesite	247.8		limey Hf. Pink in color from 245.6-247.8 where there is a sharp igneous contact. Massive unjointed RK with single piece of core 9.8' in length
247.8	Andesite porphyry			Very similar to what has been mapped as Post-Min And. on surface but contains finely disseminated py
259.9	"	273.7		As above. Very finely disseminated py & c.c.
273.7	Hf & Mbl			Hf & white marble cut by bands of finely disseminated py, mag., and possibly pyrrhotite
282.9	Tt & Mbl			mble interlaced with tactite and bands of massive sulfides
292.5	Mbl			mostly marble with some garnet, epidote, wk cpy. lacking massive sulfides above.
302.1	Mbl			coarse, white to pink marble with few sulfides
315.9	"			Coarse crystalline mble with thin zones of hornfels and veinlets of cpy
325.4	"			As above, limonite on fractures
335.1	Mbl			As above
344.7	Hf & Tt	348.8 / 348.4		Hf and/or Tt containing about 50% garnet plus other dense silicates, some dis. cpy
355.0	Mbl			Very coarse mbl, xtals ≈ 1/8"; occasional thin irregular zone of silicates and cpy
363.3	"			As above
372.8	"			As above, limonite filling vuggy fractures in marble
382.2	"			mble contains more impurities, some finely disseminated sulfides
391.4	Wollastonite garnet Hf	38?.?		grades from marble to wollastonite marble to garnet hornfels wk dis cpy
401.8	"			Continued interlayering of facies named above.
411.3	"			As above, mixed intervals of wollastonite marble and garnet hornfels
423.9	Dolomitic? / Mbl	423.9		white to pink marble may contain about ⅓ dolomite, ⅔ calcite. some cpy on fractures.
433.4	" / Garnet	439.7		As above to sharp contact with garnet-Diop-wollastonite Hf.

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO- SILVER BELL UNIT

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Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. F-153
Page 2 of 2 Pages
Collar Elev 2897.26 Final Depth 507.5
Coords. N 30,528.85 E 23,849.04
Inclination 30°; N30°E
Logged by RE
Date: Start 4-22-68 Finish 5-8-68

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green		Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE		(3) Rock Type	Structures (4) Depth	True Dip	Remarks
442.7	451.9	9.2		.03			3.05	97								.03		-	-	-	-	-	-	-	-	40	30	30	-	-	-	-	-		Hf & mbl			Alternating irregular bands of marble and Hf with garnet, wollastonite.
451.9	460.8	8.9		.08			2.66	92								.08		-	-	-	-	-	-	-	Tr	60	10	30	-	-	-	-	-		"			(No mineralization although rock has high temperature mineral assemblage) As above, only change is in relative percentage of mbl, garnet
460.8	469.8	8.9		.08			3.02	98								.08		-	-	-	-	-	-	-	-	10	5	10	70	-	-	-	-		wollastonite (Hf?) Hf			Rock is at least 70% wollastonite with some dolomite, is not a hornfels in texture, but neither is it a marble or tactite.
469.8	479.3	9.0		.02			2.81	99								.02		-	-	-	-	-	-	-	-	30	5	60	-	-	-	-	-		mbl			varies from wollastonite-dolomite to fg. dip(?) Hf to marble
479.3	489.3	10.0		.03			2.13	98								.03		-	-	-	-	-	-	-	-	50	5	40	-	-	-	-	-		"			Alternating thin bands of poorly mineralized Hf and marble, less wollastonite than above.
489.3	497.8	8.5		.02			3.01	94								.02		-	-	-	-	-	-	-	-	90	3	7	-	-	-	-	-		mbl			mostly a white marble with less than 10% impurities
497.8	507.4	9.6		.03			2.89	80								.03		-	-	-	-	-	-	-	-	60	10	25	-	-	-	-	-		mbl - Hf - 503			f.g. white marble to about 503 followed by f.g., green Hf
	EOH																																					

A composite sample of the igneous rock contained 10 ppm moly. (8.0' - 197.2')
" " sedimentary " " 20 " " (197.2' - 247.8')

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO- SILVER BELL UNIT

Note (3)
Tt - Tactite
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Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. F-154
Page 1 of 2 Pages
Collar Elev 2880.75 Final Depth 678.8
Coords. N 30,638.04 E 23,372.93
Inclination ~~45°~~ 52° ; N 30° E
Logged by RE
Date: Start 5-14-68 Finish 6-5-68

Depth From	Depth To	Int'vl	Elev.	% Cu Total	Avg.	NS	Avg	% Core Recov	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	misc. N.S.	Cc.	Cpy.	Covellite Born
0	5.0	5.0															
5.0	14.3	9.3		.14										.14			
14.3	20.7	6.4		.08										.08			
20.7	27.5	6.8		.20										.20			
27.5	36.4	8.9		.05										.05			
36.4	45.5	9.1		.06										.06			
45.5	58.3	12.8		.06										.06			
58.3	67.0	8.7		.11										.11			
67.0	75.9	8.9		.25										.05	.17	.03	
75.9	84.8	8.9		.10										.02	.02	.06	
84.8	93.6	8.8		.09											.09		
93.6	103.0	9.4		.10										.05	.05		
103.0	112.4	9.4		.09										.08	.01		
112.4	121.6	9.2		.09										.06	.03		
121.6	132.9	11.3		.07										.05	.02	Tr	
132.9	140.0	7.1		.05										.03	0.2		
140.0	149.4	9.4		.03										.01	.02	Tr	Tr
149.4	158.6	9.2		.09										.02	-	.02	.05
158.6	167.8	9.2		.10										.02	.06	.2	
167.8	178.6	10.8		.28									.05	-	.20	.03	
178.6	187.2	8.6		.35									.06		.25	.04	
187.2	193.6	6.4		*.65		.09								?	?		
193.6	205.1	11.5		.14									.02	-	.06	.02	.04
205.1	214.2	9.1		.13									.01		.07	.03	.02
214.2	223.4	9.2		.12									.01		.07	.03	.01
223.4	232.8	9.4		.07									.02		.05		
232.8	241.6	8.8		.05										.04	.03		
241.6	250.6	9.0		.14										.03	.10	.01	
250.6	260.2	9.6		.12										.03	.08	.01	
260.2	270.3	10.1		.02												.02	
270.3	280.0	9.7		.05												.05	
280.0	289.4	9.4		.23										.03		.20	
289.4	299.4	10.0		.21										.04		.17	
299.4	307.9	8.5		.08												.08	
307.9	316.6	8.7		.30										.01		.29	
316.6	329.1	12.5		.47		.01								.01		.46	
329.1	343.0	13.9		.31										.02		.29	
343.0	359.2	16.2		.19									.05	.05		.09	
359.2	368.6	9.4		.02										.02			
368.6	378.3	9.7		.06										.06			
378.3	390.2			.30								Native		.08		.22	
390.2	400.6			.91	20.9' @ 0.71	.14	20.9' @ 0.11					.14				.77	
400.6	411.1			.51		.08					.08					.43	
411.1	420.4			.05													

Depth From	Depth To	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE		(3) Rock Type	Structures (4) Depth	True Dip
0	5.0																		Cover	5.0	
5.0	14.3	ST	-	-	wk	-							md	md	3	20	Tr		P.M. And / Da	10.2	
14.3	20.7	ST	-	-	md	-							md	md	8	25	3		Da	20.7	
20.7	27.5	ST	-	-	-	-							-	wk	-	-	?		P.M. And	27.5	
27.5	36.4	ST	-	-	md	-							md	ST	8	25	1		Da		
36.4	45.5	ST	-	-	wk	-							wk md	ST	3	20	3				
45.5	58.3	ST	Tr	-	wk	-			Tr				md	ST	3	20	1				
58.3	67.0	ST	sp	-	Tr	-							md	md	3	20	1		Da	67.0	
67.0	75.9	md	1	-	Tr	-			Tr				md	ST	1	15	10		MZ	75.9	
75.9	84.8	ST	<1	-	ST	-							ST	md	10	25	Tr		Da		
84.8	93.6	wk	20	-	-	-			Tr +				v. ST	ST	5	20	-		Da		
93.6	103.0	ST	5	-	md	-			Tr				ST	md	3	25	-		Da		
103.0	112.4	ST	3	-	md	-			Tr				ST	md	1	25			Da		
112.4	121.6	ST	2	-	md				-				ST	md	1	25			Da		
121.6	132.9	md	3	-	-								ST	md	2	20			Da / P.M. And	128.0 / 135.0	
132.9	140.0	ST	3	-	md								ST	wk	4	25			Da		
140.0	149.4	md ST	<1	-	Tr	-							ST	wk	10	35	-		Da		
149.4	158.6	md	1	-	-	-							ST	wk	5	30	-		Da		
158.6	167.8	md	1-2	-	Tr								ST	wk	3	30	-		Da	Py Veins	
167.8	178.6	md ST	1-2	-	Tr	-			Tr				md ST	wk	3	25	Tr		Da		
178.6	187.2	ST	1-2	-	-	-							ST	md	3	25	Tr		Da	Joints & shears; 187.2	
187.2	193.6	ST	-	-	-	-							-	wk	-	-	?		P.M. And	193.6	
193.6	205.1	ST	1-2	-	-								ST	md	3	25	Tr		Da		
205.1	214.2	md	2	-	-								ST	md	1	25	-		Da	Py Veins	
214.2	223.4	md	1	-	-	-							ST	md	-	25	-		Da		
223.4	232.8	md	<1										md	md	-	25	-		Da		
232.8	241.6	md	2										ST	md	2	25	-		Da	Py veins	
241.6	250.6	md	2										md	ST	-	5	10		MZ? / Da	242.8 / 249.0	
250.6	260.2	ST	2										md ST	md	-	20	5		Da / Hf	259.6	
260.2	270.3	wk	<1	-	-	-				Tr	5	50	-	md	-	5	5		Hf		
270.3	280.0	-	<1	-	-	-			Tr	-	5	60	-	5	-	5?	3		Hf	279.5	
280.0	289.4	-	<1	-	-	-			-	-	3	40	-	20	-	-	5		Bx		
289.4	299.4	wk	1	-	-	-				-	3	50	-	10	-	-	5		Bx		
299.4	307.9	wk	<1	-	Tr	-	-	-	-	-	1	40	-	-	-	30	5		Hf	303.5	
307.9	316.6	-	<1	-	-	-	-	-	Tr	-	5	75	-	10	-	10	3	scp	Hf	322.2	
316.6	329.1	-	<1	-	5	-	-	-	Tr		5	50	-	10	-	3	-	20	Bx		
329.1	343.0	-	<1	-	5	-	-	-	-	-	-	30	-	10	-	-	10	40	Bx		
343.0	359.2	md	Tr	-	md	-	-	-	-	-	-	20	-	30	-	-	10	30?	Bx / P.M. and	359.2	
359.2	368.6	md	-	-	-	-	-	-	-	-	-	-	-	30	-	-	20	-	Bx		
368.6	378.3	md	-	-	-	-	-	-	-	-	-	-	-	35	-	-	15	-	" / Hf	378.3	
378.3	390.2	md	Tr	-	Tr	-	-	-	-	-	-	40	-	20	-	-	15	5	Bx		
390.2	400.6	md	Tr	-	Tr	-	-	-	-	-	-	40	-	20	-	-	15	2	Hf & Bx		
400.6	411.1	md	Tr	-	Tr	-	-	-	-	3	-	30	-	30	-	-	15	5	Bx	408.6	
411.1	420.4	wk	Tr	-	-	-	-	-		5	20	30	-	15	-	-	10	5	Hf		

Depth From	Depth To	Remarks
0	5.0	
5.0	14.3	Da has numerous leached sulfide veinlets of probable high initial Py:cc ratio.
14.3	20.7	3% biotite altd to chlorite. sharp Da - And contact
20.7	27.5	Olive green, aphanitic, post-mineral andesite dike
27.5	36.4	Da as above, limonite is mostly yellow-brown exotic var.
36.4	45.5	st clay alt of fspars; mdly broken; some non-sulfides on fracts
45.5	58.3	Post-min and: 46.4-46.7, Remnant py & moly in Da.
58.3	67.0	Remnant py in some veins, also dis. No "live" limonite
67.0	75.9	Partially Leached MZ contains dis py, cpy, cc, moly. gradational Contacts; sulfides in Da.
75.9	84.8	Leached mineralized Breccias, up To 3" Thick, to 80.0; followed by dis
84.8	93.6	massive py and v. st. sericite, also md moly content
93.6	103.0	ST oxidation 93.6-100.0, py and st Sericite 100.0-104.5
103.0	112.4	alternating zones of sulfides and oxidation
112.4	121.6	As above
121.6	132.9	Py undergoing oxidation in fractures, aphanitic, grey postmin and.
132.9	140.0	As above. ST py & ser but little cpy & cc
140.0	149.4	ST alt (Sericite & silicification) st lim on most of wide spaced joints, remnant py, cpy, cov & cc.
149.4	158.6	ST alt, increasing sulfide content although st lim persists in fractures.
158.6	167.8	ST ser & silicification, sp "live" limonite. py, cpy, cc, cov present.
167.8	178.6	Continued mixed sulfides and oxides. Sulfides in all stages of oxidation
178.6	187.2	As above. Ser in bands along sulfide veinlets
187.2	193.6	Dark grey aphanitic post-mineral andesite.
193.6	205.1	Da as above with sulfides in all stages of oxidation. Lim is mostly Jarosite with occasional "live limonite".
205.1	214.2	As above
214.2	223.4	some cc on dis. py. Complete oxidation along joints
223.4	232.8	decrease in py veinlets and associated sericite.
232.8	241.6	py and ser again increase, Jarosite on fractures
241.6	250.6	MZ? broken & gougey, biotite altd to chlorite, sharp contacts.
250.6	260.2	Da with xenoliths of Hf. Run ends in chloritic Hf.
260.2	270.3	Brecciated and gougey to 265.2,' Then broken, dense, silicate Hf.
270.3	280.0	wkly mineralized. stly broken; diop & other calc-silicates with serp, talc, and clay
280.0	289.4	Brecciated, gougey. Unbroken rock is very soft. ST Talc and/or serp.
289.4	299.4	Brecciated but more compact and cohesive than above.
299.4	307.9	mineralized Bx with matrix of chlorite & serp. followed by silicified Hf
307.9	316.6	f.g. light green, siliceous Hf with disseminated cpy, moly
316.6	329.1	stly. sheared, broken, gougey. Abundant serp., dis cpy, moly
329.1	343.0	fewer visible sulfides more chlorite and serpentine.
343.0	359.2	Strong breccia zone, fragments average about ½". Lim & hem staining
359.2	368.6	Brecciated and gougey post-mineral (?) andesite porphyry.
368.6	378.3	As above, 50% breccia & 50% sections of solid core.
378.3	390.2	Hf brecciated to 398.0 followed by dense, f.g. light-dk green Hf
390.2	400.6	Alternating bx with sections of soft, dk green Hf
400.6	411.1	st. Bx to 408.6 followed by soft green, vuggy, Hf.
411.1	420.4	silty to garnetiferous Hf serp along shears.

*This interval re-assayed, gave 0.66/0.11. But metallurgists report no sulfides!

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO- SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. F-154
Page 2 of 2 Pages
Collar Elev 2880.75 Final Depth 678.8
Coords. N 30,638.04 E 23,372.93
Inclination 52°, N30°E
Logged by RE
Date: Start 5-14-68 Finish 6-5-68

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Unknown	NS	Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	Serpentine	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
420.4	428.3	7.9		.11													.11		md	Tr	-	-	-	-	-	10	25	35	-	5	-	-	5	20	Hf			Vuggy, mdly leached Hf with varying proportion of garnet & silicates.
428.3	436.7	8.4		.46		.01								.01			.45		-	1	-	-	-	-	-	20	5	60	-	-	-	-	5	3	Hf			limy diop(?) Hf with ½" cpy vein plus dis. py & cpy
436.7	445.6	8.9		.53		.01								.01			.52		Tr	<1	-	-	-	-	-	20	5	30	-	5	-	-	10	20	Hf / Bx	440.0		well mineralized Hf to ≈440 followed by Bx to 449.4
445.6	455.1	9.5		.33													.33		-	2	-	-	-	-	-	30	5	30	-	5	-	-	5	5:10	Hf	449.4		spaces between mineral grains limy Hf (impure mbl) with sulfide veinlets and f.g. sulfides filling
455.1	467.9	12.8		.20													.20		-	1	-	-	-	-	-	Tr	10	5	50	-	10	-	-	5	10	Hf			soft silty to limy Hf, stly brecc. to brecciated in places. dis. cpy, st. molyb. on fracts.
467.9	476.7	8.8		.44	86.4 @ 0.48	Nil	86.4 @ 0.01							Nil			.44		-	1	-	-	-	-	-	Tr	10	1	40	-	10	-	-	3	5	Hf			soft tan-light green Hf. cpy dis and in veins
476.7	485.6	8.9		.42		Nil								Nil			.42		-	1	-	-	-	-	-	-	10	-	30	-	10	-	-	10	8	Hf			soft light green silty-chloritic Hf. dis. and veined cpy, stly brecc.
485.6	493.2	7.6		.23													.23		-	2	Tr	-	-	-	-	-	15	-	50	-	10	-	-	10	10	Hf			slightly harder, darker Hf with fine dis sulfides and calcite veinlets
493.2	504.1	10.9		.73		.01								.01			.72		-	1-2	-	-	-	-	-	-	20	Tr	30	-	10	-	-	10	10	Hf			limy-silty Hf., dis cpy, numerous calcite veinlets.
504.1	512.9	8.8		.71		.01								.01			.70		wk Tr	1-2	-	-	-	-	-	-	25	5	35	-	5	1	1	15	5	Hf			Fault gouge: 510.4-511.8. more chlorite & silicates. dis. cpy
512.9	522.5	9.6		.42		.01								.01			.41		wk	1	-	-	-	-	-	-	30	-	20	-	5	-	-	15	5	limy Hf / silty mbl			" : 511.2-512.6. Grading into a silty mbl, lim on fract.
522.5	531.4	8.9		.16													.16		-	<1	-	-	-	-	-	-	40	-	10	-	5	-	-	20	2	Limy Hf			mixture of calcite, chlorite, silt and other impurities. Fine, dis cpy
531.4	540.4	9.0		.37													.37		Tr	<1	-	-	-	-	-	-	35	-	15	-	5	-	-	30	5	"			As above. light green, mag., soft limy Hf in a black matrix
540.4	550.8	10.4		.10													.10		-	<1	-	-	-	-	-	-	25	-	20	-	10	-	-	20	5	"			grading into a black limy rock with elongated, parallel calcite crystals
550.8	559.9	9.1		.24													.24		-	<1	-	-	-	-	-	-	35	-	30	-	5	-	-	5	5	"			salt & pepper texture of white calcite in black matrix. grades back into soft light green Hf.
559.9	568.1	8.2		.13													.13		-	1	-	-	-	-	-	-	35	-	30	-	5	-	-	5	15	"			As above, granular rock with grains of calcite, serp., silicates. Fine dis cpy
568.1	577.3	9.2		.12													.12		-	1	-	-	-	-	-	-	30	-	25	-	10	-	-	5	20	"			As above. short intervals of soft, silty Hf
577.3	586.9	9.6		.09													.09		-	<1	Tr	-	-	-	-	-	35	-	25	-	5	-	-	5	20	"			Very little visible cpy (px:cpx ≈ 3:1)
586.9	596.4	9.5		.38													.38		-	1	2	-	-	-	-	-	35	-	25	-	10	-	-	5	20	"			Strong, v. f.g. cpx with mag: 592.7-596.4; white silty Hf: 587.1-591.0
596.4	605.1	8.7		.09													.09		-	<1	Tr	-	-	-	-	-	20	-	50	-	5	-	-	2	5	Silicate Hf			Less limy, tan, f.g., Hf. (H ≈ 5) wk cpy
605.1	613.7	8.6		.12													.12		-	<1	Tr	-	-	-	-	-	20	-	50	-	5	-	-	2	10	"			Light yellow-tan-green, f.g. Hf. still strongly acid reactive
613.7	623.2	9.5		.13													.13		-	<1	2	-	-	-	-	-	20	-	50	-	2	-	-	2	10	"			As above, too fine grained to identify silicate minerals
623.2	632.4	9.2		.09													.09		-	1	2	1	2	-	-	-	20	-	50	-	2	-	-	2	10	"			magnetite assoc. with py. very little visible cpy
632.4	642.3	9.9		.08													.08		-	2	3	-	-	-	-	-	15	-	60	-	2	-	-	2	10	"			green-brown Hf. (H ≈ 4.5) dis. magnetite, few sulfide veinlets
642.3	651.5	9.2		.07													.07		-	1	1	-	-	-	-	-	20	-	50	-	2	-	5	2	10	"			As above. mag assoc. with py. very little visible cpy
651.5	660.5	9.0		.03													.03		-	<1	1	-	-	-	-	-	20	-	60	-	-	-	5	2	8	"			As above
660.5	670.0	9.5		.04													.04		-	1	1	-	-	-	-	-	20	-	60	-	-	-	5	2	8	"			As above
670.0	678.8	8.8		.02													.02		-	1	1	-	-	-	-	-	20	-	60	-	-	-	2	5	2	Diop. Hf			Fat clay: 675.2-675.8, md. green, f.g., Hf., numerous calcite veinlets
	EOH																																						

Acid etching test results

Depth	Angle
5'	52°
175'	52°
286'	52°
386'	52°
486'	51½°
578'	55°
660'	57°

PRELIMINARY GEOLOGIC LOG
(Subject to Revised Logging)
ASARCO- SILVER BELL UNIT

Note (3): Tt - Tactite; Hf - Hornfels; Mb - Marble; Qt - Quartzite; Bx - Breccia; Da - Dacite; Mz - Monzonite; An - Andesite

Note (4): V - Vein; F - Fault; D - Dike; C - Contact; Ig - Undif igneous

Collar Elev 3039.07 Final Depth 573.5
Coords. N 30,830.19 E 23,860.61
Inclination vertical
Logged by RE
Date: Start 5-16-68 Finish 5-27-68

From	To	Int'vl	Elev.	% Cu Total	Avg.	NS	Avg	% Core Recov	Sp. Gr.	Chrys.	Pitch	Native Copper	Blue Green	misc N.S.	Cc.	Cpy.	Born
0	5.0	5.0															
5.0	14.0	9.0		.36										.34		.02	
14.0	25.3	11.3		1.58		1.38					.50		.20	.68?		.10?	
25.3	35.8	10.5		.25							.20		.05				
35.8	42.0	6.2		.07										.07			
42.0	50.0	8.0		.21							.16		.02			.03	
50.0	62.6	12.6		.05										.05			
62.6	78.0	15.4		.02										.02			
78.0	87.3	9.3		.07										.07			
87.3	96.2	8.9		.05										.01			
96.2	105.5	9.3		.07										.07			
105.5	114.1	8.6		.10										.10		(Tr?)	
114.1	123.4	9.3		.04										.04			
123.4	132.6	9.2		.03										.03			
132.6	141.7	9.1		.02										.02			
141.7	155.3	13.6		.10										.10			
155.3	165.0	9.7		.42		.01								.01		.41	
165.0	174.1	9.1		.85		.07					.05		.02			.78	
174.1	186.0	11.9		.66		.02	0.03							.02		.64	
186.0	196.3	10.3		.42	59.9 @	.03								.03		.39	
196.3	206.0	9.7		.65	0.63 / 0.03	.01								.01		.64	
206.0	215.2	9.2		.81		.04								.04		.77	
215.2	224.0	8.8		.20												.20	
224.0	233.1	9.1		.35												.35	
233.1	246.1	13.0		.24										.01		.23	
246.1	253.9	7.8		* 1.28 / 1.32	1.30	.04	0.14					.30		.04		1.26?	
253.9	261.7	7.8		1.12 / 1.10	1.11	.24						.10	.24			.77	
261.7	271.1	9.4		.40 / .45	.42	.25							.25			.17	
271.1	280.6	9.5		.76 / .74	.75	.50					.25		.25			.25	
280.6	289.8	9.2		.37	51.0 @	.28	51.0 @				.14		.14			.09	
289.8	299.3	9.5		.49	0.32	.33	0.33				.15		.18			.16	
299.3	308.8	9.5		.51		.26					.10		.16			.25	
308.8	318.7	9.9		.56		.37					.25		.12			.19	
318.7	327.6	8.9		.31		.26					.14		.12			.05	
327.6	338.1	10.5		.30							.10		.10			.10	
338.1	347.2	9.1		.31							.11		.10			.10	
347.2	356.5	9.3		.26									.16			.10?	
356.5	365.6	9.1		.16									.06			.10	
365.6	375.7	10.1		.25									.05			.20	
375.7	385.4	9.7		.11												.11	
385.4	395.0	9.6		.10												.10	
395.0	402.5	7.5		.08												.08	
402.5	411.4	8.9		.27												.27	
411.4	421.0	9.6		.17												.17	

From	To	Lim.	Py.	Mag.	Hem.	Spec.	Galena	Sphal.	Molyb.	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	Quartz	Chlorite	Serpentine
0	5.0																	
5.0	14.0	wk	Tr	Tr	ST	-	-	-	-	10	5	30	Tr	md	5	15	wk	
14.0	25.3	wk	-	-	ST	-	-	-	-	10	-	30?	-	ST	3	3	wk	
25.3	35.8	ST	-	-	Tr	-	-	-	-	3	-	-	wk	ST	2	20	-	
35.8	42.0	ST	Tr		Tr	-	-	-	-	1	-	-	wk	ST	2	20	-	
42.0	50.0	ST	-	-	Tr	-	-	-	-	15	5	40	-	md	2	2	md	
50.0	62.6	ST	-	-	Tr	-	-	-	-	1	-	-	wk	md	2	20	-	
62.6	78.0	ST	-	-	Tr		-	-	-	1	-	-	-	md	-	-	md	
78.0	87.3	md ST	-	-	-	-	-	-	-	Tr	-	-	-	md	-	?	md	
87.3	96.2	md	Tr	-	-	-	-	-	-	Tr	-	-	-	md	-	-	md	
96.2	105.5	md ST	-	-	-	-	-	-	-	Tr	-	-	-	md	-	-	md	
105.5	114.1	md ST	Tr	-	-	-	-	-	-	Tr	-	-	-	md	-	-	md	
114.1	123.4	md ST	Tr	-	-	-	-	-	-	1	-	-	-	md	-	-	md	
123.4	132.6	md ST	Tr	-	-	-	-	-	-	1	-	-	-	md	-	-	md	
132.6	141.7	md ST	Tr	-	-	-	-	-	-	2	-	-	-	md	-	-	md	
141.7	155.3	md	Tr	-	-	-	-	-	-	5	-	-	-	wk	-	-	md	
155.3	165.0	wk	1	-	Tr	-	-	-	-	20	10	40	-	20	-	-	5	
165.0	174.1	md	1	-	-	-	-	-	Tr	15	70	10	-	-	-	-	-	
174.1	186.0	Tr	<1	-	-	-	-	-	Tr	30	Tr	5	-	md	-	-	10	25%
186.0	196.3	-	<1	-	-	-	-	-	-	10	-	10	-	md	-	-	10	25
196.3	206.0	-	1	2	-	-	-	?	?	0	-	20	-	-	-	-	md	10
206.0	215.2	-	1	1-2	-	-	-			50	-	25	-	-	-	-	5	15
215.2	224.0	-	1	1	-	-	-			65	-	10	-	-	-	-	5	10
224.0	233.1	-	5?	5	-	-	-			50	-	5	-	-	-	-	5	20
233.1	246.1	Tr	1	3	-	-	-			65	-	5	-	-	-	-	5	15
246.1	253.9	ST	1	Tr	3	-	-	-	-	50	10	20	-	-	-	-	-	Tr
253.9	261.7	ST	<1	Tr	10					50	10	20	-	-	-	-	-	-
261.7	271.1	ST	<1	Tr	10					60	10	5	-	-	-	-	-	-
271.1	280.6	ST	Tr	Tr	10					60	5	5	-	-	-	-	-	-
280.6	289.8	ST	-	-	20		Tr			45	15	5	-	-	-	1	-	-
289.8	299.3	ST	-	-	5					60	5	5?	-	-	-	3	-	-
299.3	308.8	ST	-	-	15					60	5	5	-	-	-	-	-	-
308.8	318.7	ST	<1	-	5		Tr			60	-	10	-	-	-	-	-	-
318.7	327.6	md	-	-	-		-	-		70	?	10	-	-	-	-	-	-
327.6	338.1	ST	-	-	3		-	-		75	-	10	-	-	-	-	-	-
338.1	347.2	ST	-	-	2	-	-	-		70	-	5	-	-	-	10	-	-
347.2	356.5	ST	-	-	2	-	-	-		75	-	10	-	-	-	5	-	-
356.5	365.6	md	<1	-	Tr	-	-	-		50	-	10	wk	md	-	1	-	1
365.6	375.7	wk	Tr	-	2	-	-	-		75	5	-	-	20	-	-	-	Tr
375.7	385.4	Tr	-	-	-	-	-	-		80	-	-	-	10	-	Tr	-	Tr
385.4	395.0	-	-	-	-	-	-	-	Tr	80	-	-	-	10	-	Tr	-	Tr
395.0	402.5	-	-	-	-	-	-	-	Tr	80	8	-	-	-	-	Tr	-	Tr
402.5	411.4	-	<1	-	-	-	-	-	-	80	8	3	-	-	-	-	-	5
411.4	421.0	-	<1	-	-	-	-	-	-	85	5	Tr	-	-	-	-	-	3

From	To	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0	5.0				Rockbit
5.0	14.0	Hf & Da	calcite & qtz veins	0-70°	Hf cut by thin Da dikes; tr of py & cpy, weakly magnetic, ST manganese on fractures
14.0	25.3	Hf	Fault 25.3	≈65°	Fault gouge 18.0-19.0. Hf altd to red clay, Tr of malachite
25.3	35.8	Da			Da with MnO & CuOx on fractures, gradational contact
35.8	42.0	Da	42.0		Tr of remnant sulfides, grains of hematite (altd from mag.?)
42.0	50.0	Hf	50.0		Hf varies from limy to silty to denser silicates; copper pitch & malachite
50.0	62.6	Da	62.6		Da as above, Tr of copper pitch, st MnO on fractures
62.6	78.0	Post min And.			Post-mineral andesite porphyry. (This dike contains dis py below base of oxidation.)
78.0	87.3				As above, 15% feldspar phenocrysts altd to white clays in a dark groundmass with biotite & chlorite.
87.3	96.2				As above, Tr of finely disseminated py.
96.2	105.5				As above.
105.5	114.1				Groundmass becoming more aphanitic. 5% altd fspar phenocrysts. Barely visible sulfides may include Tr of cpy.
114.1	123.4				As above.
123.4	132.6				As above.
132.6	141.7				As above
141.7	155.3	Post Min? And.	155.3		Contains xenolith of Hf; few joints in and; sharp, irregular contact
155.3	165.0	Hf	165.0		Limy Hf. Alternately composed of silt or clay and calc-silicates. Finely disseminated sulfides with weak oxidation along fractures.
165.0	174.1	Tt	174.1		Porous, limy Tactite with scattered disseminations of cpy.
174.1	186.0	Hf / Mbl	178.0		Limy, silty Hf to 178.0 followed by a marble with 40% serpentine.
186.0	196.3	Hf & Mbl			Alternating irregular beds of siltstone, serpentine and mble, cpy associated with serpentine and darker minerals in fine grained dk green to black bands.
196.3	206.0	Mbl			White mbl cut by cpy-magnetite veins surrounded by serpentine and other dark minerals
206.0	215.2	"	cpy (?) vein	80°	As above. Cpy accompanied by mag. & dark silicates in mble
215.2	224.0	"			Less visible mineralization than above, also fewer dark alt. minerals
224.0	233.1	"			Massive fine grained sulfides & magnetite: 225.0-227.9.
233.1	246.1	Mbl	246.1		As above to sharp contact with vuggy, leached, hem. stained Mbl.
246.1	253.9	Native Cu; Leached Mbl			This rock differs from above in that it is vuggy with calcite crystals filling cavities and Native Copper laying between calcite crystals. The mag. has been mostly altd to hem. addition of some garnet.
253.9	261.7	"			Cpy has been partially oxidized to copper pitch & malachite. Some cavities lined by quartz crystals.
261.7	271.1	"			Continues very porous & vuggy, ST oxidation, veins of barite.
271.1	280.6	" Limy			As above. Very vuggy. Vugs represent about 10% of volume. Iron in various stages of oxidation simulates garnet. The garnet content may be small.
280.6	289.8	TT			Vuggy and leached with cpy, copper pitch and malachite present
289.8	299.3	Leached Mbl			Fine grained mbl and dolomite. Vuggy and leached. Mal.
299.3	308.8	"			Impure mbl. beds of silt and hematite. Vuggy and leached
308.8	318.7	"	veins	50°-70°	Highly veined, but strongly leached, Galena, Fluorite & wulfenite present in addition to abundant copper pitch and some ?cpt
318.7	327.6	"			Fluorite in open veins. Less vuggy and leached than above.
327.6	338.1	"			Leached veins up to 2" thick. Primary Cu was probably about 1.50%
338.1	347.2	Qtzite	345.3 / 345.5		Less veining; Thin band of Qtzite; copper pitch & mal.
347.2	356.5	Mbl	356.5		As above, white crystalline mbl with open, leached veins, occasional Hf.
356.5	365.6	SP / Mbl	360.5		Syenodiorite followed by sharp decrease in oxidation. Some CC in SP
365.6	375.7	Native Cu; Clay	367.2 / 369.4		Very coarse mbl except for interval of white, compact, unreactive clay.
375.7	385.4	impure Mbl			Very coarse, white mbl with thin irregular cpy veinlets, short intervals of compact white clay.
385.4	395.0	impure Mbl			Coarse mbl and white clay as above, some cpy veinlets
395.0	402.5	Mbl			As above, coarse mbl; garnet with some cpy in steep irregular veins
402.5	411.4	Mbl			Numerous veinlets of sulfides & sulp.; dis sulfides in small patches of garnet
411.4	421.0	Mbl			As above, mbl is very coarse grained

* This interval was split and assayed twice for accuracy due to native copper.

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO- SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. F-155
Page 2 of 2 Pages
Collar Elev 3039.07 Final Depth 573.5
Coords. N 30,830.19 E 23,860.61
Inclination vertical
Logged by RE
Date: Start 5-14-68 Finish 5-28-68

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green		Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz.	QUARTZ	CHLORITE	Serp.	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
421.0	430.3	9.3		.19												.19		-	<1	-	-	-	-	-	-	85	5	3	-	-	-	-	3	mbl			white, coarse mbl cut by sulfide veinlets, some with garnet others with serp.
430.3	439.7	9.4		.12												.12		-	<1	-	-	-	-	Tr	Tr	80	10	5	-	-	-	-	2	mbl			impurities and mineralization increase towards bottom of interval
439.7	449.0	9.3		.12												.12		-	<1	-	-	-	-	-	Tr	80	5	-	-	10	-	-	1	mbl			Generally as above, contains white clay similar to that above
449.0	458.6	9.6		.22												.22		-	<1	-	-	-	-	-	-	60	5	-	-	5	-	20	-	-	455.0 456.7	80°	As above except for white, f.g. QTzite.
458.6	468.0	9.4		.15												.15		-	<1	-	5	-	-	-	Tr	70	10	-	-	1	-	-	-	5	mbl	Sulfide veins	60°	veins include garnet & hematite plus wk sulfides
468.0	477.7	9.7		.10												.10		Tr	<1	-	-	-	-	-	-	85	5	-	-	-	-	-	3	mbl			Coarse mbl cut by thin sulfide veinlets
477.7	486.8	9.1		.04												.04		-	<1	-	-	-	-	-	-	80	-	-	-	5	-	-	1				As above. some white clay. calcite becomes darker near sulfides
486.8	496.4	9.6		.06												.06		-	<1	-	-	-	-	-	-	15	5	5	-	-	-	3	3				As above, more impurities - silt, chlorite
496.4	505.8	9.4		.20												.20		-	<1	-	-	-	-	-	Tr	75	3	10	-	-	-	5	3				mbl has become darker, finer grained. more visible sulfides
505.8	515.0	9.2		.06												.06		-	<1	-	-	-	-	-	-	75	3	10	-	-	-	5	3				As above. some green copper stain
515.0	524.5	9.5		.13												.13		Tr	-	-	-	-	-	-	-	80	-	10	-	-	-	3	3				Coarse grained white to dark grey. lim on some fractures
524.5	537.0	12.5		.09												.09		wk	<1	-	-	-	-	-	-	70	-	10	-	-	-	5	3				small patches of silty tochloritic Hf with dis cpy in mbl
537.0	549.2	12.2		.06												.06		wk	-	-	-	-	-	-	-	80	-	5	-	-	-	5	2				Coarse white to gray mbl, wk oxidation
549.2	561.4	12.2		.04												.04		wk	-	-	Tr	-	-	-	-	75	5	5	-	-	-	5	-				small bands of garnet & hem. Green Cu staining.
561.4	573.5	12.1		.06												.06		Tr	-	-	-	-	-	-	-	85	-	3	-	-	-	5	-	mbl			very coarse white mbl, few impurities
	EOH																	-	-	-	-	-	-	-	-	5-10	-	5	-	-	-	80	-	-	qtzite			sharp contact with f.g. white limy quartzite.
																																					(Note: rods burnt in hole, so hole was stopped due to depth and expense of recovery. It may be necessary to deepen this hole at a later date. RCE)

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO- SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. F-156
Page 2 of 2 Pages
Collar Elev 2,859.25 Final Depth 451.5
Coords. N 30,989.07 E 23,197.37
Inclination Vertical
Logged by RE
Date: Start 6-11-68 Finish 6-18-68

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green		Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb.	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE		(3) Rock Type	Structures (4) Depth	True Dip	Remarks
425.0	433.5	8.5		.10			3.09	97								.10		-	½	-	-	-	-	-	-	10	40	40	-	-	-	-	-		Gt? Hf			light green, -Tan, Garnet-? Hf
433.5	442.3	8.8		.06			3.26	100								.06		-	½	-	-	-	-	-	-	10	50	30	-	-	-	-	-					As above
442.3	451.5	9.2		.07			3.07	92								.07		-	½	-	-	-	-	-	-	10	30	40	-	Tr	-	Tr	Tr		Hf	444.2 444.7		As above except for thin Mz dike
	EOH																																					

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARÇO - SILVER BELL UNIT

Note (3): Tt - Tactite; Hf - Hornfels; Mb - Marble; Qt - Quartzite; Bx - Breccia; Da - Dacite; Mz - Monzonite; An - Andesite

Note (4): V - Vein; F - Fault; D - Dike; C - Contact; Ig - Undif igneous

Hole No. F-156 Page 1 of 2 Pages
Collar Elev 2,859.25 Final Depth 451.5
Coords. N 30,989.07 E 23,197.37
Inclination vertical
Logged by RE
Date: Start 6-11-68 Finish 6-18-68

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Unknown NS	Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	Serpentine	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0	30.0	30.0																																	QAl	30.0		Alluvium and channel fill
30.0	41.6	11.6		.25				83	2.82		.15		.05			.05		md	½	-	Tr	-				10	2	80	-	-	-	-	5		Hf	41.6		f.g., light to dark green diop(?) HF., py, cpy, copper pitch, & mal.
41.6	49.7	8.1		.03				87	2.63					.03				md	-	-	-	-				Tr	-	-	-	wk	-	-	Tr		Post Min And.			Post-min. andesite porphyry, sharp contact
49.7	58.8	9.1		.02				90	2.51					.02				st	-	-	-	-				1	-	-	-	md	-	-	Tr			Fault @52.0	10°	Broken and gougey, stly limonite stained
58.8	68.8	10.0		.03				75	2.51					.03				st	-	-	-	-				1	-	-	-	md			Tr					Brecciated and gougey " " "
68.8	77.6	8.8		.03				95	2.64					.03				wk	Tr	-	-	-				1	-	-	-	wk	-	-	Tr					less broken & oxidized. Py on some fractures.
77.6	89.5	11.9		.04				98	2.57					.04				wk	Tr	-	-	-				2	-	-	-	Tr	-	-	Tr		Post min And.	89.5		As above, not as broken. wk lim on fractures
89.5	96.2	6.7		.16				91	2.94					.02		.14		Tr	Tr	-	-	-	Tr	Tr	Tr	10	-	60	-	10	-	-	Tr	Tr	HF			light to dark green, mdly broken HF. cpy & sphal. in calcite veins
96.2	106.7	10.5		.18				80	2.56					.06?		.12		Tr	Tr	-	-	-	-	-	-	5	-	55	-	10	-	-	Tr	5				Broken and gougey: 97.5-98.5; 101.1-102.1. Sheared throughout
106.7	116.0	9.3		.19				99	2.61					.02		.17		-	½	-	-	-	-	-	-	7	Tr	70	-	2	-	-	2	5				Tan - dk green, hard, diop(?) HF. finely dis. cpy. Broken: 114.0-116.0
116.0	125.1	9.1		.13				91	2.48					.09		.04		wk	Tr	-	-	-	-	-	-	10	-	60	-	15	-	-	2	5				Broken and gougey: 117.0-120.5. Tan - green HF to 125.1
125.1	134.6	9.5		.18				89	2.47					.10		.08		wk	Tr	-	2	-	-	-	-	10	2	60	-	15	-	-	2	7				Broken and gougey: 125.1-130.9. dk grey green HF to 134.6
134.6	143.7	9.1		.23				92	2.96							.23		Tr	½	-	3	-	-	-	-	10	5	85	-	-	-	-	1	1		mineral Banding	80°	Joint spacing 3/4', alternating green and tan bands.
143.7	152.8	9.1		.04				88	2.70							.04		Tr	Tr	-	3	-	-	-	-	5	2?	85	-	-	-	-	-	-		Banding	75°	dark green to black HF, pronounced banding. stly broken 151.8-152.8
152.8	161.8	9.0		.10				94	2.66							.10		-	Tr	-	3	-	-	-	-	10	-	85	-	-	-	-	-	-		"	65°	Tan - light green-dk green, Hard, HF. cpy in stringers and fine dis.
161.8	170.6	8.8		.16				100	2.56							.16		-	1	-	Tr	-	-	-	-	15	-	80	-	-	-	-	-	-				As above. Finely dis. cpy & py.
170.6	176.4	5.8		.17				73	2.66							.17		-	1	-	-		-	-	Tr	5	15	75	-	-	-	-	-	2	garnet-diop HF	garnet		V.f.g. green-tan HF with numerous patches of brown garnet
176.4	185.9	9.5		.12				100	2.71							.12		-	½	-	-	-	-	-	-	3	25	65	-	-	2	2	-	Tr				As above. No noticeable increase of cpy in garnetized zones.
185.9	195.3	9.4		.18				90	2.77							.18		-	1	-	-	-	-	-	-	Tr+1	35	55	-	-	1	1	-	2				Cemented BX 190.8-191.3. Py vein 191.8. Generally as above.
195.3	203.1	7.8		.15				100	2.63							.15		-	½	-	-	-	-	-	-	4	30	60	-	-	-	-	-	Tr	garnet diop HF	203.1		Complex mineralogy. f.g., tan - green silicates with zones of st. garnet
203.1	212.7	7.6		.15				86	2.70							.15			½	-	-	-	-	-	-	2	5	85	-	-	-	-	-	Tr	diop HF	Banding	55°	light tan to dark green, dense HF. Few visible sulfides.
212.7	221.4	8.7		.11				100	2.72							.11		-	½	Tr	-	-	-	-	-	2	10	80	-	-	-	-	-	Tr		"	55°-60°	dk green to black HF. Patches of garnet and epidote
221.4	229.8	8.4		.15				100	2.71							.15		-	½	-	-	-	-	-	-	2	10	80	-	-	-	-	-	Tr		"	50°-55°	Alternating zone of light and dark f.g. minerals, all hard.
229.8	240.0	10.2		.23				92	2.70							.23		-	½	-	-	-	-	-	-	2	25	65	-	-	-	-	-	Tr	HF & Tt			Tactite: 231.6-234.4. HF are dark green, H34.5.
240.0	249.0	9.0		.18				100	2.61							.18		wk	½	-	-	-	-	-	-	1	5	90	-	-	-	-	-	-	HF	Banding	55°	Tan - md green, f.g., hard HF.
249.0	258.3	9.3		.37				100	2.59							.37		-	½	-	-	-	-	-	-	5	35	50	-	-	-	-	-	Tr	HF & Tt			alternating brown Tactite and md green HF.
258.3	267.0	8.7		.34				100	2.73							.34		Tr	1	-	-	-	-	-	-	3	20	70	-	-	-	-	-	Tr	"	267.0		As above, lim on some fractures.
267.0	276.1	9.1		.20				94	2.64							.20		wk	1	-	-	-	-	-	-	5	-	-	-	wk	1	10	5		MZ	276.1		Monzonite with secondary(?) K spar and epidote. bi → chl (Partial)
276.1	281.3	5.2		.21				94	2.57							.21		wk	<1	-	-	-	-	-	-	10	Tr	30	-	-	-	10?	5		Hf	281.3		varies from soft green silty Hf to siliceous Hf.
281.3	290.0	8.7		.14				100	2.49					.04		.10		wk md	1	-	-	-	-	-	-	5	-	-	-	md	1	10	5		MZ			MZ as above, fault gouge & bx: 283.5-285.1
290.0	303.6	13.6		.14				100	2.66						.02?	.10	.02	wk	½-1	-	-	-	-	-	-	1	-	-	-	wk	1	10	3		MZ			very wk alt., unaltered plag., bi. wkly altd to chlor. abundant K spar in groundmass
303.6	313.0	9.4		.18				91	2.61						Tr?	.18		md	1	-	-	-	-	-	-	Tr	-	-	-	wk	2	10	0		MZ			" " ", limonite on fractures, wk dis py, Tr of C.C.
313.0	319.4	6.4		.21				100	2.64							.21		md	1	-	-	-	-	-	-	Tr	-	-	-	wk	1	10	10		MZ	contact 319.4	60°	" " ", sharp 60° contact with HF. Tr of fluorite
319.4	331.6	12.2		.28				92	2.92							.28		-	½-1	-	-	-	-	-	-	5	40	45	-	-	-	-	-		Gar.-Diop Hf			light tan, garnet-diop. Hf., little visible cpy
331.6	340.8	9.2		.12				94	2.73							.12		-	½	-	-	-	-	-	-	5	2	90	-	-	-	-			Diop. Hf			light-dark green, f.g. Hf. numerous thin calcite veinlets
340.8	350.1	9.3		.26				100	2.62							.26		Tr	½	-	-	-	-	-	-	3	25	70	-	-	-	-	-		Hf			md green Hf to 345.8. garnet-?-Hf with dis. cpy
350.1	360.0	9.9		.68		N.1		96	2.87							.68		-	1	-	-	-	-	-	-	5	45	45	-	-	-	-	Tr	Tr	gar-? Hf			light green-light tan, silicate-garnet Hf. increase in py, cpy
360.0	370.0	10.0		.16				83	2.98							.16		-	½	-	-	-	-	-	-	Tr+10	35	45	-	-	-	-	Tr	Tr				As above.
370.0	379.8	9.8		.23				80	3.03							.23		Tr	½	-	-	-	-	-	-	15	20	55	-	-	-	-	Tr	Tr				open calcite veins lined with calcite xtals & limonite.
379.8	389.4	9.6		.08				98	2.?4							.08		Tr	½	-	-	-	-	-	-	15	25	50	-	-	-	-	Tr	Tr				As above, green-tan, garnet-diop(?) HF with calcite veins
389.4	398.4	9.0		.08				91	3.29							.08		Tr	½	-	-	-	-	-	-	Tr 10	45	35	-	-	-	-	Tr	Tr				As above.
398.4	407.6	9.2		.11				98	2.75							.11		-	½	-	-	-	-	-	-	7	5	80	-	-	-	-	-	-	Diop Hf			dark grey-green, dense, f.g. hornfels.
407.6	416.5	8.9		.09				100	2.?0							.09		-	½	-	-	-	-	-	-	7	Tr	80	-	-	-	-	-	-				As above
416.5	425.0	8.5		.13				78	3.87							.13		-	½	-	-	-	-	-	-	15	35	40	-	-	-	-	3	Tr	gar-? HF			Green-Tan, medium hard, garnet-? Hf; few visible sulfides

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO- SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. F-15-1
Page 2 of 2 Pages
Collar Elev 2,880.47 Final Depth 456.1
Coords. N 31,078.91 E 23,340.79
Inclination vertical
Logged by RE
Date: Start 6-20-68 Finish 6-27-68

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green		Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem.	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
430.9	443.3	12.4		.04				100	2.25							.04		Tr	<1	-	-	-	-	-	-	2	3555	-	-	-	-	Tr	Hf	Banding	60°	f.g., green-tan garnet-diopside Hf.
443.3	456.1	12.8		.06				100	2.75							.06		-	<1	-	-	-	-	-	-	2	2070	-	-	-	-	Tr		Banding	65°	As above, dk green banded Hf.
	EOH																																				

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO- SILVER BELL UNIT

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Tt - Tactite
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Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. F-157
Page 1 of 2 Pages
Collar Elev 2,880.97 Final Depth 456.1
Coords. N 34,078.97 E 23,340.79
Inclination Vertical
Logged by RE
Date: Start 6-20-68 Finish 6-27-68

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Unknown NS	Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem	Spec.
0	12.4																					
12.4	21.6	9.2		.15				75	2.61				.05	.10				md	-	-	-	-
21.6	32.9	11.3		.14				65	2.64					.11	.02	.01		md	Tr	-	-	-
32.9	41.8	8.9		.15				84	2.67				.02	.11	.01	.01		md	Tr	-	-	-
41.8	49.9	8.1		.17				96	2.65		.02		.07	.08?	Tr	Tr		md ST	-	-	-	-
49.9	59.8	9.9		.20				95	2.50				.05	.03?	.07	.05		md	½	-	-	-
59.8	68.8	9.0		.26				94	2.64				.05	.04	.10?	.07		md	<½	-	-	-
68.8	77.6	8.8		.24				82	2.62					.07?	.10?	.07		md	½	-	-	-
77.6	87.4	9.8		.50		.01		88	2.71					.01		.49		Tr	1	-	-	-
87.4	96.3	8.9		.09				100	2.92							.09		Tr	<½	-	Tr	-
96.3	104.7	8.4		.26				100	2.97							.26		wk	<½	-	wk	-
104.7	114.3	9.6		.29				83	3.13							.29		Tr	Tr	-	-	-
114.3	123.9	9.6		.47		.01		94	2.75					.01		.46		Tr	1	-	Tr	-
123.9	137.6	13.7		.44		.02		95	2.91					.02		.42		Tr	1	-	Tr	-
137.6	152.1	14.5		.21				94	2.62							.21		wk	1	-	-	-
152.1	163.6	11.5		.12				98	2.57							.12		wk	1	-	-	-
163.6	173.0	9.4		.25				100	2.38		.05		.05			.15		wk md	1	-	-	-
173.0	182.1	9.1		.18				72	3.06							.18		wk md	<1	-	-	-
182.1	191.6	9.5		.22				94	2.61							.22		-	<1	-	-	-
191.6	200.6	9.0		.10				100	2.67							.10		-	<1	-	-	-
200.6	211.2	10.6		.04				92	2.93							.04		Tr	Tr	-	-	-
211.2	219.3	8.1		.08				92	3.40							.08		Tr	Tr	-	-	-
219.3	228.2	8.9		.10				97	3.09		.02		.03			.05		Tr	Tr	-	-	-
228.2	237.2	9.0		.18				100	2.56							.18		md	-	-	-	-
237.2	248.0	10.8		.04				89	2.91							.04		-	-	-	-	-
248.0	256.7	8.7		.04				95	3.17							.04		-	<½	-	-	-
256.7	265.5	8.8		.04				100	2.77							.04		-	Tr	-	-	-
265.5	273.8	8.3		.04				100	2.79							03	01	-	Tr	-	-	-
273.8	283.8	10.0		.06				91	2.85							.06		-	Tr	-	-	-
283.8	293.0	9.2		.17				88	3.03							.17		md	-	-	-	-
293.0	300.1	7.1		.33				100	2.89						.05	.28		Tr	3	-	5	-
300.1	307.9	7.8		1.42		.01		86	2.69					.01		1.41		-	3	-	5	-
307.9	319.8	11.9		.58		.02		100	2.65				.02			.56		wk	1	-	-	-
319.8	328.7	8.9		.24				90	2.50				.02			.22		md	½	-	-	-
328.7	338.8	10.1		.25				87	2.52							.25		wk md	Tr	-	-	-
338.8	347.9	9.1		.27				90	2.56							.27		wk	Tr	-	-	-
347.9	358.0	10.1		.49		Nil		94	2.81							.49		Tr	2	-	3	-
358.0	367.5	9.5		.46		Nil		90	2.72							.46		-	<1		2	-
367.5	376.4	8.9		.21				97	2.84							.21		-	<1	-	-	-
376.4	385.9	9.5		.09				95	3.07							.09		-	<1	-	-	-
385.9	396.5	10.6		.11				80	2.97							.11		-	<1	-	Tr	-
396.5	403.3	6.8		.09				97	2.70							.09		wk	<½	-	-	-
403.3	412.5	9.2		.10				87	3.41							.10		wk	-	-	-	-
412.5	422.1	9.6		.05				96	2.76							.05		wk	-	-	-	-
422.1	430.9	8.8		.11				99	2.79							.11		-	-	-	-	-

Depth From	Depth To	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	Serp	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0	12.4													Fill	12.4		dumps and alluvium
12.4	21.6							wk	md	-	10	5		MZ			mdly altd MZ porphyry. Lim, MnO and CuO on fractures
21.6	32.9							wk	md	2	12	10					As above, mdly broken, st MnO. wk-md alt.
32.9	41.8							wk	md	1	11	5					As above, Tr of py, cpy. Fresh looking biotite
41.8	49.9							wk	md	1	11	5-10					md-stly broken. Copper pitch & mal in leached veins, Lim & MnO on fractures
49.9	59.8							wk	md	1	15	10					less broken, less oxidized, dis py, cpy, cc, md alt. & silicification
59.8	68.8			Tr				wk	md	-	15	15					As above
68.8	77.6							wk	md ST	-	15	15		MZ	77.6		stly broken, MZ fine grained along contact. Gouge: 77.0-77.2'
77.6	87.4			Tr	15	-	70	-	-	-	-	5	3	HF			sheared HF with massive py, cpy between irregular calcite veins.
87.4	96.3	-	-	-	10	-	80	-	-	-	-	3	-		Bedding?	65°	Alternating light & dark green bands dip ≈65° (H. ≈4½) few sulfides
96.3	104.7	-	-	-	10	-	80	-	-	-	-	3	1		"	50°	Banding as above; very finely disseminated cpy, oxidation on fractures
104.7	114.3	-	-	-	25	10	55	-	-	-	-	2	-				Pale yellow, brown, & green limey HF. wk cpy in thin veinlets
114.3	123.9	-	-	-	5	5	80	-	-	-	-	Tr	-				Dark green HF. cpy in cemented px, blebs & veinlets
123.9	137.6	-	-	-	5	5	80	-	-	-	-	Tr		HF	137.6		" " ". Red clay fills vertical shears. dis cpy.
137.6	152.1	-	-	Tr	2	-	-	Tr	md	2	10	10		MZ			wk-md alt. Tr of epidote, wk silicification
152.1	163.6	-	-	-	-	-	-	Tr	md	2	10	10		MZ			As above, wk-md min., alt. & silicification
163.6	173.0	-	-	-	2	·	5	-	md	2	10	10		MZ	172.0		Partially leached cpy veins in HF adjacent to contact
173.0	182.1	-	-	-	2	-	85	-	-	-	-	2		HF			dk green HF, Lim & MnO on fractures, occasional large blebs of cpy in calcite vein
182.1	191.6	-	-	-	2	70	20	-	-	-	-	-		garnet HF			yellow-brown garnet HF, few sulfides
191.6	200.6	-	-	-	2	75	15	-	-	-	-	-		"			Gouge: 192.2-193.8. f.g. garnet HF.
200.6	211.2	-	-	-	3	60	30	-	-	-	-	Tr	-	HF	Banding	65°-75°	Light brown garnet HF. open calcite veins wk oxidation
211.2	219.3	-	-	-	5	35	40	-	-	-	-	2	2		"	60°-70°	light green-brown HF (H≈4) Alternating green & brown bands
219.3	228.2	-	-	-	5	35	35	-	-	-	-	2	3		"	65°-75°	As above, Tr of cpy, copper pitch, mal.
228.2	237.2	-	-	-	5	20	50	-	-	-	-	1	2	Diop HF	237.8		mdly oxidized to 237.8. Dense, f.g., dark green diop HF below 237.8
237.2	248.0	-	-	-	3	25	70	-	-	-	-	-		Gar diop HF	Banding	70°	ST banding of light and dark green silicates with brown garnet
248.0	256.7	-	-	-	1	30	65	-	-	-	-	-		"	"	70°	contrasting thin parallel bands of garnet and silicates -- must represent bedding control of alteration
256.7	265.5	-	-	-	1	35	60	-	-	-	-	-		"	"	70°	garnet HF to 258.9, followed by banded HF as above
265.5	273.8	-	-	-	1	20	75	-	-	-	-	-		"	"	65°-70°	Alternating bands of light & dark green silicates, some garnet. Individual bands range in size down to 0.1"
273.8	283.8	-	-	-	1	20	75	-	-	-	-	-		"	"	70°	Broken & gougey: 277.6-278.0. Otherwise As above
283.8	293.0	-	-	-	5	10	75	-	md	-	-	-		"	"	70°	st oxidation along fissures lined with calcite
293.0	300.1	-	-	-	5	10	60	-	-	5	5	2		"	cpy vein	10°	increased alt. & min., 2" py vein at 300'. several qtz-py-cpy veins
300.1	307.9	-	-	-	5	5	65	-	-	2	2	2		"	307.9		steep irregular py, cpy veins. Approx. 5% Total sulfides
307.9	319.8	-	-	-	2	-	-	wk	md	-	10	10		MZ			HF: 313.9-314.3.; mdly altd MZ w/dis py & cpy, lim on fractures.
319.8	328.7	-	-	-	1	-	-	Tr	md	2	12	10		MZ	QTZ veins	65°	bi —complete→ chl. Green staining of groundmass. Tr of mal on fractures
328.7	338.8	-	-	Tr	2	-	-	wk	md ST	2	12	10		MZ			Rock has been shattered, rehealed with numerous offsets of thin qtz moly veins
338.8	347.9	-	-	-	1	-	-	Tr	md	2	12	10		MZ	347.9		As above; some schistosity, parallel alignment of chlorite.
347.9	358.0	-	-	-	5	20	60	-	-	-	-	2		HF			dk green, md hard HF to 353' followed by garnet in soft matrix
358.0	367.5	-	-	-	3	20	70	-	-	-	-	-		Gar Diop HF	Banding	70°	Banded HF as above. Thin bands of garnet cut diop. cpy veinlets cut banding (bedding?)
367.5	376.4	-	-	-	2	20	70	-	-	-	-	-		"	"	65°	As above, cpy in calcite veins.
376.4	385.9	-	-	-	2	30	60	-	-	2	2	2		"	"	70°	As above
385.9	396.5	-	-	-	3	10	80	-	-	-	-	-					light tan-green HF to 392.0, followed by dark green HF
396.5	403.3	-	-	-	4	10	80	-	-	-	-	-			Banding	55°	dk green HF with open calcite veins stained with lim
403.3	412.5	-	-	-	5	15	75	-	-	-	-	-					As above
412.5	422.1	-	-	Tr	10	15	70	-	-	-	-	-					Vertical, open, wkly lim stained calcite vein runs throughout interval.
422.1	430.9	-	-	-	5	10	80	-	-	-	-	-		Gar Diop HF	Banding	65°	Core unfractured, pronounced thin parallel banding.

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO- SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. F-158
Page 1 of 1 Pages
Collar Elev 2912.06 Final Depth 297.8'
Coords. N 30,668.42 E 22,859.99
Inclination vertical
Logged by RE; RHL
Date: Start 7-15-68 Finish 7-19-68

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Turq.	Cc.	Cpy.	Tenorite Born	Fe (2) Lim.	Py.	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb.	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0	7.5	7.5																																			
7.5	16.4	8.9		.22										.22				ST	-	Tr	wk	-							md	ST	1	10	Tr	MZ			md-stly altd. MZ with abundant jarosite & Turquoise on fractures.
16.4	25.6	9.2		.22										.22				ST	-	-	wk	-							md	ST	-	10	Tr				Boxwork bed with jarosite xtals. Turquoise. biotite complete → hydromica. of some groundmass
25.6	34.9	9.3		.18										.18				ST	-	-	wk	-							ST	½ ST	-	5?	Tr				Broken & gouge, stalt., Turquoise & jarosite as above. hem. staining
34.9	43.0	8.1		.04										.04				md	-		md	-							ST	ST	2	10	Tr		loached veins.	60-65°	Numerous thin leached veinlets with strong sericite alt. Trace hem.
43.0	52.5	9.5		.07										.04	.03			md	½	Tr	wk								ST	ST	-	10	/				dis py, & c.c. oxidation along fractures & veins. jarosite & Turquoise
52.5	65.1	12.6		.08										.08				ST	Tr	Tr	md								ST	ST	-	10	/				soft, stly altd & broken. dis mag. altd to hem. few sulfides
65.1	76.2	11.1		.09										.01	.06			ST	½	-	Tr								ST	ST	-	10?	1-2				" remnant dis. py & c.c. st oxidation along fractures
76.2	84.2	8.0		.07										.02	.05			ST	½	-	-								ST	ST	-	10	2				harder than above. Jarosite, and tr of Turquoise
84.2	93.2	9.0		.10									.06	.04				md	½	-	-								ST	ST	-	10	2				wk dis sulfides. Jarosite & non-sulfides on fractures
93.2	102.3	9.1		.14									.04		.10			wk	1	-	-								md ST	md ST	-	20	2				loss altd, mdly silicified jar. on fract. dis py & c.c.
102.3	111.0	8.7		.10									.03		.05	.02		md	1	-	-								md	md	-	20	5				md-stly broken & gouge. As above, md-st silicification. dis py & cpy w/ wk c.c. mal
111.0	118.7	7.7		.10									.10					md	1	-	wk								md	md	-	20	5		loached veinlets	65°	Gouge: 116.8-117.1 " " lim & N.S. on fractures
118.7	129.6	10.9		.09									.05		.04			ST	½	-	wk								ST	ST	-	15	2	fault			Broken & gouge: 126.1-129.6. patches of st c.c. N.S. on fractures.
129.6	139.3	9.7		.11									.04		.05	.01	.01	md	1	-	-								md ST	md ST	-	20	5		shears	80°	hard, solid, mdly silicified. st c.c. on some fractures, lim on others.
139.3	148.0	8.7		.12											.12			wk md	1	-	-			Tr					ST	md	2	20	7		fault	50°-80°	Broken & gouge: 141.9-143.2. st dis c.c.
148.0	157.1	9.1		.15											.15			md	1	-	-								md ST	md	-	15	7				mdly broken, increase in oxidation.
157.1	166.1	9.0		.09											.09			ST md	1	-	Tr								md	md	-	10	7				mdly broken & gouge. lim on fractures. some unoxidized dis sulf.
166.1	175.5	9.4		.03											.02	.01		ST	1		Tr								md	md	-	10	7				As above. dis py, cpy, c.c. where st is silicified. Tr of hem. on fracs
175.5	184.6	9.1		.02											.01	.01		md	1		½								md	md	-	15	7				mdly altd, & silicified. gouge on fractures. Attracts magnet.
184.6	195.1	10.5		.02												.02		md	½	-									md	ST md	-	10	5				mdly broken & gouge. lim on fractures
195.1	206.7	11.6		.02												.02		wk	½	1	-								md	ST	-	15	7				As above. Unbroken intervals are strongly silicified.
206.7	216.1	9.4		.05												.05		Tr		2	-								ST	ST	-	50	5				massive py 207.5-207.9 followed by stly broken & gouge wk to 216.1
216.1	222.3	6.2		.03												.03		-		1-2	-	-	-						md	md	1	10	7				mdly altd, dis py & cpy, No visible c.c.
222.3	231.3	9.0		.02												.02		-		1-2	-	-	-						md	md	-	15	7				" " & silicified, " " " "
231.3	240.0	8.7		.02												.02		-		1-2	-	-	-						md	md ST	-	10	7				mdly broken & gouge. py on fractures. No c.c.
240.0	248.8	8.8		.03												.03		-		1-2	-	-	-				Tr		md	md ST	-	10	7				md-st alt., secondary ksper along fractures
248.8	258.4	9.6		.03												.04		-		1-2	-	-	-						md	md	-	15	7				mdly broken, md-stly alt. & silicified
258.4	269.0	10.6		.04												.06		-		1-2	-	-	-						md	md ST	-	15	7		shears	45-65°	mdly sheared & broken. 2nd ksper. dis py, no visible c.c.
269.0	277.9	8.9		.06											.01	.05		-		1-2	-	-	-						md	md ST	-	15	7				As above except for Tr. of c.c. on dis. cpy
277.9	287.3	9.4		.04												.04		-		2	-	-	-						md	md ST	3	18	7		ST-py cpy veins	30°-40°	Less fractured than above, md-st alt & silicification.
287.3	297.8	10.5		.02												.02		-		1-2	-	-	-						md	md ST	1	16	7	MZ			dis cpy, occasional trace c.c., " " "
	EOH																																				(Hole has had high ratio py to cpy)

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. F-159
Page 1 of 1 Pages
Collar Elev 2897.14 Final Depth 352.7
Coords. N 30,873.75 E 23,026.09
Inclination vertical
Logged by RHL
Date: Start 7/19/68 Finish 7/26/68

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green		Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE		(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0	20.0	20.0																																				Rockbit
20	29.6	9.6		.42		.29				10			.19		.13			mod st	tr	wk	-							mod st	st	½	10	-		Mz				Mod-st. alt. Mal. from 21.7-22.5' along fract. Strongly broken and alt. from 25.6-29.6'.
29.6	39.0	9.4		.21		.07							.07		.15			st	-	wk-mod	-							mod st	st	-	10	-						Strongly alt. rock. Feldspars stained greenish. Mica → hydromica in part. Tr. turq. wk jar. Tr cc?
39.0	48.8	9.8		.17											.17			wk mod	-	tr	wk	-						mod	st mod	-	10	-						Mod-st alt. wk jarosite mainly along fract. From 42-44.0 clayey and fractured.
48.8	58.0	9.2		.16											.16			wk mod	-	tr	wk	-						mod	mod st	-	15	½						As above. wk jarosite. Slight silicification. Bi → chl. in part.
58.0	68.4	10.4		.16									.06		.10			wk mod	-	-	wk	-						mod	mod	-	10	-						Mod alt. V.wk Cu stain along fract. with traces of jarosite. v.sp. cc.
68.4	79.4	11.0		.10											.10			wk mod	-	tr?	v.wk	-						mod wk	mod st	-	8	-						Moderate alt. From 77.4-78.4' st. broken lim-clay zone.
79.4	89.6	10.2		.09											.06	.03		wk mod	< ½	-	wk	-						mod	mod	-	7	-						Mod alt. Tr. jarosite. Some diss. py. lim. mainly along fract.
89.6	98.7	9.1		.12											.08	.04		wk	1	-	v.wk	-						wk	mod	2	10	< ½		Mz				wk-mod alt. Subst incr. of py over last run. tr. jar. lim. boxwork @ 96.7' with tr. of lim.
98.7	107.6	8.9		.12									.02		.05	.05		wk	½	-	wk	-						wk	mod	-	10	½						Bi → chl. in part. wk-mod alt. lim principally coating fractures. Cc coating py.
107.6	114.5	6.9		.11											.04	.07		wk	1	-	v.wk	-						v.wk	mod	-	10	½						As above.
114.5	123.7	9.2		.07											.04	.03		wk mod	1	-	wk	-						mod	st mod	-	15	wk						Mod alt. Sericite alt locally strong. No Cu. min. obs.
123.7	133.0	9.3		.08											.04	.04		mod	½	-	wk	-						mod st	mod st	tr	20	wk		Mz				Mod-st alt. Sil. from 125.9-126.2'.
133.0	141.6	8.6		.13											.07	.06		mod	< ½	-	wk	-						mod st	mod st	-	15	½						As above. St. broken, clayey zone from 139-140.5'
141.6	151.2	9.6		.15											.05	.10		wk mod	1	-	wk	-		Tr				mod	mod	-	25	½			py 149'	40°		St. alt from 141.6'-142.9'. Mod alt. remainder of int. Tr. of cpy, c.c. mod ½ py @ 149
151.2	160.8	9.6		.15											.02	.13		mod	1	-	tr	-						mod	mod st	tr	15	tr						Mod alt in overall aspect but locally st. clay develop. Tr. cc.
160.8	169.9	9.1		.11											.05	.06		wk mod	1	-	tr	-						mod st	mod st	-	20	tr						Mod-st alt. Mod. silicif from 164.8'. Tr. Cu. min. obs.
169.9	179.0	9.1		.18											.02	.16		wk mod	½	-	wk	-						mod	mod	tr	20	½						Mod. alt with local silicif. St. broken from 174-174.5'.
179.0	188.3	9.3		.10											.06	.04		wk	½	-	tr	-						wk	mod	-	15	tr			18° shears	55°		Mod. alt. Rock quite fractured with wk py and tr. chl. along fract. Py incl. @ 184'
188.3	197.9	9.6		.07											.03	.04		tr	½	-	-	-						mod st	st	-	10	1						St. alt. Bleached appearance. St. broken from 191.4'. Tr. cpy.
197.9	207.8	9.9		.08												.08		tr	½	-	-	-		Tr				mod st	st	-	10	2						Very much broken. St. alt. Bi → chl. in part.
207.8	217.3	9.5		.08												.08		-	< ½	-	-	-						mod st	st	-	8	4						Essentially as above. No visible Cu min.
217.3	228.1	10.8		.13												.13		-	½-1	-	-	-		Tr	Tr			mod	mod st	-	15	5		Mz	217.3-219.4 Fault	?		St. gouge zone from 217.3-219.4' St. alt. wk silicif. Tr. moly, cpy
228.1	236.9	8.8		.05												.05		-	1	-	tr	-		Tr				mod	mod st	-	15	4						Gouge from 228.6-228.9. Py vein @ 232.7' 1" wide. Bi (compl.) → chl. Mod. broken
236.9	246.8	9.9		.04												.04		-	½	-	-	-		1				mod	st	-	10	5						Highly fractured rock. Num clayey zones. St. alt.
246.8	257.1	10.3		.06												.06		tr	½	-	-	-		½				mod	st	-	10	5						As above.
257.1	265.6	8.5		.08												.08		wk	1	-	-	-		tr				wk mod	st	-	10	4			262.7'	70°		St. alt. mostly clay. Lim. Chl. coating fract. 1/8" py veinlet @ 262.7'. St. alt.
265.6	272.0	6.4		.06												.06?		tr	-	-	-	-		-				wk mod	st	-	20	-						Mislatch of core. Poor recovery. Rock highly broken up. Mod-st. alt.
272.0	280.5	8.5		.09											.03	.06		tr	tr	-	-	-		Tr.				wk mod	mod st	-	15	tr						Mod-st. alt. wk. silicif. Tr. moly, calc.
280.5	290.7	10.2		.05											.01	.04		tr	< ½	-	-	-						mod st	st	-	15	tr						St. broken to 288.6'. wk. silicif. Tr. cc.
290.7	300.6	9.9		.07											.02	.05		wk mod	< ½	-	-	-						wk mod	mod st	-	20	tr.						Mod silicif, alt. Tr cc along fract.
300.6	304.7	4.1		.15											.10	.05		wk	< ½	-	-	-						wk	mod	-	25	-		Mz				Essentially as above. wk cc.
304.7	315.0	10.3		.05											.01	.04		tr	< ½	-	-	-		Tr				wk	mod	-	25	-						As above. tr cc, py along fract. Calcite along fract, tr. moly
315.0	320.0	5.0		.03												.03		wk	½	-	-	-						v.wk	mod st.	-	20	-						wk lim coating fract, with tr. moly. Mod. alt. Tr. cc?
320.0	331.6	11.6		.02											.01	.01		tr	tr	-	-	-						-	st	-	40	-			Fault	?		St. gouge from 320-321'. Traces of py, cc. Silicif increases greatly at end of int.
331.6	339.7	8.1		.05												.05		wk	tr	-	-	-						wk	st	-	60	-		Mz?				Strongly broken, st. silicification. little min.
339.7	348.1	8.4		.08											.04	.04		wk	tr	-	-	-						wk mod	st	-	35	-						Int. shat'd. St. alt. Tr cc, py.
348.1	352.7	4.6		.03											.03			tr	tr	-	-	-						-	-	-	100	-						Broken up quartz fragments. Very poor recovery.
	E.O.H.																																					

PRELIMINARY GEOLOGIC LOG
(Subject to Revised Logging)

ASARCO- SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Collar Elev 2664.30 Final Depth 1522.5
Coords. N 29,646.85 E 27,731.34
Inclination Vertical
Logged by RHL, RCE
Date: Start 7/29/68 Finish 9-15-68

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Unknown NS	Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem	Spec.
0	12	12						—														
12	20.5	8.5		.38		.30		100	2.67					.30	-	.08		wk	½	-	tr	-
20.5	29.3	8.8		.41		.31		79	2.67					.31		.10		tr	½	-	-	-
29.3	38.6	9.3		.24				79	2.72							.24		-	½	-	-	-
38.6	48.7	10.1		.35				98	2.66							.35		-	½	-	-	-
48.7	58.5	9.1		.18				90	2.61							.18		-	1	-	-	-
58.5	65.2	6.7		.18				93	2.61							.18		-	½	-	-	-
65.2	69.6	4.4		.14				100	2.60							.14		-	½-1	-	-	-
69.6	76.7	7.1		.37				100	2.63							.37		-	½	-	-	-
76.7	85.6	8.9		.25				100	2.43							.25		-	½	-	-	-
85.6	90.0	4.4		.15				69	2.57							.15		-	½	-	-	-
90.0	99.0	9.0		.42		.01		92	2.62					.01		.42		-	½	-	-	-
99.0	108.1	9.1		.09				96	2.64							.09		-	<½	-	-	-
108.1	114.6	6.5		.18				94	2.62							.18		-	½	-	-	-
114.6	123.4	8.8		.16				100	2.62							.16		-	<½	-	-	-
123.4	128.1	4.7		.20				100	2.58							.20		-	1	-	-	-
128.1	130.2	2.1		.12				42	2.58							.12		-	<½	-	-	-
130.2	137.4	7.2		.08				100	2.57							.08		-	½	-	-	-
137.4	146.6	9.2		.10				97	2.63							.10		-	½-1	-	-	-
146.6	158.2	11.6		.13				100	2.61							.13		-	½	-	-	-
158.2	167.9	9.7		.07				85	2.79							.07		-	<½	-	-	-
167.9	176.9	9.0		.15				89	2.59							.15		-	½	-	-	-
176.9	186.0	9.1		.13				100	2.55							.13		-	½	-	-	-
186.0	191.9	5.9		.09				82	2.63							.09		-	1	-	-	-
191.9	201.2	9.3		.13				100	2.63							.13		-	1-2	-	-	-
201.2	210.2	9.0		.22				100	2.66							.22		-	1	-	-	-
210.2	219.0	8.8		.20				98	2.63							.20		-	1-2	-	-	-
219.0	230.0	11.0		.17				97	2.64							.17		-	1-2	-	-	-
230.0	239.5	9.5		.19				95	2.68							.19		-	2-3	-	-	-
239.5	252.1	12.6		.22				89	2.74							.22		-	2-3	-	-	-
252.1	261.0	8.9		.26				99	2.65							.26		-	1-2	-	-	-
261.0	270.2	9.2		.19				93	2.61							.19		-	1-2	-	-	-
270.2	281.8	11.6		.17				94	2.62							.17		-	1-2	-	-	-
281.8	291.3	9.5		.11				99	2.61							.11		-	1-2	-	-	-
291.3	300.0	8.7		.13				100	2.57							.13		-	1-2	-	-	-
300.0	308.7	8.7		.19				100	2.61							.19		-	1-2	-	-	-
308.7	315.0	6.3		.09				96	2.64							.09		-	1-2	-	-	-
315.0	323.9	8.9		.12				90	2.69						.01	.11		-	1-2	-	-	-
323.9	333.4	9.5		13				96	2.66							.13		-	1-2	-	-	-
333.4	342.4	9.0		.26				100	2.59							.26		-	2	-	-	-
342.4	351.1	8.7		.21				86	2.62							21		-	2	-	-	-
351.1	360.0	8.9		.25				86	2.63							.25		-	2	-	-	-
360.0	368.9	8.9		.20				98	2.64							20		-	2	-	-	-
368.9	378.1	9.2		.20				96	2.64							.20		-	2	-	-	-

Depth From	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	2ND Kspar	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0																Rockbit
12			-	tr	-	-	wk	mod	⊥	-	45		Sp.			Highly chloritized Sp. Py mainly along fract with wk lim. Tr. cpy
20.5			-	tr	-	-	wk	mod st	tr	½	55					As above with WK. silicif. Moderately broken.
29.3			-	-	-	-	V.wk	mod	-	½	50					Mod alt. WK silicif, cpy. Int. remains highly chloritized.
38.6			-	-	-	-	wk	mod	tr	3	45			38.6'	50°	Mz(?) dike from 38.6-41.2' with mod. silicif. Also Mz veinlet @ 44.8' ± 3" thick. Otherwise as above.
48.7			tr	-	-	-	wk mod	mod st	tr	15	30		Sp			Subst. incr. in silicif and pyrite occurrence. Wk. cpy
58.5			tr	-	-	-	wk mod	mod	tr	25	25		65.2'			Mod-st. silicif. Tr. cc(?) cpy along fract and as dissem.
65.2			tr	-	-	-	tr	mod	½	5	2		Mz 69.6'	65.2'	60°	WK-mod. alt, silicif. Bi → (in part) chl and along fract, with tr. cc.
69.6			-	-	-	-	wk mod	mod st	-	30	35		Sp			Mod. silicification, chlor. WK. cpy. Py predom. coating fract.
76.7			-	-	-	-	wk mod	mod st	-	35	30		85.6			Mod-st. silicif. Otherwise as above. WK. cpy.
85.6			-	-	-	-	wk	wk mod	-	4	-		Mz 90.0'			WK silicif, mod. alt. Tr. cpy.
90.0			tr	-	-	-	mod st	st	-	10	30		Sp 99.0'	99.0	?	Mz to 90.7'. Sp. to end of int. WK Silicif. as qtz. veinlets. Tr. cpy. moly. Mod. broken
99.0			tr	-	-	-	mod	mod	-	20	1		Mz	qtz veins	70°	Mod. silicif. as qtz. veinlets. WK. cpy. Bi → (in part) chl. Sporadic 2nd K-feldspar phenos.
108.1			tr	-	-	-	wk	mod st	-	30	½	WK				Mod-st. silicif, alt. WK. diss. cpy. tr. moly. Few 2nd K feldspar x'tals.
114.6			tr	-	-	-	V.WK	mod st	-	35	½-1	-				St. quartz veining through hostrock. Tr. moly. WK. cpy.
123.4			tr	-	-	-	mod	st	-	30	2	WK				St. silicif. Bi → chl. WK. cpy. Some 2nd feldspar.
128.1			-	-	-	-	mod st	st	-	20	1	-				as above; many thin veinlets of qtz as well as blebs.
130.2			tr	-	-	-	mod	st	-	25	1	-				St. alt, silicif. Bi → chl. v. wk cpy.
137.4			tr	-	-	-	mod	mod st	2	30	1	-				Mod-st. alt. with silicif. as quartz veinlets. Qtz. x'tals lining vugs in places. Bi → (in part) chl.
146.6			tr	-	-	-	mod st	st	½	20	½	wk				St. alt. Bi → chl (complete). WK. cpy. Tr. moly @ 155.1' along fract. Mod silicif.
158.2			tr	-	-	-	mod	mod st	-	20	½-1	WK				As above. Tr. moly. Fractures run parallel with core. Sp. diss. cpy
167.9			-	-	-	-	mod	mod st	-	25	1	-				At 168.8' crushed zone @ 70°. Mod-st. alt. WK. diss. cpy.
176.9			-	-	-	-	mod	mod	tr	25	½-1	-				Mod alt. silicif. Bi → chl. (complete). WK. diss. cpy.
186.0			-	-	-	-	mod	md st	tr	35	3	-				St. silicif. alt. Tr. barite along fractures. V. wk diss. cpy.
191.9			-	-	-	-	wk md	md ST	3	25	3	wk		QTZ-sulf	50°-	silicification varies wk to st. 2nd kspar xtals. irregular QTZ veins
201.2			-	-	-	-	wk md	md ST	3	15	3	md		veins	90°	less silicification, groundmass becoming pink in color
210.2			-	-	-	-	md	md ST	2	15	5	wk				slight pink color of groundmass. py & cpy as dis. grains.
219.0			Tr	-	-	-	wk	md ST	4	15	3	wk md				As above, irregular, vuggy QTZ veins with wk sulfides.
230.0			Tr	-	-	-	wk	md ST	6	18	4	md		QTZ ser-sulf veins	60°-	pinkish coloration of groundmass. large blebs of py in QTZ veins
239.5			-	-	-	-	md	md ST	6	18	4	md			70°	several veinlets with more sulfides and sericite than above.
252.1			-	-	-	-	wk md	md ST	4	15	5	md		"	70°	As above
261.0			Tr	-	-	-	wk	md ST	4	15	5	md		QTZ-sulf veinlets	45°-70°	Numerous thin QTZ-PY, cpy veinlets
270.2			-	-	-	-	wk	md ST	4	15	5	md		"	"	As above, groundmass continues to be pink, some 2ND kspar phenos.
281.8			-	-	-	-	wk	md ST	5	15	5	md				irregular barren QTZ veins, some offset by sulfide lined fractures
291.3			Tr	-	-	-	wk	md ST	5	15	5	md		QTZ-py-Mo veins	70°-80°	strong 80° shearing. QTZ-py-moly veins.
300.0			Tr	-	-	-	wk md	md ST	10	20	5	md ST				irregular QTZ veins (±1"). several large 2nd kspar phenos
308.7			Tr	-	-	-	wk	md ST	7	17	5	md				As above
315.0			-	-	-	-	md	md ST	7	17	5	wk		Fault @317.6	40°	vn QTZ from 316.9-317.3 followed by fault gouge to 317.6.
323.9			-	-	-	-	md	md ST	5	15	5	wk md		QTZ veins	45°-70°	Thin QTZ veins, both with & without sulfides, spaced about 4 per ft.
333.4			Tr	-	-	-	md	md ST	7	17	5	wk				QTZ veins as above, plag. altd to yellow clay min., 2nd kspar phenos.
342.4			-	-	-	-	wk md	md	7	17	5	wk				silicification and QTZ veining : 344.4-345.4.
351.1			-	-	-	-	wk	md	7	17	5	wk				Irregular QTZ vein with large blebs of cpy : 353.2-353.8.
360.0			-	-	-	-	wk md	md	5	15	5	wk		py-cpy veins	60°-70°	True QTZ-py-cpy veins with uniform thickness (¼") and dip (60°-70°)
368.9			Tr	-	-	-	wk	md	10	20	5	wk md				Irregular white QTZ veins - semi-barren, some w/sulfides

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Collar Elev 2664.30 Final Depth 1500.0
Coords. N 29,646.85 E 27,731.34
Inclination vertical
Logged by RE and RHL
Date: Start 7/29/68 Finish 9-15-68

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	NS	Avg	% Core Recov	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green		Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag	Hem	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	2nd KSPAR	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
378.1	386.7	8.6		.22				100	2.62							.22		-	1	-	-	-			-	-	-	-	wk	md	3	13	3	md	MZ			Pink staining of groundmass. Phenos. of 2nd kspar.
386.7	396.0	9.3		.09				97	2.59						.02	.07		-	1	-	-	-			Tr	-	-	-	wk	md	3	13	3	md		Qtz vein	50°-90°	As above. 5-10% yellow waxy alt. mineral
396.0	405.0	9.0		.08				98	2.64							08		-	1-2	-	-	-			-	-	-	-	wk	md	5	14	3	wk		½" py vein 400.1	50°	Decrease in potash alt. bands of silicification c̄ py
405.0	414.7	9.7		.15				90	2.57							.15		-	1	-	-	-			-	-	-	-	wk	md	3	13	3	wk		Fault	70°	fault w/ gouge @ 409.3 (70°). overall shearing, vuggy qtz veins & brecciation
414.7	423.0	8.3		.08				100	2.60							.08		-	1	-	-	-			-	-	-	-	wk	md ST	3	13	5	wk				increase in chlorite, increase in alt. of plag. to green-yellow clay min.
423.0	434.0	11.0		.08				96	2.58							.08		-	1	-	-	-			-	-	-	-	wk!	ST	15	22	3	-		Fault 426.5	65°	Fault w/ gouge, Bx. st alt. of Kspars to yellow clay min. ^ very irregular white qtz. veins
434.0	439.2	5.2		.14				99	2.56							.14		-	tr	-	-	-			-	-	-	-	mod	st	2	20	2	-				St. silicified to 437.1'. Gouge to 438.8' with st. sericite, clay min. Feldspars -> yellow clay min.
439.2	452.3	13.1		.17				92	2.80							.17		-	1½	-	-	-			-	-	-	-	wk	mod	1	10	1	wk		¼" py vein 449.5	60°	Mod alt. St. silicif. from 446.0 to 450.0'. Feldspars -> greenish-yellow clay min.
452.3	460.9	8.6		.32				100	2.64							.32		-	2	-	-	-			-	-	-	-	mod	mod	3	8	2	wk				Conspicuous qtz. veins and vugs to 456.9'. Finer text. from 456.9-460.9'. Mod. alt. Wk cpy.
460.9	469.8	8.9		.11				80	2.87							.11		-	1	-	-	-			-	-	-	-	mod	mod	2	12	3	wk				Mod. alt. Tr. cpy. Feldspars have a greenish-grey appearance now.
469.8	479.0	9.2		.10				93	2.60							10		-	1	-	-	-			-	-	-	-	wk mod	mod	4	11	3	wk mod				Essentially as above. Wk. cpy. Bi->chl.
479.0	483.7	4.7		.26				82	2.66							.26		-	2	-	-	-			tr	-	-	-	wk	mod	4	10	4	mod		Fault 480.5'	60°	Fault with gouge, moly pyrite. Mod. alt. V. wk. cpy. Increase in 2nd feldspar, silicif.
483.7	492.7	9.2		.07				97	2.64							.07		-	1-2	-	-	-			tr	-	-	-	wk	md	1	10	4	md				2nd Kspar in groundmass. Sericite along py veinlets. Tr. moly
492.7	501.5	8.6		.16				98	2.62							.16		-	1	-	-	-			tr	-	-	-	wk	md	½	10	5	md				As above
501.5	509.7	8.2		.09				97	2.61							09		-	2	-	-	-			-	-	-	-	wk	md	1-2	10	5	md		gougey veins	65°	qtz. veins separated from rock by gouge.
509.7	518.4	8.7		.06				96	2.63							06		-	2	-	-	-			-	-	-	-	wk	md	3	12	5	md		1" qtz-py vein	75°	As above
518.4	526.6	8.2		.10				96	2.60							.10		-	2	-	-	-			-	-	-	-	wk md	md	10	18	5	wk		qtz py veins	70°-90°	1" qtz veins vary from 70°-90°. Less 2nd kspar than above.
526.6	536.5	9.9		.17				84	2.64							.17		-	1-2	-	-	-			-	-	-	-	mod	mod	8	15	4	wk mod				< ½" qtz veins parallel to core throughout int. Incr. in silicif. from 536.0-536.5'.
536.5	543.8	7.3		.11				100	2.61							.11		-	3	-	-	-			tr	-	-	-	wk	mod	5	20	2	wk		py-moly v. 540.7'	80°	St. silicif. Massive py from 536.5-536.9'. Bi -> chl. (in part)
543.8	553.3	9.5		.10				90	2.65							.10		-	1-2	-	-	-			tr	-	-	-	wk	wk mod	2	12	1	v.wk				Mod. silicif. Qtz. veinlets relatively sparse. Most biotite appears fresh.
553.3	561.9	8.6		.07				100	2.66							.07		-	2	-	-	-			-	-	-	-	wk mod	wk mod	½	10	1	v.wk				Wk-mod alt. Otherwise as above.
561.9	570.0	8.1		.05				93	2.63							.05		-	2	-	-	-			tr	-	-	-	mod	mod	1	10	3	wk mod		ser-py-qtz vn. 569'	80°	Mod. alt. Bi -> chl. (complete). Increase in 2nd K-feldspar phenos. Slightly vuggy along qtz-py veinlets.
570.0	578.5	8.5		.18				98	2.66							18		-	2	-	-	-			-	-	-	-	ST	md ST	3	15	3	md		py veins	70°	Bx: 574.6-576.6, strongly sheared, st alt. c̄ sil. along py veinlets
578.5	587.0	8.5		.10				100	2.61							.10		-	1-2	-	-	-	Tr		-	-	-	-	md	md	2	15	4	md				increasing silicification. Tr. galena in qtz. veinlet.
587.0	596.0	9.0		.11				86	2.61							.11		-	2	-	-	-			-	-	-	-	md ST	md	3	18	3	wk				md-st silicification, Tr. of cpy in py veins w/ st. sericite
596.0	605.9	9.9		.12				91	2.62							12		-	1-2	-	-	-			-	-	-	-	md	md	3	15	3	wk		qtz py veins	70° 90°	thin qtz vein (90°) contains several blebs of cpy.
605.9	614.1	8.2		.13				72	2.54							.13		-	1	-	-	-			-	-	-	-	mod	st mod	2	10	4	mod				Pink groundmass from 208.5' to end of int. Wk. cpy.
614.1	623.3	9.2		.20				96	2.61							.20		-	1	-	-	-			-	-	-	-	md	md	1	10	3	md		shears	70°-90°	mdly sheared: 618.8-623.3, otherwise as above
623.3	631.9	8.6		.20				97	2.66							.20		-	1	-	-	-			-	-	-	-	wk md	md	2	12	4	wk md		qtz veins	55°	Vuggy qtz vein (65°) @ 628.9. md alt. c̄ silicification
631.9	641.1	9.2		.14				90	2.62							.14		-	1	-	-	-			Tr	-	-	-	md	md	2	12	4	wk		shears	70°-90°	mdly sheared, steeply dipping shears and thin qtz-py veins.
641.1	646.9	5.8		.18				100	2.74							.18		-	1-2	-	-	-			Tr	-	-	-	ST	ST	-	12	?	wk	MZ?			Alteration becomes intense near fault zone. obscures texture entirely
646.9	652.1	5.2		.05				93	2.87							.05?		-	3	-	-	-			-	-	-	-	ST	V ST.	-	5?	-	-	MAJOR FAULT		?	5.2 feet of compact gouge and breccia fragments which have been partially replaced by py ^
652.1	661.4	9.3		.04				99	2.83							.04		-	15	-	-	-			Tr	-	-	-	ST	V ST	5	20	-	-	MZ?	py vein	80°	vein of massive py 652.1-653.5'. intense alt. c̄ silicification.
661.4	671.3	9.9		.11				80	2.57							.11		-	1	-	-	-			-	-	-	-	wk mod	st	2	12	5	wk				Feldspars alt. to light green clay min. Bi -> chl. (in part) Gen. st. alt.
671.3	679.7	8.4		.12				92	2.65							.12		-	1	-	-	-			-	-	-	-	mod	st	2	10	3	wk				Essentially as above. Mdly sheared.
679.7	690.8	11.1		.12				100	2.55							.12		-	1	-	-	-			-	-	-	-	mod	st	3	15	2	wk mod				St. alt. monz. Quite fractured throughout interval.
690.8	700.2	9.4		.10				96	2.57							.10		-	½	-	-	-			-	-	-	-	mod st	st	2	12	2	wk				Feldspars conspicuously altered to a light green clay min.
700.2	709.1	8.9		.11				100	2.63							.11		-	½	-	-	-			-	-	-	-	mod	st	4	15	2	wk		qtz veins tr. py	80-90°	Incr. in silicif. as qtz. veinlets. Bi -> chl. (complete) Feldspar -> light green clay min.
709.1	717.5	8.4		.09				91	2.60							.09		-	½	-	-	-			Tr	-	-	-	mod st	st.	5	15	4	wk		qtz-py veins	80-90°	As above. Wk. py in groundmass.
717.5	726.5	9.0		.20				94	2.61							.20		-	½-1	-	-	-			-	-	-	-	st	st	2	12	3	sp.				Incr. in fracturing, but less silicification. Alteration remains strong.
726.5	735.2	8.7		.17				96	2.65							.17		-	1	-	-	-			-	-	-	-	mod	mod	3	10	2	wk mod				Mod alt. Few fract. Occ. cavities with qtz. x'tals. Sp. cpy.
735.2	745.0	9.8		.09				91	2.56							.09		-	2	-	-	-			-	-	-	-	mod st	mod st	2	12	2	wk mod				At 737.5' st. gouge, breccia for 6".
745.0	754.5	9.5		.14				97	2.65							.14		-	½	-	-	-			-	-	-	-	wk mod	mod st	3	15	3	wk		qtz-py veins	75°	Noticeable decrease in py content of groundmass. Mod. alt.
754.5	764.0	9.5		.09				97	2.67							.09		-	½	-	-	-			-	-	-	-	wk mod	mod	1	12	1	wk		qtz-py veins	65-80°	Bi -> chl. (in part) Mod. alt.

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO- SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

F-160

Hole No. F-160
Page 3 of 4 Pages
Collar Elev 2664.30 Final Depth 1500.0
Coords. N 29,646.85 E 27,731.34
Inclination vertical
Logged by RE
Date: Start 7-23-68 Finish 9-15-68

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Cu (1) Pitch	Cu (1) Black	Cu (1) Blue Green	Cu (1)	Cu (1) Cc.	Cu (1) Cpy.	Cu (1) Born	Fe (2) Lim.	Fe (2) Py	Fe (2) Mag.	Fe (2) Hem	Fe (2) Spec.	Other (2) Galena	Other (2) Sphal.	Other (2) Molyb	Other (2) Calcite	Other (2) Garnet	Other (2) Silicates	Other (2) Sericite	Other (2) Clay	Other (2) Vn. Qtz	Other (2) QUARTZ	Other (2) CHLORITE	Other (2) 2ND K-SPAR	(3) Rock Type	Structures (4) Depth	Structures (4) True Dip	Remarks
764.0	773.0	9.0		.17				100	2.59							.17			1										wk	md	½	10	5	md ST	MZ			2nd. Potash alt. of groundmass. Thin py veinlets
773.0	782.0	9.0		.15				98	2.63							.15			1										wk	md	1-2	15	5	Md				Varying silicification. Numerous thin QTZ veinlets
782.0	791.4	9.4		.90		.01		95	2.82					.01		.89			2										wk	wk	20	25	3	wk		MAJOR FAULT	70°	Fault: 789.4 to 789.6. Followed by QTZ-py-cpy vein to 791.4
791.4	800.3	8.9		.37				95	2.68							.37			1-2										md	md ST	5	15	3	wk				mdly sheared. Md-ST alt. c̄ silicification. wk dis cpy.
800.3	806.6	6.3		.26				94	2.58							.26			1										wk	md	2	15	3	wk		QTZ-cpy veinlet	65°	Md-ST alt, c̄ silicit. cpy dis. and in thin QTZ veinlets
806.6	815.0	8.4		.21				100	2.63							.21			1										wk	md	1	15	5	wk md		cpy veinlets	60°	silicification varies. wk-md 2nd kspar. Several thin cpy veinlets
815.0	824.1	9.1		.18				98	2.55							.18			1										wk	md	2	10	4	wk md		QTZ veins	20-70°	less silicification. wk-md alt. c̄ 2nd Kspar
824.1	834.5	10.4		.18				97	2.64							.18			1										wk	md	2	10	4	wk md				As above
834.5	843.4	8.9		.29				96	2.61							.29			1										wk	md	2	10	4	wk md				mdly sheared c̄ broken: 8?' 8?7-843.4
843.4	852.7	9.3		.16				93	2.60							.15			1										WK	mod	2	10	4	WK md				Fault: 844.0'-845.2'. Otherwise as above.
852.7	862.3	9.6		.11				87	2.62							.11			1										mod	mod	3	12	3	wk				Mod alt. Slight incr. in silicit.
862.3	873.1	10.8		.15				100	2.60							.15			½										mod	mod st	2	12	3	wk mod				As above. Decr. in py content.
873.1	886.4	13.3		.15				97	2.61							.15			1										wk mod	mod	4	10	4	wk mod				WK-mod alt. Last foot of int. incr. of vein qtz with qtz x'tals lining vugs
886.4	895.5	9.1		.26				99	2.64							.26			1										wk MOD	MOD	5	15	4	MOD		QTZ VEINS	40-70°	2ND POTASH ALT. of GROUNDMASS THIN QTZ. VEINLETS. QTZ XTLS. LINING VUGS
895.5	903.3	7.8		.18				90	2.62							.18			1										wk MOD	MOD	2	10	4	wk MOD		FAULT	40°	QTZ. VEIN DIMINISH. FAULT w/ gouge AT 900.7'
903.3	911.8	8.5		.18				76	2.56							.18			1-2										wk MOD	MOD	1	10	4	wk MOD		FAULT	45°	FAULT @ 909.3', THIN PYRITE VEINLETS, ROCK CHANGE BELOW FAULT, FINER GROUNDMASS, Porphyritic.
911.8	920.3	8.5		.17				88	2.65							.17			1										wk MOD	MOD	2	10	3	MOD		FAULT	50°	QTZ VEINLETS 30°-70°, 2ND K-SPAR ALT of GROUNDMASS,
920.3	926.6	6.3		.22				100	2.61							.22			1-2										wk MOD	MOD	5	15	4	MOD		QTZ. VEINLETS	30-70°	NUMEROUS CROSSCUTTING QTZ. VEINLETS. CPY & PYRITE IN QTZ. VEINS.
926.6	935.6	9.0		.12				94	2.59							.12			1-2										wk	md	3	10	3	md	Dike?			Texture from 927.2-931.6 is porphyritic with large, light colored, scattered phenocrysts in gray groundmass. Rest of interval is medium grained equigranular.
935.6	944.3	8.7		.18				96	2.63							.18			1-2										wk	md	1	15	4	md				medium grained, equigranular. 2nd kspar alt of groundmass. dis cpy
944.3	950.7	6.4		.17				86	2.64							.17			1-2										md	md	1	15	4	md				As above, sericite along thin sulfide veinlets
950.7	959.6	8.9		.38				100	2.63							.38			1-2										md	md	1	15	4	md		CPY V. 0.1"	60°	As above
959.6	967.3	7.7		.20				96	2.63							.20			1-2										md	md	1	15	4	md		Fault 965.?	70°	As above. wk silicification near end of interval
967.3	976.7	9.4		.18				93	2.64							.18			1-2										md ST	md ST	2	15	4	md ST				texture partially destroyed by zones of alt. c̄ silicification
976.7	985.6	8.9		.27				91	2.55							.27			1-2										md ST	md ST	1	15	4	md ST		Fault		As above, md-stly broken, fault gouge: 982.6-982.7
985.6	992.7	7.1		.22				96	2.61							.22			1-2										md	md	5	15	4	md ST				steep irregular white vein qtz with blebs of sulfides,
992.7	1001.5	8.8		.14				100	2.65							.14			1										wk md	md	1	10	4	md ST		QTZ-sulf. veins	55°, 75°	3-1/8" py-cpy veinlets. wkly fractured. md-st alt
1001.5	1010.6	9.1		.16				94	2.65							.16			1										md	md ST	2	10	4	md				md-stly broken, alt. of plag. to green clay min.
1010.6	1018.6	8.0		.18				95	2.62							.18			1										wk md	md ST	2	10	6	md				st chlorite ass. w/ irregular zones of aplite like rk.
1018.6	1030.9	12.3		.07				90	2.70							.07			1										md	md	15	20	3	ST				braided irregular qtz veins. ST potash alt. of groundmass
1030.9	1040.9	10.0		.04				87	2.63							.04			1										MD	MD ST	3	15	3	ST				BADLY BROKEN; ST. POTASH ALT. of GROUNDMASS.
1040.9	1045.9	5.0		.04				92	2.53							.04			1										MD	ST	3	15	3	ST				AS ABOVE; NUMEROUS "SLICK" SURFACES.
1045.9	1055.3	9.4		.03				93	2.63							.03			1-2										MD	MD	10	15	2	ST		QTZ. VEINS	45°	CROSS-CUTTING QTZ. VEINS, ONE SET w/ PY., OTHER BARREN, ST. K-FELD. ALT.
1055.3	1064.3	9.0		.03				93	2.76							.03			1										MD	MD	5	15	3	MD ST		HIGH ∠ SHEARS	80°	LOWER HALF BROKEN BY HIGH ANGLE SHEARS FILLED w/ qtz veins & py.
1064.3	1074.0	9.7		.13				71	2.67							.13			1										MO	MD ST.	4	10	3	MD ST.		CAVING?		BROKEN BY HIGH ∠. SHEARS FILLED w/ PY.; SOME CAVING ? 1072-1074.
1074.0	1082.4	8.4		.06				100	2.66							.06			1										MD	MD ST.	5	10	3	MD ST.				THIN, HIGH ∠ FRACTURES FILLED w/ PY; ST K-FELD. ALT. of GROUNDMASS.
1082.4	1090.5	8.1		.10				91	2.96							.10			2										MO	MD ST.	4	10	3	MO		PY VEIN ½-¾" THICK	70°	PY VEIN w/ TRACE COVELLITE @ 1089., MOD. K-FELD. ALT., HIGH ∠ FRACT. w/ PY.
1090.5	1100.1	9.6		.25				89	2.89							.25			2										md	md	3	15	3	md	MZ 1094.8 SP? 1100.1	½" QTZ PY CPY vein	73°	Fine grained, stly altd, silicified rock from 1094.8-1100.1 may be SP
1100.1	1113.0	12.9		.19				82	2.62							.19			1-2						Tr				md	md	2	12	3	md ST	MZ			mdly broken, 2nd kspar alt of groundmass, st sericite along sulf. veinlets
1113.0	1122.0	9.0		.23				86	2.63							.23			1-2										MD	MD	10	15	3	MD	MZ	QTZ VEINS	40°-70°	NUMEROUS CROSS-CUTTING QTZ. VEINS (40°-70°) FINE GR. GRAY ROCK IN SOME FRACT. ON EDGE of QTZ. VEINS.
1122.0	1131.4	9.4		.14				95	2.66							.14			2										MD	MD	3	10	3	MD		QTZ VEINS	70°	cpy & py on 70° QTZ VEINS.
1131.4	1138.7	7.3		.07				74	2.62							.07			1										MD	MD	3	10	3	MD ST.		SULF. VEINLETS	70°	AS ABOVE. 2nd K-FELD ALT. INCREASING
1138.7	1147.1	8.4		.11				94	2.64							.11			1										md	md ST	3	10	4	wk md	MZ			stly altd. clay alt exceeds kspar alt. numerous thin QTZ-sulf. veinlets
1147.1	1153.7	6.6		.11				85	2.68							.11			1										md	ST	2	10	4	md		Fault	≈70°	Fault gouge: 1153.3-1153.6 strongly sheared c̄ broken
1153.7	1165.0	11.3		.05				73	2.59							.05			½-1										MD	MD ST	2	10	4	wk MD	MZ			wk-MD silicification of a few sections of core, BARITE LINING SOME 45° JOINTS
1165.0	1170.2	5.2		.06				98	2.64							.06			1										MO	MD ST	2	10	4	wk MD	MZ	JOINTS	~80°	High ∠ Joints filled w/ py/cpy; clay alt. MD-ST.

PRELIMINARY GEOLOGIC LOG
(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Note (3)
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Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. F-160
Page 4 of 4 Pages
Collar Elev. 2664.30 Final Depth 1500.0
Coords. N 20,646.85 E 27,731.34
Inclination vertical
Logged by L.J., RE
Date: Start 7-29-68 Finish 9-15-68

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green		Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem.	Spec.	Other (2) Galena	Sphal.	Molyb.	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	2ND K-SPAR	SULFITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
1170.2	1179.8	9.6		.09				84	2.66							.09			1									MD	MD ST	3	10	4	MD		MB	FROM 1178. Joints	50° 40-50°	Joints filled w/ py/cpy; clay alt. MD - ST.
1179.8	1188.5	8.7		.06				99	2.64							.06			1									WK	WK MD	2	15	2	WK	4				silicification increases to MD @ 1183.1'
1188.5	1196.9	8.4		.07				97	2.61							.07			1-2									WK MD	WK MD	4	15	3	WK MD	2		py/cpy vein	~70°	py/cpy veins @ 1189 ~ ½"; barren lining 50° joints. qtz. veins // to 70° joints.
1196.9	1205.8	8.9		.06				95	2.64							.06			1-2									WK	MD	4	15	3	WK MD	3		qtz/py veins	~70°	wk-MD silicification of groundmass, py lining high ∠ fractures.
1205.8	1214.7	8.9		.07				88	2.65							.07			1									WK	MD	2	10	3	WK MD	2		py/cpy veins	~70°	As above, py-cpy lining high ∠ fractures; py/cpy > 1
1214.7	1220.6	5.9		.05				96	2.63							.05			1-2									WK	MD	3	15	2	WK MD	3		qtz/py veins	~60°	Braided qtz-py veins in lower half of interval; MD silicification of upper half.
1220.6	1229.7	9.1		.07				99	2.73							.07			1-2									WK	MD	3	15	3	WK	2		py/cpy veins (thin)	~60°	py/cpy veins (thin). py/cpy = 1.
1229.7	1238.7	9.0		.06				85	2.69							.06			2									WK MD	MD	3	15	3	WK	2		qtz, py veins	~70°	qtz-py veins up to ½"; Also thin py. veins // to qtz. veins.
1238.7	1247.7	9.0		.09				100	2.63							.09			1									WK MD	MD	3	15	2	WK MD	3		qtz. vein	~70°	qtz. vein ½ - 3/4" thick; py filling high ∠ fract., 2ND K-spar mostly on fract.
1247.7	1256.0	8.3		.11				100	2.49							.11			2									MD	MD ST	4	15	3	WK MD	2		"	"	increase in no. qtz veins; py filling " " " & cavities // fract.
1256.0	1264.0	8.0		.11				92	2.79							.11			2									MD	MD ST	4	15	3	WK	1		"	"	Tr. cpy.; py in thin, high ∠ fract.; amnt. increases in large qtz veins.
1264.0	1272.5	8.5		.11				87	2.66							.11			2									MD	MD ST	3	15	3	WK MD	1		fault zone 1269.5-1272.5		core broken in fault zone, gouge; as above
1272.5	1280.8	8.3		.13				95	2.64							.13			1									md	md	3	15	3	WK	2				Mly broken. As above
1280.8	1287.9	7.1		.07				94	2.61							.07			1									WK	md	2	15	4	m	<1		qtz-py vein	50°	wkly broken, md 2nd k-spar alt of groundmass
1287.9	1296.9	9.0		.08				99	2.66							.08			2									wk	md	4	17	4	md	1		qtz-py veins	55°-70°	Several ¼"-½" qtz-py veins. Alternating zones of 2nd k-spar; silicification
1296.9	1305.5	8.6		.07				81	2.63							.07			1									wk	md	1	20	4	wk	1				Stronger silicification, stly broken: 1302.0-1305.5
1305.5	1313.2	7.7		.04				87	2.74							.04			½									ST	ST	1	15	4	ST	1				core badly broken & fractured, 2ND k-feld st., clay alt. st.
1313.2	1322.8	9.6		.06				80	2.50							.06			1									MD ST	MD ST	1	15	3	ST	1		core broken to 1320.1		As above to 1320.1; rest solid w/ decrease in alt.; py in 50° joints.
1322.8	1331.3	8.5		.05				96	2.64							.05			1									MD ST	MD ST	1	15	2	MD ST	2				MD-ST alt., some py on 50° joints
1331.3	1338.7	7.4		.05				70	2.63							.05			1									MD	MD	1	15	3	MD	1				Largely broken core; tr. cpy.
1338.7	1346.4	7.7		.10				99	2.57							.10			1									MD	MD	2	15	3	MD ST	<1				As above; numerous "slick" surfaces
1346.4	1355.2	8.8		.07				85	2.59							.07			½-1									MD ST	MD ST	1	10	3	ST	<1				Largely broken; tr. cpy; tr. calcite on joint surfaces.
1355.2	1364.2	9.0		.09				96	2.64							.09			1						Tr			MD	MD	1	15	2	MD	2		py veins	60°-80°	Alt. intensity decreases; py filling joints.
1364.2	1370.7	6.5		.06				93	2.67							.06			1-2							1		MD	MD	1	15	4	WK MD	<1		py veins	10°-80°	calcite (caliche) on fractures. py filling near horizontal & high ∠ joints, broken in lower 2 ft.
1370.7	1378.7	8.0		.04				98	2.63							.04			1							1		MD	MD	1	15	3	MD ST	—				core partly broken, caliche coating on most of joint & broken surfaces.
1378.7	1387.2	8.5		.03				95	2.68							.03			<1							1		MD	MD	2	15	3	MD ST	<1		calcite rep. veins	70°	core broken, caliche filling joints & coating surfaces, py on "slick" surf.
1387.2	1397.5	10.3		.05				80	2.39							.05			1							1		MD SD	MD ST	1	10	3	ST	—				core badly broken; caliche & calcite xtls filling & coating joints & surfaces.
1397.5	1407.7	10.2		.03				91	2.75							.03			<1							Tr		MD	MD	3	15	3	MD	<1		thin qtz veinlets	50-70°	Alt. intensity decreases; py generally on joint surfaces; some "slicks"
1407.7	1417.0	9.3		.03				99	2.66							.03			1									MD	MD	3	15	3	MD	<1		close-spaced fractures	70°	Thin py veinlets filling close-spaced fractures.
1417.0	1426.0	9.0		.06				100	2.65							.06			1							Tr		MD	MD	2	10	2	MD ST	2				py veinlets filling 80° joints, 2ND K-spar MD.
1426.0	1434.3	8.3		.06				96	2.67							.06			2							Tr		MD	MD	3	15	2	MD	2		close spaced shears	85°	py filling close-spaced, high ∠ shears; numerous "slick" surfaces
1434.3	1443.4	9.1		.06				100	2.64							.06			1									MD	MD	4	15	3	MD	1		qtz-py veins	80°	Thin py veinlets & qtz veins on high ∠ joints.
1443.4	1449.0	5.6		.05				81	2.69							.05			2							1		MD	MD	4	15	3	MD	1		"		As above; numerous "slick" surfaces, calcite (caliche) lining fract. surf.
1449.0	1457.0	8.0		.06				100	2.65							.06			1							1		MD ST	MD ST	3	15	3	WK MD	1	MZ	fractures & joints	60-80°	py as fracture fillings & on walls of qtz. veins; caliche on joint & fracture surf.
1457.0	1465.8	8.8		.03				96	2.68							.03			1-2							<1		MD ST	MD ST	2	15	2	WK MD	2		fracture	90°	py as fract. & joint fillings.
1465.8	1474.4	8.6		.03				97	2.66							.03			1							1		ST	ST	2	15	3	ST	1				As above; alt. intensity increasing.
1474.4	1485.5	11.1		.04				93	2.65							.04			1							<1		MD ST	MD ST	3	15	2	WK MD	2		qtz-py veins	70°	py as fract. fillings & in qtz. veins, some calcite filling joints.
1485.5	1495.5	10.0		.10				91	2.65							.10			1							—		WK	WK	3	20	2	md	<1				md silicification, sulfides in qtz veins and on fractures.
1495.5	1500.0	4.5		.10				98	2.67							.10			1							—		WK	WK	1	15	1	WK MD	1				MD silicification, as above.

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Note (4)
V - Vein
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C - Contact
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Hole No. F-161
Page 1 of 2 Pages
Collar Elev. 3065.22 Final Depth 471.3
Coords. N 28,329.22 E 27,759.78
Inclination Vertical
Logged by L.J., RE
Date: Start 9-17-68 Finish 10-12-68

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Mal. N.S.	Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0-7.0 / 7.0	7.0 / 16.3	7.0 / 8.3	RK bit	.02				73						.02						ST.								ST	ST.	-	15-20°	-	MZ			ST. clay & SERICITE ALT. ≈ 15-20% qtz AS GRAINS.; STRONG hemitite STAIN.; TR. LIMON.
16.3	25.5	9.0		.02				71						.02						ST								ST	ST	-	15	-				as ABOVE.
25.5	34.2	8.7		.01				97						.01				md		ST								md	ST	1	20	-				ST. Jarosite, st. hem staining of groundmass. Grain size varies fine to coarse
34.2	43.0	8.8		.01				88						.01				md / ST		ST.								md	ST.	1	20	-				As above, Jarosite, bright red lim on fractures
43.0	50.4	7.4		.01				87						.01				ST		ST								md	ST	4	15	-	BX	leached veins	80°	Brecciated and gouggy, ST Jarosite
50.4	61.1	10.7		.01				71						.01				ST		ST.								ST	ST	2	5?	-	50.4-60.4 SP?	Leached veins	70°-90°	Much weaker Jarosite. Sulfide veinlets. BX to 60.4 followed by stly altd, v f.g. intrusive w/k. Many thin leached
61.1	71.2	10.1		Nil				74										ST		ST								ST	ST	2	5?	-				stly broken to 66.9. ST. Alteration, original sulfides ≈ 5%. Some buxwork filled with live limonite.
71.2	81.2	10.0		.01				87						.01				ST		ST								ST	ST	3	6	-				stly broken 80.2-81.2
81.2	90.1	8.9		.02				100						.02				ST.		md								ST	ST	3	12	-				" " Sericite altd veins cut hematite stained groundmass.
90.1	98.6	8.5		.03				85						.03				ST.		ST.								ST	ST	4	8	-		leached veinlets	50°-80°	" " md-st silic., live limonite in veins and breccia zones
98.6	108.0	9.4		.03				79						.03				ST		ST								ST	ST	3	6	-				" " stly bleached, stly broken, live lim.; some Jarosite
108.0	116.8	8.8		.03				99						.02	.01			md<1		md								ST	ST	3	6	-				" " Numerous thin Jarosite filled veinlets, hem stained G.M.
116.8	122.0	5.2 / 2.0		.06				72					.02		.04			Tr	1-2	-								ST	ST	2	5		Sulfides SP?			Mixed interval w/k py & cc. ST Jarosite
122.0	131.2	9.2		.24				91					.02		.22			Tr.	1									ST	ST	3	6			close-spaced qtz-sulf. veinlets 40-60		Fine disseminated py & cc. Bleached stly altd Ground Mass
131.2	140.1	8.9		.24				76					.02		.22			—	1									ST	ST	2	5			close-spaced fract. "		fine ~~d~~ py & cc on qtz-veins.; REST AS ABOVE.
140.1	149.3	9.2		.31				82						03	.28			md / ST	1	Mo								ST	ST.	2	5			limon. on some fract. "		py & cc on fract. & finely disseminated., local ST. MIN. developed; bleached & f.g. GM.
149.3	158.3	9.0		.10				100							.06	.04		Tr	3	-								ST	ST	2	5			Py veinlets	50-70	ST. finely disseminated Py, mostly unreplaced., stly altd f.g. SP?
158.3	166.5	8.2		.26				91					.02		.24			—	3	-								ST	ST	2	5					As above, stly broken. Thick $CuSO_4$ on fractures
166.5	176.7	10.2		.38			.02	74						.02	.36			—	4	-								ST	ST	-	5		SP?			v. stly broken & altered, w/k cc replacement of steep Py veins
176.7	185.9	9.2		.96			.03	84						.03	.93			wk	15	-								ST	ST	5	7		BX (Massive Py)			Broken qtz vein 176.7-177.7. Followed by BX; gouge to 179.7. Massive Py 184.0-185.4. yellow-brown lim on fractures
185.9	190.3	4.4		.14				92						.03	.11			md	5									ST	ST	-	3		SP? Gouge			massive py & cc. 188.1-188.3. Gouge 188.6-189.3.
190.3	200.5	10.2		.88	56.1 @ 0.5	.01		63						.01	.87			—	?									ST	ST	-	1		MAJOR FAULT			broken & altd SP? Fault Gouge 190.5-196.5. (except for 192.3-192.9) followed by stly
200.5	207.0	6.5		.31	0.6		0.02	88						.01	.30			—	4									ST	ST	3	5		SP? BX	Shears	60°	Soft, stly altd, broken and gouggy
207.0	216.4	9.4		.34		.02		87						.02	.30	.02		—	1									ST	ST	1	3		SP?			fine grained, stly altd, stly broken. w.k. cc
216.4	224.5	8.1		.50		.02		100						.02	.46	.02		—	5									ST	ST	1	3			Py veins	80°	steeply dipping (~80°) massive py veins with some cc. 214-224.5
224.5	233.4	8.9		.43		.02		82						.02	.41			—	2									ST	ST	-	3					stly altd, f. broken, cc. replacement of thin Py veins
233.4	242.3	8.9		.14				95							.14			—	1-2									ST	ST	-	3					mdly broken, as above
242.3	251.2	8.9		.29				90							.29			—	1									ST	ST	-	3					stly broken, decreasing py & cc
251.2	260.7	9.5		.15				88							.15			—	1									ST	ST	1	3					" " , becoming coarser grained. w/k-md cc replacement of Py
260.7	269.9	9.2		.13				87							.13			—	1									ST	ST	Tr.	4					" " , soft, stly altd, as above
269.9	281.8	11.9		.17				80							.17			—	1									ST	ST	md-md	20		SP? 273.4			md-st silicification 274.0-279.4. BX & gouge: 279.4-281.8
281.8	291.7	9.9		.15				78							.15			—	1									ST	ST		10		BX 288.0			BX to 288.0 followed by mdly silicified SP? with dis py & cc
291.7	300.6	8.9		.34				100							.34			—	1									ST	ST		10		SP?			mdly broken, stly altd & sil., w/k cc.
300.6	310.0	9.4		.31				98							.31			—	1									ST	ST	2	5			Fault 306.8	70°	Broken and gouggy 304.0-306.8
310.0	316.0	6.0		.34				91							.33	.01		—	1									ST	ST	2	5					stly broken to 311.3., stly altd. w/k visible cc.
316.0	326.0	10.0		1.32	19.1 @ 1.24		.04	76						.04	1.88			—	2-3									ST	ST	-	3					v. stly. altd, f. gouggy 319.4-324.5. py veinlets replaced by cc
326.0	335.1	9.1		.51			.01	94						.01	.47	.03		—	5	Tr.								ST	ST	1	5			Py veins	50°	massive py w/ cpy: 326.0-326.3; 327.3-327.6. spotty silicification
335.1	343.2	8.1		.26				99							.23	.03		—	1	-								ST	ST	1	5					stly broken, and altd. Bands of silicification
343.2	351.9	8.7		.12				94							.09	.03			1									ST	ST	1	5					As above
351.9	361.3	9.4		.18				86							.13	.05		—	1									ST	ST	2	5			Shears	50°-80°	As above
361.3	370.9	9.6		.08				93							.04	.04		—	1									ST	ST	1	5					As above, w.k. c.c. persists
370.9	383.8	12.9		.12				86							.09	.03		—	1									ST	ST	1	5					As above, stly broken & altd, silicification spotty
383.8	393.6	9.8		.06				85							.03	.03		—	1									ST	ST	2	5					core broken & ART.; silicification spotty; TR. cc. covering py. ~~d~~ grains.

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Hole No. F 61
Page 2 of 2 Pages
Collar Elev 3065.22 Final Depth 471.3
Coords. N 28,329.22 E 27,759.78
Inclination vertical
Logged by R.E. Allen
Date: Start 9-17-68 Finish 10-12-68

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green		Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem.	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE			(3) Rock Type	Structures (4) Depth	True Dip	Remarks
402.3	412.0	9.7		.13				83							.10	.03		-	1										ST	ST	3.6					SP?			STL. BROKEN & ALT.; py VEINS replaced & COATED w/ CC. BANDS of silicification
412.0	421.0	9.0		.08				87							.07	.01		-	1										ST	ST	1.5						85°		CC. replacing & COATING py. VEINS.; fine dissem. py cubes coated w/ cc. in SHEARS.
421.0	431.7	10.7		.07				86							.05	.02		-	2										ST	ST	1.5								ST. & BROKEN & gouge 423.-430.8'; AS ABOVE. 2nd Kspar phase TR K-spar fills AT base
431.7	445.0	13.3		.02				86							.01	.01		-	2										ST	ST	.5						"	80	AS ABOVE to 436.0., MASSIVE PY. VEINS ALONG FRACT.; CC. REPLACING GARTS of py. VEINS IN GOUGE PACK
445.0	453.8	8.8		.04				97								.04		-	1										ST	mod	1.5								mdly broken & altd. Fresh Kspar (2nd?) w/ dis py
453.8	462.0	8.2		.03				97								.03		-	1										mod	mod	1.6								mod-stly broken & silicified.
462.0	471.3	9.3		.06				100							.04	.02			1										ST	ST	2.6								stly broken, altered & silicified
	EOH																																						

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. F-162
Page 1 of 2 Pages
Collar Elev 3153.14 Final Depth 525.9
Coords. N 28,532.15 E 28,571.02
Inclination Vertical
Logged by RE, LV
Date: Start 10-24-68 Finish 11-9-68

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Unknown NS	Cc.	Cpy.	Cov. Nitr. Born	Fe (2) Lim.	Py.	Mag.	Hem. Spec.	Other (2) Galena	Sphal.	Molyb.	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz.	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0	20.0	20.0																																		Some stly altd NC Core, exact depth not certain.
20.0	29.8	9.8		.05				88	2.57					.05				ST		ST								V ST	ST 2	10	-		SP?	veinlets	70-90	Fine grained, stly altd, numerous steep leached veinlets.
29.8	41.7	11.9		.02				79	2.38					.02				ST		ST								V ST	ST 3	10	-			"	"	Texture varies from fine grained to porphyritic. st live lim.
41.7	48.6	6.9		.01				100	2.65					.01				ST	Tr	ST								V ST	ST 1	10				"	"	As above ST live limonite. remnant dis py
48.6	57.0	8.4		.03				90	2.67					.03				ST	Tr	ST								V ST	ST -	10				"	"	f.g., stly altd. mixed limonites & sulfides (py, cpy, born)
57.0	65.9	8.9		.02				87	2.71					.02	Tr			ST	Tr	ST								V ST	ST 2	10						Completely leached thick veins 57.0-63.0, partially leached sulfs. 57.0-65.9
65.9	70.8	4.9		.03				83	2.67					.03	Tr			ST	Tr	ST								V ST	ST 3	10			70.8 sulfides	braided veinlets	90°	ST oxidation, numerous boxwork & live limonite.
70.8	75.6	4.8		.10				95	2.76						.09	.01		wk	2	wk								ST	ST 2	10						Sharp decrease in oxidation @ 70.8 followed by st dis. sulfides
75.6	85.2	9.6		.02				91	2.68					.01	.01			md	1/2	md								V ST	ST 1	10						Mixed sulfides & limonite. Red & black smeary crusts on fractures
85.2	93.6	8.4		.02				88	2.61					.02	Tr			ST	Tr	md								V ST	V ST -	5						v. stly altd., almost completely oxidized
93.6	101.4	7.8		.09				95	2.71					.02	.07			ST	1	md								V ST	V ST	5	10			py veins	70°	red brown color with "mud crack" structure. About 1/2 sulfides remaining. Unusual limonitic residue on fractures
101.4	111.1	9.7		.02				95	2.35					.02				ST	Tr	ST								V ST	V ST 2	7						almost completely leached. excellent live limonite development
111.1	120.2	9.1		.08				98	2.44					.02	.06			md ST	1-2	md								V ST	V ST <1	5						≈ 2/3 sulfides remaining. good c.c. development
120.2	128.8	8.6		.22				100	2.43					.02	.20			wk	2	—								V ST	V ST 1	5						st c.c. decrease in oxidation.
128.8	137.6	8.8		.05				87	2.61					.01	.04			ST	1	md								V ST	V ST 2	10				leached veins	40°-45°	smeary red & black crusts. Complete oxidation of most veins with st live limonite and oxidation on few fractures, st sulfides. mineralized cemented Bx
137.6	147.2	9.6		.16				84	2.80					.01	.15			wk	4	—								V ST	V ST 3?	12						
147.2	151.3	4.1		.26				97	2.73					.01	.25			wk	1	Tr								V ST	ST -	5						137.6-147.2 wk oxidation, dis sulfides
151.3	159.4	8.1		.17				100	2.72						.16	.01		Tr	2	—								ST	ST 5	10			Partial Oxidation			No oxidation, massive quartz veins 155.0-159.0
159.4	167.5	8.1		.04				98	2.73						.04			wk	2	—								ST	ST 2	10				QTZ veins	35°-50°	massive, few joints. wk oxidation, some silicification
167.5	176.6	9.1		.05				93	2.76						.05			wk	2	—								ST	ST 2	10				py veins	50°	c.c. on dis py. st oxidation & live lim on some fractures. By veins wkly oxidized
176.6	186.1	9.5		.08				87	2.84						.08			md	1	—								ST	ST 2	10				leached veins	55-80	steep stly & oxidized veins and fractures.
186.1	195.1	9.0		.08				91	2.77				Cu 50%		.04		.02	md	2	—								ST	ST 1	10						1/2" faults with Bx fragments cemented by alunite 189.0-195.0
195.1	202.7	7.6		.17				100	2.75					.01	.15	.01		wk	2	—								ST	ST 1	10						Modly broken, wk oxidation along fractures. numerous small qtz veins.
202.7	211.5	8.8		.35				100	2.65					.02	.33			wk	2	—								ST	ST 1	10						As above, TR. cc. coating pyrite grains in veins
211.5	220.2	8.7		.34				96	2.69					.02	.29	.03		—	2	—		TR						ST	ST 3	10				QTZ veins	40-60	No lim., chrysocolla in some vuggy qtz. veins., TR. clay in thin veins; TR. cc. coating py.
220.2	228.7	8.5		.29				89	2.73					.03	.25	.01		—	3	—								ST	ST 2	10			Sulfides	SULF. veins	40°	Modly. broken.; cc. coating & replacing py. veins.
228.7	237.4	8.7		.23				91	2.76					.04	.18	.01		—	2	—								ST	ST 2	10						Stly. broken, cc. coating py.
237.4	251.2	13.8		.33				57	2.74					.04	.27	.02		—	2	—								ST	ST 2	10						St. broken; as above; TR. chrysocolla. Alunite filling fractures.
251.2	259.1	7.9		.33				100	2.72					.02	.29	.02		—	2									V ST	ST 1	8						Stly altd., fine to medium grained, porphyritic. dis c.c.
259.1	268.0	8.9		.28				99	2.74					.01	.26	.01		—	2									V ST	ST 1	8	Tr			QTZ & HV.	50°	Tr of cpx. About 1% hydromica, st alt of groundmass
268.0	277.1	9.1		.11				99	2.57						.11			—	2									V ST	ST 3	10	-					As above
277.1	284.2	7.1		.10				100	2.79						.10			—	4									V ST	ST 3	10			BX			Bx intruded by QTZ veins and irregular py veins with hydromica
284.2	293.3	9.1		.29				89	2.78						.29			—	7									V ST	ST 5	15			BX			Bx cemented by sulfides and irregular white qtz veins.
293.3	301.4	8.1		.08				100	2.67						.08			wk	1									ST	md 25	30						Jarosite & live lim on fractures. Numerous thick, irregular QTZ veins
301.4	309.4	8.0		.16				80	2.69						.16			—	5									md	md 15	20			BX			Angular to subrounded Bx fragments in a matrix of sulfides & qtz. Numerous thin irregular crosscutting qtz veinlets
309.4	320.1	10.7		.12				85	2.74						.12			wk	7									md	md 20	30			BX			ST cpx replacing matrix in pods 1"-2" diameter. lim on fractures
320.1	330.7	10.6		.04				84	2.69						.04			wk	3									md	md 30	55			BX QTZ vein 324.0			QTZ vein 324.0- . As above 320.1 to 324.0.
330.7	338.8	8.1		.28				100	2.74					.04?	.24			wk MO	2									MO	ST 40	60			335 SP BX			As above, cc replacing SULF, lim. on fract.
338.8	349.0	10.2		.16				77	2.54						.16			wk	2									MO	ST 20	30			338.8 ST?			Stly broken, Bx t. 348.0 st. clay alt., cc veins & coating sulf., SP? is cpx & qtz phase. cc coating py. TR. lim on fract. TR oxides.
349.0	360.4	11.4		.23				96	2.53						.23			wk	2									MO	MO 20	35			X? or MZ?			cpx qtz phase w/ numerous thin qtz. veins; clay alt MO. cc. coating py veins.
360.4	368.4	8.0		.26				100	2.51						.26			Tr	1									md	ST 3	8			"		"	As above. Short intervals of Bx. vuggy qtz veins
368.4	375.0	6.6		.10				82	2.78						.10			Tr	1									md	ST 25	30			"		"	Vn QTZ 369.0-369.3; 371-372. Stly brkn vn QTZ 373.5-375.0
375.0	384.8	9.8		.12				66	2.46						.11	.01		—	2									md	ST 2	8			"		"	Cemented Bx as above. Stly broken
384.8	389.8	5.0		.15				38	2.45						.15			—	1									md	ST 25	30			"		"	As above, most core lost in hole

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO- SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. F-162
Page 2 of 2 Pages
Collar Elev 3153.14 Final Depth 525.9
Coords. N 28,532.15 E 28,571.02
Inclination Vertical
Logged by RE, LJ
Date: Start 10-24-68 Finish 11-9-68

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Unknown N.S.	Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem.	Spec.	Other (2) Galena	Sphal.	Molyb.	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
389.8	398.9	9.1		.48		.04		82	2.62					.04	.42	.02			1										st	st	1	7	-	Mz			Decrease in alt & brecciation shows definite Mz Texture
398.9	407.7	8.8		.52		.01		88	2.52					.01	.47	.04			1										md	st	1	10					wkly broken, large stly altd plag phenos in fresher matrix.
407.7	416.3	8.6		.34				88	2.84						.30	.04			1										md	st	1	12	-				Zones of mod silicification, Tr of 2nd K spar & hydromica
416.3	425.3	9.0		.29				97	2.46						.26	.03			1										md	st	1	10	-				wkly broken, stly altd As above
425.3	435.1	9.8		.28				91	2.53						.25	.03			1										md	st	-	15	-				mod silicification and/or recrystallization dis sulfides w/wk cc
435.1	445.7	10.6		.33				89	2.38						.30	.03			1										md	st	-	10					S.S. and covellite replacing dis grains of cpy. Tr of 2nd Kspar
445.7	454.0	8.3		.21				100	2.49						.18	.03			1										md	st	1	10					As above.
454.0	461.8	7.8		.10				100	2.52						.06	.04			1										md	st	1	10			Py veinlets	50°	As above. st clay alt. Tr of hydromica and 2nd Kspar
461.8	471.6	9.8		.11				52	2.58						.07	.04			1										md	st	1	10					" "
471.6	479.9	8.3		.10				73	2.55						.07	.03			1-2										md	st	-	10					wk cc on fractures.
479.9	486.2	6.3		.07				94	2.60						.03	.04			1										md	st	1	10			Fault	50°	fault 2483. indly broken and gouggy
486.2	494.5	8.3		.15				95	2.89						.11	.04			1										md	st	-	5	2				Groundmass becoming darker, less altd. wk cc. chlorite, hydromica
494.5	500.4	5.9		.16				91	2.77						.12	.04			1										md	st	-	5	1		Cpy veinlet	70°	st Alt. wk cc
500.4	509.2	8.8		.13				88	2.59						.08	.05			1										md	st	1	6	1				As above
509.2	517.4	8.2		.22				84	2.77						.18	.04			1										md	st	1	5	-				pernite coated cpy on fractures. Tr of cc
517.4	524.8	7.4		.10				85	2.80						.05	.05			1										md	st	-	5	-				stly bleached. No visible cc Gouge: 318-320
524.8	525.9	1.1		.08				92	2.72						.03	.05			1										wd	st	-	5	-				As above.
	EOH																																				

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO SILVER BELL

F-163

	1	2
	3113.26	521.5
	28,388.59	27,996.32
	Vertical	
	L.J.	
	10/30/68	11/1/68

From	To	Int'vl	Elev	Total % Cu	Avg	N/S	Avg	% Core Recov	Sp Gr	Cu min.	Unknown N.S.	Cc	Cov	Lim	Py	Hem	Other	Alteration	2nd K-feldspar	Zone	Structure	Remarks
~~0~~	~~5.0~~	~~5.0~~																				
5.0	15.8	10.8		.05				73	2.48		.05			ST	-	ST		ST ST 1 10		SP?	Lim. filled fract. 40-60°	ST. LEACHED CAPPING; LIM. filled fract. RIMMED BY BANDS of SERICITE; ST. SER. & CLAY ALT.
15.8	25.3	9.5		.04				84	2.37		.04			MD ST	-	ST		ST ST 2 10				ST. HEM. STAINING of GROUNDMASS., SOME LIM. filled FRACT. showing relic structure of py.
25.3	35.7	10.4		.03				[illegible]	2.40		.03			MD	-	ST		ST ST 2 10			Lim. filled fract. 50-80°	STLY. HEM. STAINED G.M. w/ 2 fine gr. phases @ 31.6-32.0' & 33.0-33.7'; some lim. filled fract.
35.7	45.9	10.2		.04				[illegible]	2.38		.04			MD	-	ST		ST ST 3 10		Oxides		STLY. HEM. STAINED G.M., FEW LIM. filled FRACT RIMMED w/ BANDS of SERICITE.
45.9	50.5	4.6		.30				98	2.60			.36		-	1	-		MD ST 2 10 TR.		SP? Sulfides		ENRICHED ZONE. COARSE gr.; ELONGATED TO LATH SHAPED feld xtls. w/ hint of flow structure.; CC. COATING fine PY. GR.
50.5	59.2	8.7		.45		.31		94	2.65	.01		.47		Tr	1	-		ST ST 1 5 -		60.2		stly sheared texture. cc. on dis py, & cpy
59.2	68.7	9.5		.09				94	2.52					ST	Tr	ST		md ST 1 10		oxides		stly oxidized; hem stained. No fault between oxides & sulfides
68.7	77.6	8.9		.15				93	2.52					ST	-	md		md ST - 5		77.6 sulfides		As above, Chrysocolla on fractures
77.6	86.5	8.9		.67		.03		93	2.56	.03		.64		wk	1	-		md ST - 5				dis sulfides, wk oxidation & chrysocolla on some fractures.
86.5	95.3	8.8		.40		.05		98	2.52	.05		.35		wk ST	<1	wk		md ST - 5		93.5 Oxides	Fault 93.0 40°	mdly broken & gougey. ST oxidation below 93.5
95.3	103.4	8.1		.04				100	2.36					ST	-	ST		md ST - 5				Completely leached. Soft, mdly broken.
103.4	112.3	8.9		.07				91	2.59					MD	-	ST		MD ST - 5				AS ABOVE., SOFT, MDLY BROKEN.
112.3	121.5	9.2		.04				98	2.45					MD ST	-	ST		MD ST 1 8				completely leached, MDLY BROKEN, MD. HEM. STAIN.; SOME LIM. ON FRACT.
121.5	129.7	4.2		.05				67	2.52			.05		WK MD	TR	MD		MD BT 1 5		Mixed sulf & leached		TR. fine. dissem. py w/ some cc. coating; lim. on some fract.; no faulting or bx. apparent.
125.7	136.9	11.2		.47		.03		100	2.91	.03		.44		-	2	-		MD ST 1 5		Sulfides	Mass. py vein 134.0-134.2 50°	cc. coating of some sulf. veins., some replacement,
136.9	148.4	11.5		1.25		.02		69	2.75		.02	1.23	TR	-	TR	-		MD ST - 5			Fault Bx 147?	STLY. BROKEN, CC. COATING PY IN TOP HALF., filling along bx & gouge.
148.4	159.0	10.6		.84		.02		81	2.75		.02	.82		-	1-2	-		MD ST - 5				MDLY BROKEN, CC. IN SULF. VEINS COATING PY. GR; ST. CLAY ALT.
159.0	168.5	9.5		.88		.02		100	2.55		.02	.86		-	1	-		MD ST - 5			Fract. w/ sulf 70°	COARSE gr. phase w/ TR. HYDROMICA? @ 159.0-160.0; 161.8-164.8; cc coating py in fract.
168.5	181.3	12.8		.64		.02		93	2.74		.02	.66		-	2	-		MD ST - 5			Mass. sulf. vein 178.5 60°	MD-STLY BROKEN, INCREASED PY., SOME CC. COATING PY.
181.3	190.2	8.9		.24				99	2.78			.24		-	4	-		WK MD MD 2 8			Mass sulf veins 50°	MASS. PY VEINS, STLY. OXIDIZED w/ WK TR. CC. COATING
190.2	199.8	9.6		.80		.02		80	2.85		.02	.78	TR	-	3	-	TR.	WK MD MD 2 6			Sulf. veins 40-60°	TR. MOLY; FEW CC. VEINLETS.; WK. CC. COATING of PY.
199.8	208.1	8.3		1.02		.02		92	2.80		.02	1.00	TR	-	2	-	<1	MD MD ST 2 6		SP? 205 MZ?	Sulf-cc. veins 60°	ST TR. MOLY. py & cc. veinlets. in MZ?; ROCK COARSE gr. w/ hydromica below 205.1; core broken.
208.1	217.4	9.3		1.65	183.0' @	.02	183.0' @	19	2.39		.02	1.63		-	2	-	-	ST ST 1 8		MZ?	Sulf-cc. veins 60-70°	STLY. BROKEN, CC. VEINLETS REPLACING PY.; AS ABOVE.
217.4	225.2	7.8		1.50	1.10	.02	.02	85	2.80		.02	1.48		-	2	-	-	ST ST 2 10		MZ?	Fault zone	STLY. BROKEN & SHEARED, CC VEINS & ALONG SHEAR ZONES.,
225.2	234.8	9.6		1.78		.03		90	2.44		.03	1.75		-	1	-	-	ST ST 1 10		MZ?		AS ABOVE., CC. INCREASED OVER ABOVE
234.8	243.6	8.8		2.01		.03		82	2.57		.03	1.98		-	1	-		ST ST 1 10		MZ?	cc. veins 60-70°	MDLY BROKEN., CC. IN VEINS & DISS.
243.6	252.6	9.0		1.24		.03		91	2.77		.03	1.21		-	1	-		WK MD MD 3 15		MZ	Qtz. py. cc. veins 60-90°	CC. REPLACING & COATING PY. in ASSOCIATED QTZ. VEINS.
252.6	262.4	9.8		1.47		.03		100	2.39		.03	1.44		-	1			WK MD MD 2 10		MZ	CC VEINS 90°	CC. VEINS. w/ SOME COATING of PY., ABNT. HYDROMICA.
262.4	271.7	9.3		2.75		.02		100	2.32		.02	2.25	.48		1			ST ST 2 10			" "	AS ABOVE, BUT CC DECREASING; COATING MORE ABNT. ST. SERICITE
271.7	279.0	7.3		.62		.03		81	2.46		.03	.59			TR.			ST ST 1 10			Fract. cc. veins 45°	MDLY. BROKEN, SOME CC. COATING.; TR. CU OXIDE.
279.0	288.7	9.7		.83		.05		91	2.68		.05	.78			1			ST ST 1 10			60-80°	MDLY BROKEN, THIN CC VEINS. & COATING of fine py xtls.
288.7	298.8	10.1		.57		.02		90	2.43	.02		.55			TR		TR	ST ST 1 10		MZ?	Major fault	VERY STLY BROKEN., VEINS OXIDIZED. TR. MOLY fine diss.; py finely diss.
298.8	308.7	9.9		.55		.02		87	2.46		.02	.53			<1		TR	ST ST 2 12		MZ?	Fault	AS ABOVE., FEW CC. VEINS.; STLY ARGILLIZED
308.7	317.9	9.2		.31		-		93	2.37			.31			<1			ST ST 1 10		MZ	Fault 312-316	STLY BROKEN 312-316., CC IN FAULT ZONE OXIDIZED, OTHER CC. REPLACING & COATING PY.
317.9	326.4	8.5		.33		-		97	2.34			.33			<1			ST ST 1 10	WK	MZ.		MDLY. BROKEN., AS ABOVE., 2nd K-SPAR ALT. WK-MD.
326.4	338.3	11.9		.15		-		73	2.42			.15			<1			MD MD 2 10	WK MD			CC. COATING ON fine py. gr. & AS REPLACEMENT filling in qtz-sulf veins.; CC. OXIDIZED.
338.3	346.9	8.6		.20		-		98	2.48			.20			1			MD MD ST 2 10	MD.			STLY. BROKEN 345-347, AS ABOVE.
346.9	356.5	9.6		.18		-		89	2.57			.18			1			MD MD ST 2 10	MD		Fract. 40-60°	cc localized on fract. & AROUND PY. GRAINS.; 2nd K-SPAR INCREASING
356.5	365.5	9.0		.33		-		95	2.58			.38			1			WK MD MD ST 3 15	MD ST.			AS ABOVE, ABNT. CC. INCREASED, CROSS-CUTTING qtz. VEINS; 2nd K-SPAR STAINED G.M.
365.5	374.9	9.4		.35		-		92	2.52			.35			1			MD MD ST 3 15	MD ST		Fract. 60-80°	AS ABOVE, good cc. filling fract.
374.9	384.2	9.3		.18				91	2.52			.18			<1			MD ST 1 10	MD ST		Fault zone 379.4-381.4	THIN VEINS CC., spotty.; 2nd K-SPAR SAME, Clay alt. INCREASED
384.2	393.2	9.0		.21				95	2.54			.21			<1			MD MD ST 2 15	MD ST.		Fract 20-90°	AS ABOVE, STLY. OXIDIZED CC. IN THIN VEINS., WK-MOLY. BROKEN
393.2	404.0	10.8		.32				100	2.50			.32			<1			MD MD ST 2 15	WK MD			MD-STLY. BROKEN 399-404, CC. ON FRACT. DECREASING.
404.0	414.0	10.0		.21				35	2.86			.21			<1			MD MD ST 2 15	WK MD			MD-STLY BROKEN, AS ABOVE.

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. F-163
Page 2 of 2 Pages

Collar Elev 3113.26 Final Depth 521.5
Coords. N 28,388.59 E 27,996.32
Inclination Vertical
Logged by L.J
Date Start 10/30/68 Finish 11/1/68

Depth From	Depth To	Int'vl	Elev	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov	Sp Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Unknown N.S.	Cc.	Cpy.	Born	Fe (2) Lim.	Py.	Mag.	Hem.	Spec.	Other (2) Galena	Sphal.	Molyb.	Calcite	Garnet	Silicates	Sericite	Clay	Vn Qtz.	QUARTZ	CHLORITE	2nd K-feldspar	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
414.0	423.5	9.5		.07				88	2.81						.07				1									wk MD	MD	2	15		wk	Mz	Fract.	45°	DECREASING AMNT. CC - ON FRACT. & SOME PY. QR.
423.5	432.8	9.3		.12				94	2.56						.12				1									wk MD	MD	3	18		MD		Qtz. Sulf. filled fract.	40-90°	one good qtz-py-cc. VEIN IN interval.; some cc. coating on py. grains.
432.8	441.8	9.0		.30				100	2.54						.30				1									ST	VST	1	10		MD		MDLY & FAULT 432.8-438.8		FAULT gouge 432.8-438.8 v. st. clay alt.; no visable cc. in gouge.; 2ndary K-spar MD. in solid part.
441.8	450.5	8.7		.46	2.77 @ 0.53	.01	0.01	100	2.50					.01	.45				1									MD ST	MD ST	2	15		MD		438.8-442.8 SULF. filled fract.	70°	MDLY. BROKEN, MZ. ALTERNATING w/ THIN SECTIONS DK. GRAY, FINER GR. ROCK (SP?) SOME CC ON FRACT.
450.5	460.8	10.3		.64		.01		80	2.53					.01	.65				1					Tr.				MD ST	ST	2	15		ST.				CC. spotty, but present on most fract. & finely dissem.; MZ. ALTERNATING w/ thin sect. SP.
460.8	469.5	8.7		.45		.01		94	2.51					.01	.44				1									MD	MD ST	2	15		wk MD		SULF. filled fract.	60-80°	THICK cc. filled fract.; CC IN small gouge ABOVE @ 465.2'
469.5	478.9	9.4		.12				89	2.63						.12				1									MD	MD ST	2	15		MD ST	Mz			MDLY. BROKEN, CC LESS THAN ABOVE, spotty, on FRACT.
478.9	484.4	5.5		.15				65	2.66						.15	Tr.			1									MD	MD	1	8		wk MD	SP ?			MDLY. BROKEN, CC. spotty, VEIN of PY. NEAR BASE.
484.4	493.7	9.3		.23				33	2.64						.23				2									MD	ST	-	5		wk	?			Texture destroyed by shearing & alteration, Tr. of C.C.
493.7	498.0	4.3		.25				93	2.77						.25				1									MD	ST	Tr.	5		—	MZ & SP SP	3973	25°	Mixed, broken interval of MZ and SP
498.0	508.9	10.9		.26				78	2.63						.26				1									wk	ST	1	5	—	wk	MZ & SP	5080 Fault?	80°	SP 506.8-508.8, SP is broken & alt'd.
508.9	516.6	7.7		.16				96	2.67							.16			2									wk	MD wk	-	15		—	MZ & SP	510		ST silicification, no visible CC.
516.6	521.5	4.9		.12				81	2.67							.12			1									wk	MD	1	10			SP			As above

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

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Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. F-164
Page 1 of 2 Pages
Collar Elev 3153.14 Final Depth 646.8
[1]Coords. N 28,532.15 E 28,571.02
[2]Inclination 45° Due West
Logged by RE & L.J.
Date: Start 11-9-68 Finish 11-27-68

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Azurite	N.S.	Cc.	Cpy.	Born	Fe (2) Lim.	Py.	Mag.	Hem.	Spec.	Other (2) Galena	Sphal.	Molyb.	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	Angle to axis	Remarks
0	4.4	4.4																																				Rock bit
4.4	12.8	8.4		.03											.03				md			ST								md	md	-	10		SP			Groundmass hem stained to 70-sty silicified.
12.8	21.5	8.7		.02											.02				md	Tr		md								md	"	-	10			leached veinlets	50°	Jarosite on fractures. Mod silicification. Remnant sulfides
21.5	30.2	8.7		.01											.01				ST	Tr		md								"	"	1	8					Most limonite yellow to brick red. Remnant sulfides in sil. gm.
30.2	37.0	6.8		.05												.05			md	1/2		md								"	"	1	10					Stronger silicification w/less oxidation of dis. sulfides
37.0	47.0	10.0		.12												.12			MD	1/2-1		MD								MD	MD	2	10			qtz-sulf. veins	50°	PARTIALLY LEACHED NEAR TOP.; REMAINDER qtz py. w/ SOME CC.
47.0	55.7	8.9		.04											.04				MD	1/2-1		MD								MD	MD	2	10			"	"	AS ABOVE; LIM. INCREASED ON 60° FRACT.
55.7	68.5	12.6		.05											.05				MD	Tr		MD								MD	MD	1	10			leached veinlets	0-50	FINE GR SP.; TR. VERY FINELY DISSEM. PY.; ~~TR. CC.~~; MOST FRACT. LEACHED & COATED w/ BROWN LIM.
68.5	76.5	8.0		.06												.06			MD	Tr.		ST								MD ST	MD ST.	1	10					REMNANTS of SULF. 70.5-72.5', REST STY LEACHED, ST HEM. STAIN. of GM. TR. CC NEAR TOP. ← SOME 2nd BURK ATTE PY.
76.5	88.3	11.8		.02											.02				MD ST.	1/2-1		ST								MD ST	MD ST	1	10			LEACHED ZONE ENRICHED ZONE		STY. LEACHED SECTIONS: 77.4-82.0 & 87.5-88.3, REST LEACHED ON FRACT, but sulf. st. ABNT. ^
88.3	92.3	4.0		.37												.37			-	1		wk								MD	MD	2	10			qtz-sulf.		ST. CC. ON 45° FRACT.; SEVERAL FRACT. LEACHED w/ ST. HEM. STAIN.
92.3	104.0	11.7		.30												.30			TR.	1		wk MD								MD	MD	2	10			sulf. lined LIM. filled FRACT.	20-60°	CROSSCUTTING qtz-sulf VEINS & SULF. LINED FRACT.; MD-ST. HEM. STAIN ALONG SOME FRACT.
104.0	113.4	9.4		.07												.07			MD	1/2-1		MD ST								MD	MD ST	2	12			qtz-sulf VEINS	70°	MD-ST LEACHING; SULF. SPOTTY; ST. FINELY MAROON LIM. IN 70° FRACT.; MD-ST. HEM. FORM A VAR STAIN IN
113.4	122.4	9.0		.05												.05			MD	1/2-1		ST								MD	ST	2	10			HEM-filled FRACT	60°	ST. HEM. STAINING LOCALIZED ALONG FRACT, SOME "LIVE" LIM.; SULF. IN UNLEACHED PART NEAR BKE.
122.4	128.6	6.2		.03											.03				MD	TR		ST								MD ST	ST	3	10				AN-70	STY. LEACHED, ST. HEM. STAINING of GM, NUMEROUS crosscutting qtz VEINS; MORE PORPHYRITIC. ROCK COARSER GRS
128.6	139.4	10.8		.02											.02				wk			TR.		ST						MD ST	ST	1	8			"	"	MODY. BROWN, ST. LEACHING along FRACT.; ST. HEM. (BRICK RED) on FRACT. TR. SULF. WK. LIVE BROWN LIM.
139.4	147.3	7.9		.02											.02				MD	TR		ST								MD ST	ST	5	10			qtz. veins LA3		ST. LEACHING of FRACT. REST AS ABOVE.; TR. CC. IN SMALL SHEAR.; MASSIVE qtz @ 143.
147.3	155.6	8.3		.02											.02				"	"		"								"	"	3	12			qtz-sulf. veins	10-50	AS ABOVE w/ CROSS-CUTTING qtz-sulf VEINS.; TR. CC. IN qtz. VEINS.
155.6	164.6	9.0		.08												.08			"	1/2-1		"								"	"	2	10			"	"	WK-MD. LEACHING along FRACT.; ROCK COARSER. qz. & more porphyritic than ABOVE, TR. CC. & SULF.
164.6	173.9	9.3		.02								.02							"	TR		"								"	"	2	8					ST. LEACHING. & HEM. ST., TR. VISABLE. CC. & PY.
173.9	183.2	9.3		.02											.02				wk	-		ST								"	"	1	8					ST. HEM. w/ WK. BROWN LIM. DEVELOPED ON FRACT.; NO VISIBLE SULF.
183.2	192.0	8.8		.20												.20			"	TR		MD ST								"	"	2	10			LEACHED ENRICHED	89.6	AS ABOVE TO 188.6, REST TO 1820 CONT. 2nd CC. ON FRACT. UP TO 1/8" THICK
192.0	198.8	6.8		.20												.20			—	TR		±								"	"	2	10			"		AS. ABOVE. MD. CC. DEVELOPED ON FRACT.
198.8	210.2	11.4		.02											.02				wk	-		MD ST.								"	"	1	8			LEACHED		MD-ST. HEM. w/ wk. light. brown lim. on FRACT.; NO VISIBLE SULF.
210.2	217.3	7.1		.02											.02				MD ST	-		VST.								wk MD	"	1	8					VST. HEM. & MD. ST. MAROON LIM. ON FRACT.; NO VISIBLE SULF.
217.3	222.9	5.6		.01											.01				wk	-		wk								wk	VST	1	6					STLY. BLEACHED, VST. CLAY. ALT., WK HEM. & LIM.; NO SULF.
222.9	231.9	9.0		.08											.08				MD ST	-		ST								"	"	1	6					ST. HEM. & LIM. ON FRACT. TO 227.9.; REST BLEACHED w/ ST. CLAY ALT.
231.9	241.2	9.3		.69		.01									.01	.68			—	TR		—								"	"	2	8			ENRICHED		WK-MD. CC. on FRACT.; ST-VST CLAY ALT.
241.2	249.0	7.8		.30		NIL										.30			—	Tr		—								"	MD ST.	2	8					MD. CC. on FRACT.; MD. CLAY ALT. TR. PY.
249.0	257.5	8.5		.23												.23			—	TR		—				Tr				"	"	1	10					WK-MD. CC., TR. PY & MOLY, MD-ST. CLAY. ALT.
257.5	265.5	8.0		.50	67.1 @ 0.51	.01	67.1 @ 0.02								.01	.49			—	<1		—								"	"	1	12					WK-MD CC. on FRACT., TR. PY., AS ABOVE.
265.5	274.6	9.1		.36		NIL										.36			—	1		—								"	MD	2	12					AS. ABOVE; AMNT. PY & qtz. VEINS INCREASING.; CLAY ALT. WK-MD
274.6	280.4	5.8		.23												.23			—	1		—				TR.				wk MD	wk MD	2	12					WK. CC., PY IN THIN VEINS, TR. MOLY IN VEINS; ST. SERICITE ON SOME FRACT.
280.4	290.9	10.5		.37		.01									.01	.36			—	<1		—								"	"	2	10					WK-MD CC. on FRACT.; MD. CLAY & SERICITE ALT. of G.M.
290.9	299.0	8.1		1.32		.08									.08	1.24			—	<1		—								"	"	2	12			CC-FRACT	80-90°	90-ST. CC. up to 1/8" THICK. WK-MD ALT. of G.M.
299.0	309.0	10.0		.15												.15			MD	1		MD								"	"	3	12			LEANED FRACT.	80-90°	WK. CC. ON LOW ANGLE FRACT.; LIM & HEM. on HIGH ∠ FRACT.
309.0	317.5	8.5		.04											.04				WK	1		MD ST								wk	wk	4	12			"	"	HEM. ON HIGH ∠ FRACT. & ASSOC. SHEARS., SULF. & WK CC. BETWEEN MD ASSOC. w/ MASS qtz. VEINS.
317.5	326.5	9.0		.01											.01				ST	<1		ST								"	"	10	20			"	40-90°	V. fine gr. siliceous GM, ST. HEM. & LIM. TO 322'; REST spotty GRAY G.M. (fine gr S.O.); NO VISIBLE CC.
326.5	338.4	11.9		.06												.05			MD ST	<1										"	"	10	20					fine gr. siliceous G.M. ST. LIM. (MAROON) & HEM. on HIGH ∠ FRACT., TR. SULF.
338.4	344.3	5.9		.40	24.9 @ 0.52	.01	24.9 @ 0.01								.01	.39			wk	1		—								"	"	2	12		SP	LIM. FRACT.	50°	MD. gr G.M.; THIN SULF. VEINS ALONG FRACT. w/ TR. CC; WK. LIM. ON SOME FRACT.
344.3	353.4	9.1		.54		.01									.01	.53			"	1		—								"	MD	3	12		SP-MZ	348.3		WK. LIM. ON FRACT IN SP.; MZ STLY BLEACHED; GR. PY. w/ SOME ASSOC. C.C.; TR. HYDROMICA.
353.4	363.3	9.9		.58		Nil										.58			—	1		—								"	MD ST	2	10		MZ.			MD-STLY FRACT. & re-healed, MD. CC. & PY. in healed FRACT., MOLY. BLEACHED.
363.3	372.0	8.7		.12												.12			—	1		—								wk MD	2	10		MZ			STLY. FRACT & HEALED.; FRACT filled w/ qtz, SULF & CC. & TRANSLUCENT, WATCH; MINERAL (H=2-3)
372.0	384.0	12.0		.04												.04			—	1		—								"	"	2	10		MZ.			AS. ABOVE. w/ decrease in sulf.

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

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Tt - Tactite
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V - Vein
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Hole No. E-164
Page 2 of 2 Pages

Collar Elev. 3153.14 Final Depth 646.8
[1] Coords. N 28,532.15 E 28,571.02
[2] Inclination 45° DUE WEST
Logged by L.J. & R.E.
Date: Start 11-9-68 Finish 11-27-68

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Unknown N.S.	Cc.	Cpy.	Born	Fe (2) Lim.	Py.	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb.	Calcite	Garnet	Silicates	Sericite	Clay	Vn Qtz	QUARTZ	CHLORITE	K-spar	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
384.0	394.0	10.0		.06											.06				4		–							wk-mo	2	2		wk.		MZ				wk-mo alt., sulf on fract., no visible c.c.; tr. moly at base; wk 2nd k-spar.
394.0	403.5	9.5		.06											.06				<1		–							wk-mo	2	12		wk.						as above. w/ wk-mo. cc. on fract., wk 2nd k-spar.
403.5	412.1	8.6		.07											.07				<1		–							wk-st	1	10		wk.						mo-stly broken, clay alt. mo-st., wk cc. on fract. & gouge, soft. soapstone like material in fract.
412.1	421.4	9.3		.07											.07				<2		–							wk-mo st	2	15		–		MZ	416			fine gr. dk. gray, silicified rock to 416 (SP?) w/ mo-st sulf. on fract; rest MZ. w/ qtz veins
421.4	431.0	9.6		.07											.07				2		–							wk st	1	12		wk.		"				stly. broken & fract. w/ st. cc. & py. on fract & in gouge, st. clay alt. wk 2nd k-spar
431.0	443.0	12.0		.70		Nil									.70				2		–							wk st	1	12		wk		"				mo-ly. broken, rest as above.
443.0	452.9	9.9		.35		Nil									.35				2		–							wk st	1	10		wk.		"				mo-ly. broken, st. fract. w/ massive py filling.; trace to wk. cc. on fract.
452.9	461.6	8.7		.11											.11				3		–							wk st	1	10		wk mo.		"				as above w/ st. py filling. & tr. c.c. on fract.; wk-mo. 2nd k-spar.
461.6	472.2	10.6		.21											.21				1		–							wk st	1	10		wk mo.		"				mo. broken, mo. py. w/ wk-mo cc. coating gr. & on fract., wk-mo 2nd k-spar
472.2	482.2	10.0		.10											.10				1		–							"	"	1	10	wk		"				wk-ly. broken., mo cc. vein filling & tr. cc coating py. gr., wk 2nd k-spar.
482.2	492.0	9.8		.09											.09				<1		–							"	"	1	10	wk		"				stly. broken; st. cc. coating fract., rest as above.
492.0	501.3	9.3		.15											.15				<1									"	"	–	5	wk		MZ				c.c. on some py, soft, white, waxy mineral on some fractures.
501.3	510.9	9.6		.19											.19				1									mo st	st	1	6	–		"				Texture nearly destroyed by clay alt.
510.9	519.0	8.1		.23											.23				<1									mo st	st	–	5	tr		"				soft, stly broken, as above
519.0	527.8	8.8		.25											.25				1									wk mo	st	2	8	mo		"				mo-st cc. as fract fillings to ½" thick, numerous qtz veins, mo 2nd k-spar
527.8	535.8	8.0		.25											.25				<1									wk mo	st	1	5	mo.		"				wk-mo cc. as above.; clay alt. st. 2nd k-spar mo.
535.8	544.7	8.9		.22											.22				<1									wk st	1	5		mo.		"				wk-mo cc. as. fract fillings; as above; "slicks" noted on s.c. surfaces.
544.7	553.0	8.3		.29											.29				<1									wk st	1	5		mo.		"				stly. broken, w/ wk-mo cc. on fract; st. clay alt., mo 2nd k-spar
553.0	563.0	10.0		.34											.34				<1									wk st	1	6		mo		"				stly. broken w/ gouge near top, mo-ss. cc. in broken part.
563.0	573.0	10.0		.37											.37				<1									wk st	–	5		mo.		"				stly. broken, w/ st. cc. in broken, gouge part. mo. 2nd k-spar.
573.0	583.9	10.9		.44		.01								.01	.43				<1									wk st	1	5		mo		MZ				mo-ly broken w/ wk. cc. coating on fract., st. clay alt.
583.9	593.3	9.4		.29									.01		.28				<1									wk st	1	6		wk		"				wk-mo cc. on joints, wk. blue green cu oxide on cross joints.
593.3	603.3	10.0		.32											.32				1									wk st	–	6		mo		"				wk-mo cc. & py. on fract., st. clay alt., wk-mo 2nd k-spar in gr. m.
603.3	611.3	8.0		.20											.20				<1									wk st	–	5		mo.		"				wk-mo cc. on fract. & joints. rest as above. mo-ly. broken. tr. cu oxide.
611.3	620.0	8.7		.35											.35				<1									wk st	–	5		mo		"				wk. cc. on fract. as above. mo-ly. broken.
620.0	627.2	7.2		.95		.01								.01	.94				<1									wk mo st	–	5		wk mo		MZ sp.	620.0			mz. as above w/ some qtz veins, sp. fine gr., gray, tr. cc. on py. & joints, veins of fract. sil. & pressure fit.
627.2	635.7	8.5		.38											.33	.05			<1									wk mo	2	15		–		sp				mo-st silicification in places, <1% cpy. & tr moly.
635.7	646.8	11.1		.25											.20	.05			1									wk mo	2	8		–		"				as above. silicification weaker. tr. cpy.
EOH																																						

1. Drilled due west from site of E-162, Co-ordinates listed are those of E-162

2. Acid etching test gives following dips in hole:
collar measured: 47°

Test	Depth	Inclination
1	0	47°
2	200	47°
3	400	49°
4	625	49°

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Br - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. F-165
Page 1 of 2 Pages
Collar Elev 3113.26 Final Depth 575.2
Coords. N 28,388.59 E 27,996.32
Inclination 47° DUE EAST
Logged by L.J. RE
Date: Start 11/15/68 Finish 11-30-68

Depth From	Depth To	Depth int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu N &	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Cu (1) Pitch	Cu (1) Black	Cu (1) Blue Green	Cu (1) Unknown N.S.	Cu (1) Cc.	Cu (1) Cpy.	Cu (1) Born	Fe (2) Lim.	Fe (2) Py	Fe (2) Mag.	Fe (2) Hem.	Fe (2) Spec.	Other (2) Galena	Other (2) Sphal.	Other (2) Molyb.	Other (2) Calcite	Other (2) Garnet	Other (2) Silicates	Other (2) Sericite	Other (2) Clay	Other (2) Vn. Qtz	Other (2) QUARTZ	Other (2) CHLORITE	(3) Rock Type	Structures (4) Depth	Structures (4) True Dip angle to axis of core.	Remarks
0	5.0	5.0																																			Rockbit
5.0	18.1	13.1		.03										.03				wk	-	st								st	st	1	8			SP?	(This could also be a Tuff of rhyolite)		v.st. leached capping., st. hem. staining of g.m. & texture obscured by alt.
18.1	33.0	14.9		.05										.05				"	-	"								st	st	1	8			"			stly. broken to 26.0'; alt. etc. as above.
33.0	40.0	7.0		.03										.03				wk	-	st								"	"	1	10			"			Rock no-coarse gr., porphyritic, hem. alt. generally st, but locally wk.
40.0	52.7	12.7		.04										.04				"	-	"								"	"	2	10			"			Rock texture as above.; st. hem. stain of g.m., wk. qtz veny.
52.7	60.7	8.0		.04										.04				"	-	"								"	"	3	10			"	Qtz. veins	0-50°	As above, cross-cutting qtz. veins.
60.7	70.0	9.3		.01										.01				st		"								md	"	1	7			"			stly altd, boxwork in qtz veins. st. hem staining
70.0	79.3	9.3		.01										.01				st		st								md	st	1	7			"			Texture obscured by alt, generally f.g., small qtz eyes st. live lim.
79.3	88.6	9.3		.02										.02				st		st								st	st	2	8			"	leached veinlets	50°	Live limonite filling boxwork. Pre-leach sulfides ≈ 4%.
88.6	98.1	9.5		.01										.01				st		st								st	st	2	8			"			As above. Texture medium grained porphyritic
98.1	107.7	9.6		.01										.01				md		md								md	st	1	7			"			" " Groundmass stained light purple, stly altd.
107.7	111.0	3.3		.02										.02				md		md								md	st	-	6			"			" " st clay alt, porphyritic texture.
111.0	120.5	9.5		.01										.01				st		st								md	st	-	6			"			" " Tr of light green alt mineral - not identified
120.5	129.5	9.0		.02										.02				st		st								md	st	-	6			"			Live limonite filling dis. boxwork.
129.5	134.0	4.5		.02										.02				st		st								md	st	2	8			SP?	133.7		Qtz vein with minor leached cavities
134.0	143.8	9.8		.02										.02				st		md								md	st	4	0	4	5	Qtz vein SP?	139.0		2% alunite filling fractures, st live lim. continues
143.8	149.0	5.2		.01										.01				wk md		wk								md	st	7	5	7	7	Qtz vein	145.3		stly. broken qtz vein 145.3 - 152.0
149.0	156.0	7.0		.02										.02				st		md								md	st	4	5	5	0	SP?	152.0		Qtz vein with some included Espar followed by stly altd SP?
156.0	164.4	8.4		.01										.01				st		st								st	st	4	10			"	leached veins	60°	stly broken & gouey: 162.0-162.5; 163.5-164.8 qtz veins w/live lim.
164.4	173.3	8.9		.01										.01				md		md								md	st	3	6			"			medium grained, porphyritic. ground mass light purple, stly altd
173.3	182.1	8.8		.01										.01				md	Tr	md								md	st	1	10			"			As above, Tr of dis py
182.1	190.8	8.7		.01										.01				st	Tr	st								md	st	3	10			SP? MZ	189.0		coarser grained porphyry @ 189.0. Numerous boxwork & live lim
190.8	196.5	5.7		.01										.01				st	Tr	st								md	st	2	6			"			white altd fspar laths up to .002" in red, hem stained g.m.
196.5	206.0	9.5		1.14			.02							.02	1.12			Tr	1	Tr								md	st	2	6			Sulfide MZ	196.5		crushed texture, dis. py & c.c.
206.0	216.0	10.0		1.23			.02							.02	1.21			wk	1	wk								md	st	Tr	5			"			As above. oxidation: 213-215. Thick c.c. on py
216.0	222.3	6.3		.03										.03				md	-	md								md	st	5	20			Sulfide	Alunite in fractures -216.0 222.3		Completely leached. st silicification and qtz veins: 217.1-222.3.
222.3	234.8	12.5		.37			Nil								.37			wk	1	wk								md	st	5	20			Sulfide MZ			wk lim. stain on fract. 228-230.8, st. silicification 222.3-230.3; wk. c.c. & py rest.
234.8	243.8	9.0		.61			Nil								.61			-	1	-								wk md md st	3	12				MZ			md - c.c. filled fract.; qtz veins locally st.
243.8	250.4	6.6		.79	118.5 @		.03							.03	.76			-	1	-								wk md md st	3	12				"			As above, locally abnt. qtz veins., tr. cpy?
250.4	255.3	4.9		.58	0.56		.02							.02	.56			st	1	-								wk st	1	10				"			st "live" lim. on fract.; broken core shows mo.-st c.c. vein fillings & py-coating.
255.3	266.4	11.1		.39	601		.02							.02	.37			-	1	wk mo								wk st	4	15				"			as, w/ mo. c.c. vein filling & py-coating, qtz vein 164.-265 w/ hem. stained breccias.
266.4	279.3	12.9		.40			.01							.01	.39			-	1	-								wk mo	3	12				"			wk-mo c.c. filling & coating fract. clay alt. mo.
279.3	288.0	8.7		.36											.36			-	1	-								wk md	1	6				MZ			mdly altd., Tr of c.c. Plag → clay, fspar mostly fresh.
288.0	297.7	9.7		.42			.02							.02	.40				1									wk md	2	7				"			more visible c.c. than above
297.7	305.5	7.8		.47			Nil								.47				1									wk md	1	6				"			few fractures, mdcc. on dis. py
305.5	314.8	9.3		.41			.01							.01	.40				≤1									wk md	1	6				"			mdly fractured, As above
314.8	325.5	10.7		.30											.30				≤1									wk md	1	6				"			wk c.c. on dis py
325.5	334.2	8.7		.18											.18				≤1									wk md	1	6				MZ?			md alt, fine dis. sulfides.,
334.2	342.0	7.8		.17											.17				≤1									wk md st	-	5				MZ?			soft, texture vague, overall yellow-green color, wk epidote
342.0	350.0	8.0		.11											.11				≤1									wk st	≤1	7				MZ?			As above. wk c.c. on py
350.0	359.0	9.0		.14											.14				1									wk md	1	7				MZ			More sulfides than above. Texture less altd.
359.0	369.0	10.0		.10											.10				2									wk st	2	10				MZ			py in thin veinlets, wk c.c., soft
369.0	378.1	9.1		.15											.15				1									wk st	-	7				MZ?			soft, strongly broken, texture indistinct
378.1	385.0	6.9		.22											.22				1									wk st	-	5				MZ?			As above

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO- SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. F-165
Page 2 of 2 Pages
Collar Elev. 3113.26 Final Depth 575.2
1 Coords. N 28,388.59 E 27,996.32
2 Inclination 47° Due East
Logged by LJ, RE
Date: Start 11/15/68 Finish 11-30-68

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Unknown N.S.	Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
385.0	394.1	9.1		.08											.08				1										-	ST	?	60		?	MAJOR FAULT		Very strongly silicified. Broad Gouge: 390-394
394.1	403.0	8.9		.14											.14				1										wk	wk ?	?	70?					No identifiable texture. mostly quartz except for gouge on fractures
403.0	411.9	8.9		.06											.06				1										wk	wk		70?					As above. f.g. gray qtzite like rock -- may be qtz vein, stly broken
411.9	420.4	8.5		.06											.06				1										wk	ST		25		?			f.g. stly altd, bleached rock to 418 followed by zone as above
420.4	429.7	9.3		.05											.05				1-2										-	wk	3	70?					f.g. gray, silicified rock as above cut by white qtz veins.
429.7	441.5	11.8		.03											.03				<1										-	wk	10	65?		?			As above, with increase in % of pure white vein qtz
441.5	450.5	9.0		.04											.04				1										-	wk	4	65					As above, v. ST silicification
450.5	459.5	9.0		.04											.04				2										wk	ad		5 60					occ py vein. strongly sheared stly. silicified
459.5	465.5	6.0		.06											.06				1										wk	ad	-	45					cemented Bx: 461.3-462.0. otherwise as above
465.5	475.4	9.9		.07											.07				1										wk	wk	80	90		13X qtz vein			massive qtz vein w/ some Bx near top, wk cc. on fract., stly broken
475.4	483.9	8.5		.22											.22				1										wk	wk	-	55		qtzite	473.1 / 480.8'		cemented Bx to 480.8', rest. gouge; stly silicified & broken bx. wk cc.
483.9	493.9	10.0		.62	18.5 @ 0.55 20.7	.02								.02	.60				2					.0052					wk	MD ST	5	15		SP?			VST. CC. in fract. fillings up to 1/2" THICK; rock is sugg., porphyritic, bleached. stly broken.
493.9	502.4	8.5		.50		.02								.02	.50				2					.0086					wk	MD	5	15		SP?			AS ABOVE.
502.4	511.9	9.5		.10											.10				1					.0022					wk	MD	10	20		?			TEXTURE OBSCURED BY ALT. & CROSS-CUTTING qtz VEINS. wk CC. on FRACT.
511.9	521.3	9.4		.28											.28				1										wk	ST	3	10		?			TEXTURE OBSCURED BY ST. CLAY ALT., REST AS ABOVE.
521.3	531.3	10.0		.18											.18				1										wk	ST	3	15					AS ABOVE TO 529' REST VSTLY. silicified dk. gray.
531.3	541.0	9.7		.31											.31				-										wk	-	90	90		QTZ?			VSTLY. SILICIFIED, NO VISIBLE SULFIDE.
541.0	550.7	9.7		.32											.32				1										wk	ST	3	10		SP?			TEXTURE OBSERVED by alt. MD. gr. porphyritic, some self & cc. coating on fract
550.7	562.0	11.1		.32											.32				1										wk	ST	5	15		MZ?			MD-LG gr. porphyritic, ST. ALT. lower one foot stly. silicified w/ no cc. on fract.
562.0	575.2	13.2		.17											.17				1										wk	wk MD	3	30		?			STLY. SILICIFIED, texture OBSERVED by SiO2, TR. cc., Finely disp. py.
	EOH																																				

1. Drilled due east from site of F-163. Coordinates given are for F-163.

2. Acid etching results:

Test	Depth	Inclination
1	0	47°
2	200'	48°
3	400'	48°
4	550'	50°

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

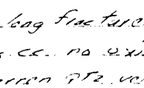
ASARCO - SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. F-166
Page 1 of 2 Pages
Collar Elev 3153.17 Final Depth 747.0
Coords. N 28,532.15 E 28,571.02
Inclination 55°, N 90°E
Logged by L.J. & R.E.
Date: Start 12/3/68 Finish 1-9-69

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Unknown N.S.	Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0.0	6.0	6.0																																			
6.0	13.9	7.9		.01				90						.01				MD	-		ST								WK	MD	5	18		SP?			ST. HEM. ON THIN FRACT. Some thick qtz veins to ½". NO VISIBLE SULF.
13.9	26.9	13.0		.02				78						.02				MD	-		ST								WK	MD	3	8		"			ST HEM, MD. LIM. ON THIN FRACT.; ALT. MD.; NO VISIBLE SULF
26.9	36.2	9.3		.02				93						.02				MD	TR		ST								MD WK	MD	3	8		"			WK. BROKEN. ST FRACT. w/ ST. HEM ON FRACT. TR. finely diss. PY.
36.2	45.5	9.3		.03				92						.03				MD	-		ST								MD ST	MD	2	8		"			ST. SERICITE, MD. LIM. "LIVE" ON FRACT. ST. HEM. NO VISIBLE SULF.
45.5	53.5	8.0		.01				100						.01				"	-		"								MD	ST MD	1	6		?			ST. HEM. stain of G.M.; PRONOUNCED porphyritic texture w/ ST. HEM. STAINING
53.5	61.6	8.1		.02				98						.02				"	-		"								"	"	2	8		Sp?			ST. HEM. STAIN FRACT.; MOLY. BROKEN, porphyritic texture NOT as dominant.
61.6	74.5	12.9		.03				93						.03				"	-		"								"	"	1	6		SP?			ST. HEM. STAIN G.M. & pronounced porphyritic texture NEAR BASE, 2" VEIN "LIVE" LIM. AT 70.0'
74.5	83.4	8.9		.01				96						.01				"	-		"								"	"	1	6		SP.			MD-ST FRACT w/ ST. HEM. STAIN // FRACT.; porphyritic texture of SP.
83.4	93.7	10.3		.01				87						.01				"	TR		"								"	"	2	8		SP			AS. ABOVE. w/ TR. sulf; sl. qz. SULF? IN MIDDLE; maybe tourmaline.
93.7	101.6	7.9		.01				100						.01				"	TR		"								"	"	2	15		SP			AS ABOVE except tourmaline; locally STLY. silicified which obscures texture
101.6	109.8	8.2		.02				100						.02				"	<1		"								ST	MD ST	2	15		SP?	LEACHED SULF 105.4		MD-ST. HEM. STAIN G.M. IN LEACHED ZONE; SULF. ON FRACT. w/ WK LIM ON FRACT. AS ABOVE
109.8	121.5	11.7		.02				94						.02				"	<1		WK MD								ST	MD	4	20		"	" 117.0		TEXTURE OBSCURED BY ST. SILICIFICATION IN SULF. ZONE, porphyritic IN LEACHED ZONE; AS. ABOVE.
121.5	135.1	13.6		.04				61						.02	.02			"	1		MD								MD ST	2	20			"	MOD SULF & LEACHED		TEXTURE OBSERVED BY ST. SILICIFICATION; MD. HEM. ON SOME FRACT; SULF. IN PART w/ TR. cc COATING PY.
135.1	143.9	8.8	DESCRIPTION STARTS @ 121.5-135.1 UNK.	.02				94						.02				WK MD	-		ST								"	"	1	10		"	LEACHED		MD. gr. porphyritic texture AT base, rest fine gr. w/ some silicification. ST. LEACHING.
143.9	153.0	9.1		.02				100						.02				"	TR		MD								MD ST	MD ST	1	8		SP.			fine gr. porphyritic text.; MOLY. LEACHED, MD. HEM. on fract, TR. SULF.
153.0	161.9	8.9		.02				90						.02				"	"		MD ST								"	"	1	12		"			MD-STLY. LEACHED; ST. silicification LOWER 2.0' w/ TR. SULF. & ¼" "VEIN" "LIVE" LIM.
161.9	170.3	8.4		.03				100						.03				"	TR		"								"	"	1	8		"	SULF 177 - 179.5		ST. LEACHING & HEM. STAINING of G.M., TR. PY. IN SULF. ZONE.
170.3	181.6	11.3		.03				88						.01	.02		121.5-135.1	"	<1		MD								"	"	2	8		"	MOD SULF & LEACHED		FINE diss. PY. w/ TR. cc. COATING; MD. HEM. ON FRACT.
181.6	186.1	4.5		.03				93						.03				MD	-		MD ST								"	MD	1	6		"	LEACHED		MD-ST. HEM. STAINING of G.M., MD-BROWN LIM. ON FRACT; fine porphyritic texture
186.1	196.6	10.5		.07				80						.07				"	—		"								"	"	2	10		"			AS ABOVE, MD-ST. silicification; TEXTURE FINER TO observed
196.6	206.0	9.4		.06				81						.06				"	TR		MD								"	MD ST	1	8					CLAY ALTERATION INCREASED, HEM. & LIM. MD., TR. SULF.
206.0	216.0	10.0		.07				80						.04				"	TR		"								"	"	2	10					MD. silicification, WK-MD. HEM. & LIM. ON FRACT. TR. SULF.
216.0	224.9	8.9		.05				95						.05				MD ST	TR		MD ST								MD WK ST MD		2	10					FINE gr. Texture; MD-ST WK & HEM. ON FRACT, HEM. STAIN of G.M. ADJACENT TO FRACT. TR. FINE PY.
224.9	234.8	9.9		.03				94						.03				MD	TR		MD								MD WK ST MD		1	8					FINE GR.; PARTIALLY LEACHED, spotty SULF.; fine dissem. PY., MD. HEM ON FRACT.
234.8	243.3	8.5		.04				100						.02	.02			MD	<1		WK								MD	MD	1	6					FINE GR.; LEACHING DECREASE, SULF. INCREASE w/ THIN cc. COATING.
243.3	251.9	8.6		.04				97						.01	.03			WK MD	1		WK								WK MD	WK MD	1	5					AS ABOVE; SULF >> LEACHED w/ COATING cc.
251.9	260.8	8.9		.05				86						.01	.04			WK	1		WK								MD WK	WK	1	8					AS ABOVE; WK, spotty HEM. & LIM. ON FRACT.
260.8	265.0	9.2		.08				83						.04	.04			WK	1		ST								MD WK	WK	1	10					spotty, ST. HEM. IN SHEARED ZONE; SULF WK. THAN ABOVE.
265.0	274.5	9.5		.04				92						.01	.03			WK	<1		WK								ST	MD	1	5					BLEACHED ROCK w/ ST. SERICITE; ≈ <1% dissem. SULF., WK HEM. & LIM. ON FRACT.
274.5	284.3	9.8		.17				90							.17			MD	1		MD								WK ST	MD	5	10					AS ABOVE, QTZ. VEIN NEAR CENTER.; MD-ST LIM NEAR BASE, TR. cc ON PY.
284.3	295.2	10.9		.05				89							.05			WK	1		WK								ST	MD	2	6					FINE gr., Bleached, wk HEM & LIM ON FRACT., SULF w/ wk COATING of cc.
295.2	303.7	8.5		.04				97							.04			WK	1		WK								ST	MD	2	6					FINE gr. w/ SULF & wk cc. COLOR IN FRACT., spotty LEACHED FRACT.
303.7	314.9	11.2		.26				86							.26			WK	1		WK								MD	MD	2	8					AS ABOVE w/ WK-MD cc.
314.9	324.9	10.0		.12				91							.12			WK	1		WK								MD	MD	2	15		SP? SULF			py, mod sil., dis. py; cc. oxidation along fractures
324.9	333.8	8.9		.50			.02	100						.02	.48			—	<1		—								WK	MD	2	20?		SP?			ST. silicification, abr. crystallization. TR. cc. no oxidation
333.8	340.0	6.2		.38				100							.38			TR	2		—								MD	MD	3	15		SULF. INCREASE			late thin QTZ molv veinlet offset by barren QTZ veinlet
340.0	348.2	8.2		.13				96						.03	.10			WK	<1		MD								MD	MD	1	15					oxidation of about ½ sulfides.
348.2	351.9	3.7		.02				94						.02				ST	TR		ST								WK	WK	80	80		SULF.			strong oxidation of highly fractured QTZ vein.
351.9	356.1	4.8		.12				93						.01	.11			TR	1		TR								MD	MD	3	20?		SP? SULF			wk oxidation on some fractures. wk-md cc., overall dk. gray in color
356.1	365.0	8.9		.38				93					.01		.29	.08		—	1		—								MD	WK MD	4	20					FINE GR., SULF. Along QTZ VEINS, TR. cpy. & cc. COATING, MD-ST. silicification
365.0	371.5	6.5		.28	1.8%			97					.01		.27			—	1		—								MD	MD	3	15					AS ABOVE, MOL. MAGNETITE; TR. BLUE-GREEN CU OXIDE ON FRACT.
371.5	379.0	7.5		.45	0.97	.01		97						.01	.44			—	1		TR								MD	MD	2	10					MOLY. FRACT.; SULF. IN QTZ VEINS, MD. silicification.
379.0	386.3	7.3		.50	0.01	.02		100						.02	.43			—	1		—								MD	MD	2	12					AS ABOVE, WK CC. & PY.



PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. F-166
Page 2 of 2 Pages
Collar Elev. 3153.14 Final Depth 747.0
Coords. N 28,532.15 E 28,571.02
Inclination 55° N90°E
Logged by RC, LV
Date: Start 12-3-68 Finish 1-9-69

Depth From	Depth To	Int'vl	Elev.	% Cu: Total	% Cu: Avg.	% Cu: NS	% Cu: Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Unknown N.S.	Cc.	Cpy.	Covellite Bora	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
386.3	394.7	8.4		.24				84							.24			md ST	1		-								wk	md	2	12		SP?			Suff on fract, md cc; md-st "like lim. on some fract
394.7	400.0	5.3		.19				96							.19			wk	1		-								wk md	md	2	10					As above; wk oxidation on joints; wk cc
400.0	409.4	9.4		.28				87							.28			-	1		-								md ST	md	3	10					fine gr texture, suff on fract, md-st sericite
409.4	418.0	8.6		.31				92							.31			-	1		-				Tr				md ST	md	2	8					As above w/ Tr moly
418.0	426.4	8.4		.58		.02		100						.02	.56																						Suff on fract, wk md oxidation on sheared zone near base. (Logged by LV on 1/8/69)
426.4	435.7	9.3		.45		.02		96							.50		.08	md	1		-								md	md	3	10					md oxidation 426.0-435.7, md silicification
435.7	444.9	9.2		.11				82							.11			md	1		Tr								md	md	4	10					" " overall. Sources / QTz veins
444.9	452.9	8.0		.41	13.6 @ 0.49 0.02	.01		96						.01	.34	.04	.02	wk	1		Tr								md	md ST	3	9		SP? / MZ	Fault 450.8		Fault: 450.0-450.8 followed by definite MZ, st silicified, coarse grained
452.9	465.2	12.3		.03		.01		88						.01	.62	.20	.20	Tr	2		-								ST	ST	2	8		MZ			ST fracs & fr. st mineralization on fract, strongest st than above
465.2	476.4	11.2		.30				94							.25	.05		-	1-2		-								ST	ST	3	8		MZ			large unbroken intervals. large grains of cpy w/ cc
476.4	487.0	10.6		.52		.02		88						.02	.28	.14	.08	-	2										ST	ST	-	6		MZ			2-¼" qz veins st/y altd. As above
487.0	499.6	12.6		.40		.01		67						.01	.14	.25		-	1½		-								ST	ST	1	7		MZ			several large blebs & thin veinlets of cpy
499.6	507.6	8.0		.4-		.04		85						.04	.10	.33		-	2										ST	ST	5	12		MZ?			ST silicification & QTz-cpy veining. Tr to cc, most cpy oxidized
507.6	516.3	8.7		.28				72							.04	.20	.04		1										md	wk	10	20?					wk " " "
516.3	525.5	9.2		.36				95							.06	.30			3										md	md	5	15?					st silicification obscures texture
525.5	534.0	8.5		.24				96							.06	.18			3										ST md	md	?	12		MZ?			md-st sil. several ¼" qz veins
534.0	542.4	8.4		.15				78							.03	.12			4										md	md	5	15		SP?			md-st sil. fine gr rock, md-st py veins up to 1/8" thick
542.4	551.7	9.3		.22				89							.05	.17			4										md	md	8	15		SP?			as above, parts STY BROKEN & sil; wk-md ac
551.7	557.0	5.3		.12				72							.03	.09			3										md	md	5	15					texture as above, but slightly more porphyritic, no visible hydromica
557.0	565.7	8.7		.22				79							.04	.18			4										wk MD	wk MD	2	20?		?			fine gr STY porphyritic, VARI gray; st silicification, Tr. cpy & moly.
565.7	579.0	13.3		.27				69							.15	.12			2										MD	wk	1	30		MZ - 573.0'			AS ABOVE w/ wk-MD cpy to 573.0', MZ w/ wk cc on fract rest of interval MD Tr MZ clay alt.
579.0	588.0	9.0		.33				77							.10	.10	.13		2										wk MD	wk MD	1	15		MZ?			md-st silicification, MZ texture obscured by silicification; wk diss. cc.
588.0	596.2	8.2		.24				94							.06	.12	.06		2										ST md	MD ST	1	6					Light colored MZ, st. sericite. Tr cpy partially replaced by cc.
596.2	609.4	13.2		.28	27.6 @ 0.35 0.01			74							.04	.08	.16		1										md ST	MD ST	1	12					wk-MD cpy & cc to 600.3; rest st/y silicified & broken
609.4	620.2	10.8		.43		.02		80						.02	.10	.10	.21		1										ST	ST	1	10		MZ			Definite MZ, 2nd Kspar. Zones of md cc.
620.2	629.5	9.3		.29				97							.09	.05	.16		1-2										md	md	2	15					wk-md silicification, white altd Kspars is brownish way B.M.
629.5	637.0	7.5		1.06				59						.01		.40	.65		2										ST	md	-	15?		MZ			st silicification. st dis cpy with replacement by Covellite
637.0	644.9	7.9		.37				98							.06	.25	.06		1-2										ST	ST	1	10			1/4" cpy vein	65°-70°	Finely dis. cpy with one vein bordered by sericite, wk(?) cov, & cc
644.9	652.0	7.1		.17				83							.02	.12	.03		1-2										md	ST	-	10					Finely dis cpy & py with wk coatings of cc & cov.
652.0	661.8	9.8		.11				76							.02	.07	.02		1										md	md	1	10	ST				md-st 2nd K-SPAR, moly silicified. REST AS ABOVE
661.8	673.6	11.8		.18				58							.08	.10			1										md	ST	1	8	wk				LOW SULF, wk cc on FRACT, Tr. cpy & covellite, ST clay alt, some sport. diss.
673.6	684.5	10.9		.14				65							.08	.06			2-3				Tr						md	md	3	8	wk				fine diss. sulf, wk-cpy & covellite in grained veinlets. Tr. cc coating.
684.5	692.4	7.9		.25				83							.07	.18			2-3										md ST	md	3	10	wk				SULF MAINLY ALONG qtz. veinlets, VERY WK TRACE of cc. or cov. wk-md. cpy
692.4	701.9	9.5		.16				60							.04	.12			2-3										md ST	md	2	8	ST				sulf on fract & finely diss., wk-md cpy. w/ very wk TRACE covellite.
701.9	707.0	5.1		.14				57							.02	.12			2										ST	md	1	6	ST	wk			md-ST cpy in fract. up to 1/8" wide, no visible cc or covellite.
707.0	716.8	9.8		.12				86								.12			2-3				Tr						wk	md	1	8	st	wk		MZ			wk-mod cpy in fracs & diss. No visible cc. Some secondary K-spar
716.8	729.0	12.2		.28				85							.04	.24			2										wk	md	2	8	ST md	wk		MZ			AS ABOVE. Tr cc. st fracturing.
729.0	736.4	7.4		.16				96							.03	.13			1-2										wk	md	4	10	md-st	wk		MZ			Cpy mostly diss., some along fracs. Abundant Qtz veins ⅛"-2"
736.4	747.0	10.6		.15				71							.03	.12			2-3				Tr						-	md	4	10	md				AS ABOVE, one ¼" vein py w/ minor cpy

EOH

Average Recovery: 86%

Depth	Angle	Depth	Angle
Collar	55°	630'	61°
200'	53°	740'	57°
400'	55°		

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. F-167
Page 1 of 2 Pages
Collar Elev. 3113.26 Final Depth 475.3
1 Coords. N 28,388.59 E 27,996.32
2 Inclination 51°
Logged by L.J. & R.E.
Date: Start 12/5/68 Finish 12-16-68

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Unknown N.S.	Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz.	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0.0	5.0	5.0																																		
5.0	17.3	12.3		.05										.05				wk MD	–	ST								MD ST	1	5			?	?		ST. LEACHED CAPPING; VST. HEM. STAIN. GM. ALT OBSCURE TEXTURE.
17.3	29.3	12.0		.04										.04				MD ST	–	ST								ST	ST 1	5			SP?			TEXTURE PARTIALLY obscurred by ST. ALT., MO. gr. porphyritic,
29.3	38.9	9.6		.06										.06				MD	–	ST								ST	ST 1	5			SP?			MD-coarse gr. porphyritic texture, NO TIRAGE HYDROMICA; ST. HEM. STAIN G.M.
38.9	51.4	12.5		.05										.05				"	–	"								"	"	–	5		"			TEXTURE PARTIALLY obscurred, REST AS ABOVE, 5-10% pale green, waxy, soft (SOAPSTONE?) ST. HEM. STAINING of G.M., fine gr. texture.
51.4	60.9	9.5		.04										.04				wk	–	"								"	"	3	6		"			AS ABOVE, NO VISIBLE SULF.
60.9	70.6	9.7		.02										.02				wk	–	"								"	"	2	5		"			MD. HEM. ALT. of G.M.; PY w/ TR. CC.? AT BASE.
70.6	80.0	9.4		.03										.03				"	1	MO								MD MO ST.	1	5			"	SULF		ST. BROWN. LIM. IN. FRACT.; DK. GRAY qtz. VEINS w/TR. py & cc.?
80.0	89.1	9.1		.03										.03				ST.	TR	"								"	"	3	10		"			SULF. IN SPATTERED, silicified ZONE AT TOP.; ST. yellow LIM. ON FRACT., MZ @ 94.7'
89.1	98.7	9.6		.02										.02				ST.	1	wk								MD ST.	2	10			SP MZ.	SP MZ LEACHED SULF	94.7 101.7	SULF. DISS. & IN qtz. VEINS, w/ WK-MO CC. ON py.
98.7	108.7	10.0		.37											.37			wk	2	–								ST	ST	3	10		"			stly altd., dis sulfides (Re-exam shows very of c.c. replacement of fine dis. py, cpy - assay checks visually)
108.7	120.0	11.3		1.76		.04								.04	1.72			–	2	–								ST	ST	1	10		MZ			Coarse grained MZ, Tr of epidote. C.C. on dis. py.
120.0	129.2	9.2		1.56		.03								.03	1.53				2									ST	ST	–	5					mdly broken, as above
129.2	138.6	9.4		.87		.02								.02	.85				2									ST	ST	½	5					As above, Tr of epidote on fractures.
138.6	148.0	9.4		.85		.02								.02	.83				1									ST	ST	1	7					" " texture crushed, wkly recrystallized
148.0	156.4	8.4		.84		.01								.01	.83				1-2									ST	ST	–	7					Py vein 163.7 - 164.1.
156.4	167.6	11.2		.77		.02								.02	.75				5									ST	ST	1	8					few fractures - intersect core at ≈90°
167.6	175.0	7.4		.52		.02								.02	.50				1									ST	ST	1	8					& py, cpy, cc. veins vary from ⅛" - 1" Finely dis. py w/c.c.
175.0	183.7	8.7		.94		.02								.02	.92				3									ST	ST	1	6					sulfides mostly disseminated, f.g. wk hydromica
183.7	193.1	9.4		.54		.02								.02	.52				2									ST	ST	<1	6					stly altd. & bleached coarse grained MZ w/ one 1" py vein
193.1	202.1	9.0		.62		.02								.02	.60				2									ST	ST	1	6					stly sheared 209.0-211.0 As above
202.1	211.0	8.9		.68		.02								.02	.66				1									ST	ST	–	5					COARSE gr. MZ., dissem. py w/ wk-MO cc.
211.0	220.2	9.2		.50		.01								.01	.49				2									ST	ST	–	5					AS ABOVE, CLAY ALT. VST. SULF. INCREASE.
220.2	229.5	9.3		.37		.02								.02	.35				3									ST	ST	1	6		MZ			AS ABOVE., SULF DISSEM. & ON FRACT.
229.5	238.4	8.9		.45		.02								.02	.43				3									ST	ST	–	5					ST. CLAY ALT., SULF. MORE DISSEM & FINE GR than ABOVE.
238.4	247.0	8.6		.37		X									.37				2									ST	ST	–	5					ST. CC.; V.ST. CLAY ALT.; SULF. BOTH DISSEM. & ON FRACT; MO-ST 2nd K-SPAR
247.0	256.8	9.8		.26		X									.26				4									MO ST	ST	–	5					fine diss. SULF & FRACT filling ST. CC.; V. ST. CLAY ALT.
256.8	266.9	10.1		.52		.02								.02	.50				3-4									MO	ST	–	6					AS ABOVE; SULF DECREASE.
266.9	277.0	10.1		.32		.01								.01	.31				2									MO	ST	–	5					very strongly broken: 281.0 - 301.7. ST dis sulf w/wk oxides
277.0	287.6	10.6		.61		.02								.02	.59				2									md	ST	–	8					" " " most sulfides dis. wk to SO4 present
287.6	298.4	10.8		.39		X									.39				2									md	ST	–	5					" " " To 301.7 thick CC. replacement on all sulfides ≈1% hydromica
298.4	306.5	8.1		.33		X								.01	.32				2									md	ST	Tr	5					few fractures, large white altered plag. phenos in brownish gray matrix w/hydromica
306.5	315.8	9.3		.40		.02								.02	.38				2									md	ST	Tr	5					Texture as above. uniformly dis. sulfides.
315.8	324.8	9.0		.37		.02								.01	.35				2									md	ST	–	5					About 9% hydromica, 0 to 3-4% large euhedral K spar phenos
324.8	334.4	9.6		.43		.01								.01	.42				2									md	ST	–	5					stronger visible C.C. Than above. white, pearly, soft, amorphous(?) min. fills fractures
334.4	343.5	9.1		.44		.01								.01	.43				2									md	ST	–	5					wk. visible cc., ST. clay alt. of feldspars.
343.5	353.4	9.9		.45		.01								.01	.44				2									MO	ST	–	5					fine gr. phase SP? lower half w/ massive py w/ cc. coating.
353.4	362.0	8.6		.81		.02								.02	.79				6									MO MO ST	–	6					COARSE gr. MZ, wk VISIBLE CC., ST. CLAY ALT.
362.0	371.0	9.1		.49		Nil									.49				2									MO ST	–	5					AS ABOVE w/ STRONGER CC.
371.0	376.0	4.9		.35		Nil									.35				2									MO ST	–	5					STLY BROKEN, WK 2nd K-SPAR Alt. of G.M., WK-MO CC.
376.0	385.6	9.6		.40		.01								.01	.39				2									MO ST	–	5					AS ABOVE
385.6	396.4	10.8		.45		.01								.01	.44				2									MO ST	–	5					CC. appears to be decreasing. similar alt. & texture to above
396.4	405.6	9.2		.44		.01								.01	.43				1-2									md ST	–	5			MZ MAJOR FAULT			Bx and Gouge: 416.6 - 415.6
405.6	415.6	10.0		.44		.02								.02	.42				1									md ST	–	5					

3427 @ 0.01 / 0.02

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Note (3)
Tt - Tactite
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Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. F167
Page 2 of 2 Pages

Collar Elev 3113.26 Final Depth 475.3
1 Coords. N 28,388.59 E 27,996.32
2 Inclination 51°
Logged by R.G.
Date: Start 12/5/68 Finish 12-16-68

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Unknown N.S.	Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem.	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
415.6	420.5	4.9		.47		.03							.03		.44				1										md	ST	2	7		MZ	415.6 Strong shear zone		strongly sheared, oltd. vuggy qtz vein.
420.5	431.9	11.4		1.38		.03								.03	1.35				2										wk md		-	5		SP			Apparent fault contact. Sough. ASP to 424.8. SP is fg, dk green wk 2nd kspar
431.9	441.4	9.5		.56		.02								.02	.54				2										wk md	1	5	ST		SP			Hard, shattered but not gouge. Thin MZ dikes.
441.4	451.0	9.6		.21											.21				2										wk md	-	10	ST		SP			" " thin coatings of clay on fractures, incl-ST sil.
451.0	460.7	9.7		.31											.31				3										wk md		10	ST		SP & MZ			shattered to 453.5. Fault @ 455.0. gradational MZ spaced shatter
460.7	469.5	8.8		.20											.20				3										wk md	1	10	md		"			MZ: 465.8-466.2. 1" py vein 464.2. ST silicification. vuggy white qtz vein
469.5	475.3	5.8		.21											.21				3										wk int	-	8	md		"			Fault @ 473.7. incl t/y silicified MZ w/ gradational SP contacts
	6011																																				

1. Drilled due north from site of F-163. Coordinates given are those of F-163.

2. Acid etching results:

Test	Depth	Inclination
1	0	49°
2	200	50°
3	460	48°

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Note (3): Tt - Tactite; Hf - Hornfels; Mb - Marble; Qt - Quartzite; Bx - Breccia; Da - Dacite; Mz - Monzonite; An - Andesite

Note (4): V - Vein; F - Fault; D - Dike; C - Contact; Ig - Undif igneous

Collar Elev 3110.55 Final Depth 500.5
Coords. N 28 358.43 E 28,134.76
Inclination vertical
Logged by RS, LJ
Date: Start 12-24-68 Finish 1-4-69

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Unknown N.S.	Cc.	Cpy.	Covellite / Born	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	Chlorite	2nd K-spar	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0	5.0	5.0															/																					[illegible]
5.0	15.1	10.1		.10				90						.10				ST	–		wk								md	md	–	8	md		MZ			medium grained porphyritic texture w/ elongate clay alt'd. plag., fresh k-spar, interstitial qtz and chlorite (after bi?)
15.1	25.5	10.4		.10				78					.01	.09				ST	-		md								md	md	1	9	md		MZ	?		Tr of mo?, st crystalline Jarosite, stly fractured
25.5	34.7	9.2		.12				92						.12				ST	Tr		wk	-							md	md	-	15	–		Da			V. ST. silic?, remnant dis py, fine grained, numerous small qtz eyes, ST Lim.
34.7	43.6	8.9		.08				98						.08				V ST	–		md								md	md	-	10	Tr		MZ/Da			All varieties of lim present. incl lim, hem, goethite, crusts and jarosite
43.6	56.0	12.4		.10				83						.10				V ST	–		ST								md	md	10	14	-		BX	shearing	40-45°	Qtz vein 44.6-45.8 Pre leach sulfides ≥ 6% Loose BX 48.3-49.8 Cemented BX with large hem lim filled cavities 49.8-53.8.
56.0	65.4	9.4		.06				99						.06				ST	–		ST								md	md	–	10			MZ?			red brown lim, hem., wk lim in cavities.
65.4	74.3	8.9		.07				100						.07				ST	–		ST								md	md	1	10			MZ?			light green clay min in 45° fract., rest as above.
74.3	84.2	9.9		.15				85						.07	.07	.01		ST	Tr		ST								md	md	5	15			MZ.	Qtz. veins	70-80°	SULF. in 82.9-84.2. TR. cc. & cpy. Rest as above, texture porphyritic.
84.2	91.0	6.8		.10				92						.06	.04	Tr		md	TR		md								md / ST	ST / md	1	10			MZ			SULF in bottom 1 foot. Lim & hem. md-st. less than above.
91.0	100.0	9.0		.22				99						.07	.08	Tr	.07	md	TR		ST								md	md / ST	5	10			MZ	Mixed sulf & leached		SULF. & leached capping. hem > lim. MD-ST. clay alt.
100.0	109.1	9.1		.33				99					.03	.05	.22	.03		ST	1		ST								md	ST	2	10			MZ			As above. oxided in center of interval w/ clean break between sulf.
109.1	118.4	9.3		.24				99						.05	.18	.01		ST	1		ST								md	ST	1	8			MZ	Sulf / leached	113.0	Oxides 113.0-118.4 as above sharp contact w/ sulf.
118.4	130.8	12.4		.11				85						.11				ST	<1		ST								md	ST	1	6			MZ.	Mixed oxide & sulf.		Mixed oxides, sulf, broken 118.4-120.4 & 125.0-128.1
130.8	139.9	9.1		.03				96						.03				wk / MD	<1		ST								md	ST	1	6						Mixed oxides & sulf, brick red hem. dominant. <1% fine diss. py
139.9	149.2	9.3		.26				98						.03	.21	.02		wk	1		MD								MD	MD / ST	1	8						As above except sulf. dominant; TR cc
149.2	158.0	8.8		.41	18.0 @ 0.45 / 0.03	.02		98						.02	.35	.04		–	1		–								MD	MD / ST	2	10				Sulf.		Clean sulf. py, cpy. cc coating on py & cpy. & TR. moly.
158.0	167.2	9.2		.48		.04		96						.04	.40	.04		wk	1		wk								MD	MD / ST	3	8				Mixed	165.3	As above to 165.3; rest mixed oxide & sulf. TR. blue-green oxide in sulf. interval
167.2	176.3	9.1		.02				91						.02				MD	TR		ST								ST	ST	4	8			MZ			Mixed oxide-sulf; oxide >> sulf, brown lim. & brick red hem.
176.3	185.3	9.0		.24				98						.02?	.18	.04		ST	TR		wk								ST	ST	2	8						As above, wk. sulf., yellow brown lim. dominant.
185.3	194.0	8.7		.31				97						.02?	.25	.04		ST	TR		wk								ST	ST	1	6			MZ			As above. TR. jarosite at base
194.0	201.0	7.0		.03				97							.03			Tr	Tr		wk								wk	wk	1	20			Da / MZ?			ST. silicification obscured texture, yellow brown lim. dominant.
201.0	211.0	10.0		.01				92						.01				ST	Tr		ST								wk	wk	-	20			Da?			Fine grained, stly silicified. Brick red hem on fractures.
211.0	220.6	9.6		.02				97						.01	.01			md	Tr		ST								wk	md	1	20			"			white bleached groundmass cut by red hem filled fractures
220.6	230.5	9.9		.19				89								.02	.17	wk	½		ST								wk	md	2	20?			"	Sulf	221.6 / 227.4 / 230.5	dis py, and covellite in interval surrounded by oxidation.
230.5	240.6	10.1		1.80		.15		89						.15	1.64	.01		Tr	1		Tr								wk	md	-	20			Da? or Sil?	Sulf (Fault)	85°	Gouge 232.5-234.5. Finely dis. sulfides in fine grained rk.
240.6	249.8	9.2		.76		.10		96						.10	.65	.01		md	1		-				Tct				md	md	-	20			Da?			Jarosite on fract. numerous small qtz eyes.
249.8	259.9	10.1		.96		.10		88						.10	.83	.03		wk	1										md	md	2	20			Fault	251.9		Shearing, gouge 252.9-264.8. Vuggy qtz veins, wk oxidation
259.9	269.5	9.6		1.15		.02		100						.02	1.10	.03		-	1										ST	md	2	20			Da? / Fault	264.8		Strongly sheared, finely dis. sulfides, md cc.
269.5	279.7	10.2		1.45		.01		85						.01	1.44				1										ST	md / ST	1	8			MZ	273.9		Gouge 269.5-273.9, sulf in fract, md. cc, TR. cpy
279.7	289.0	9.3		1.43		.02		85						.02	1.41				1										ST	MD / ST	1	6						MD-ST sericite, wk cc sulf on fract & diss.
289.0	298.5	9.5		.88	176.9' @ 0.91 / 0.04	.01		71						.01	.83	.04			2										ST	MD	2	8			MZ.			TR. covellite on fract. w/ wk-md cc.; texture locally obscured by silicification.
298.5	308.1	9.6		.48		.01		97						.01	.37		.10		1										ST	MD	1	15			MZ.			ST. silicification of G.M. 305.0-308.1. covellite between muscovite sheets...
308.1	322.3	14.2		1.06		.02		100						.02	1.04				1										ST	MD	1	10			MZ.			stly broken 312.7-328.3, locally stly. silicified
322.3	332.4	10.1		1.40		.14		96						.14	1.26				3										ST	MD	2	15						MD-ST sericite, wk-md cc in thin fract., qtz-py vein @ 329.0
332.4	342.2	9.8		1.12		.02		87						.02	.90	.05	.15		1										ST	MD	1	10			MZ.			wk-md cc in thin fract & w/ grains of py. MD-ST clay alt.
342.2	351.5	9.3		0.81		.02		97						.02	.71	.03	.05		1										MD / ST	ST	1	10	wk					wk-md cc on thin fract., as above, wk. 2nd K-spar
351.5	359.0	7.5		.51		.02		100						.02	.49				1										md / ST	ST	1	8	wk					wk-cc. as above., ST. clay alt.
359.0	367.0	8.0		.51		.02		79						.02	.47	.02			1										ST	ST	1	8	wk		MZ.	Fract w/ cc.	45°	wk-md cc in fract, rest as above
367.0	376.7	9.7		.32				95							.30	.02			1										ST	ST	1	5	wk					V. ST. clay alt., wk. cc. as coating on fract.
376.7	386.1	9.4		.74		.01		86						.01	.73				2										ST	ST	-	5	wk			Py veins	70°	ST. clay alt of GM, ST sericite on fract., wk-md cc, TR cpy.
386.1	395.9	9.8		.34		.01		93						.01	.32	.01			1										ST	ST	-	5	wk					Thick cc coatings on dis cpy+py. Soft, stly alt'd.
395.9	407.4	11.5		.45		.02		74						.02	.43				1										ST	ST	-	5	wk	wk				stly broken and gouged: 397.0-405.8
407.4	419.0	11.6		.18				73							.18				1										md	ST	-	5	Tr	wk		Shears	70°	soft, waxy green alt mineral. mdly sheared, more visible cc than above

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. F-168
Page 2 of 2 Pages
Collar Elev 3110.55 Final Depth 500.5'
Coords. N 28,358.43 E 28,134.76
Inclination Vertical
Logged by L.J., KE
Date: Start 12-24-68 Finish 1-4-69

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green		Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	Secd Mineral	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
419.0	428.9	9.9		.29				96							.26	.03			1										md	ST	Tr	S	Tr	Tr	Mz			ST cc. on sparsely dis py; spy. SOFT, STLY altd.
428.9	442.5	13.6		.27				65							.22	.05			1										Md	ST	1	S	Tr	—	Mz			MD cc. on fract. surfaces. Some diss., MOD HARD. STLY altd.
442.5	452.5	10.0		.29				94							.24	.05			1										md	ST	—	S	—	wk MD				MOD BROKEN, WK-MD cc. on diss. py & gr. NO VISIBLE cpy.
452.5	463.0	10.5		.07				76							.04	.03			1										md	ST	—	S	—	wk	Mz	Gouge 454.5 457.5		STLY BROKEN, TR-WK cc. in py.; TR cpy. STLY ALTD SOFT
463.0	474.5	11.5		.06				75							.04	.02			1					Tr					MD ST	ST	Tr	S	—	wk		Gouge 465.0 470.0		Soft, vwk-tr cc. on finely diss. py; tr cpy. & moly
474.5	485.0	10.5		.07				50							.04	.03			1										md	ST	1	7	-	wk				ST clay alt of fspar. Very wk cc. bi 100% hydromica
485.0	494.6	9.6		.17				99							.14	.03			1										md	ST	—	7	-	wk				As above. Unaltered dis spy.
494.6	500.5	5.9		.10				74							.06	.04			1										md	ST	—	7	-	wk	Mz			As above. Unaltered py; spy on fractures
	EOH																																					
Average Recovery: 88%																																						

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous
* Drilled from site of F-168.

F-169

Hole No. F-169
Page 1 of 2 Pages
Collar Elev. 3110.55 Final Depth 490.8
*Coords. N 28,358.43 E 28,134.76
Inclination 59°, S 75° E
Logged by R.E., P.B.
Date: Start 1-3-69 Finish 1-18-69

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Unknown NS	Cc.	Cpy.	Cov Born	Fe (2) Lim.	Py	Mag.	Hem	Spec	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE		(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0	5.0	5.0																																				Rockbit
5.0	14.4	9.4		.05				92						.05				md			md								md	md	2	8	5		M2			Coarse grained M2 Plag-2Clay. Bi-2Chl. K spar Fresh. Tr Cu Ox.
14.4	25.8	11.4		.05				76						.05				ST			ST								md	ST	1	3	1					Fractured and brecciated 22.0-25.8. Live lim in leached veins
25.8	37.0	11.2		.02				100						.02				ST	Tr		ST								ST	ST	6	12	1					Remnant dis sulfides, pr. cc. at 29.5' ST live lim.
37.0	46.5	9.5		.02				94						.02				ST	-		V ST								ST	V ST	-	3	-					Very soft, intensely altered and hematite stained
46.5	60.4	13.9		.18				93						.18				ST	-		V ST								ST	V ST	-	3	-					As above. alt decreases near bottom of int.
60.4	70.4	10.0		.05				88						.05				ST	-		V ST								md	V ST	½	4	Tr		M2			As above, soft, clayey. very strongly hem. stained
70.4	79.6	9.2		.04				98						.04				md	-		ST								md	ST	20	25	1	Complex qx.	QTZ.	75° 70°		Wk Cu Ox. Irregular hem staining, Salt Coarse grained above hex altered
79.6	88.8	9.2		.04				94						.04				md	-		ST								md	ST	10	15	1		M2			" " Several qtz veins bounded by fine grained stly altd rk.
88.8	96.4	7.6		.04				87						.04				ST	¼		ST								md ST	ST	6	10	1					Shattered, qtz veined, strongly altered. unoxidized intervals
96.4	105.3	8.9		.12				99						.02	.10			ST	½		md								md	ST	3	6	2					70% oxidized, iridescent coats on fractures. dis py. cc
105.3	114.8	9.5		.21				94						.02	.17	.02		md	½-1		wk								md	ST	7	12	2					60% oxidized. dis py, sph, cc. coarse grained but anhedral
114.8	125.0	10.2		.42		.03		92						.03	.36	.03		wk	1		wk								md	md ST	5	10	2					30% " ST dis cc.
125.0	134.0	9.0		.27				94						.02	.25			wk md	½-1		wk								md	md cc	2	7	Tr		M2			St. cc. in 1st 4' of intl. diss py, cpy cc. 60% of intvl. oxidized rk broken & rehealed
134.0	143.6	9.6		.32				91							.28		.04	wk	½		wk md								Md	Md	1	7	Tr	Partial Oxidation				Locally St. cc py & cc as uns & diss. 50% oxidized
143.6	151.2	7.6		.32				84							.28	.04		wk	1		Tr								Md	Md	2	8	Tr					UNOXIDIZED St. cc Some secondary K-spar
151.2	156.0	4.8		.03				99							.03			Md	-		Md								Md	St	-	5	-					100% oxidized NO sulfides observed Bx w/hem along fracs for entire intvl.
156.0	165.8	9.8		.12				86							.12			Md	2		Md								Md	Md	2-3	10	wk					60% OXIDIZED St. cc in veins & diss. Locally Bx'd
165.8	175.7	9.9		.08				89						.02	.04	.02		Md	2		Md								St	Md St	5	12	wk		Fe-4	1151		80% OXIDIZED Locally Bx'd cc, cpy, py in veins & diss.
175.7	185.5	9.8		.44		.06		95						.06	.32	.06		wk	½		-								Md	Md	3	10	-					UNOXIDIZED veins of cc & py upto 3/8" also diss. some secondary K-spar
185.5	195.5	10.0		.38				91							.34	.04		Tr	½		-								Md St	Md	1	7	-		M2			UNOXIDIZED cc, cpy, py as veinlets & diss. St cc some sec K-spar
195.5	205.3	9.8		.50		.01		92						.01	.40	.05	.04	-	1		-								St	Md	3	8	wk					Tr Cu Ox Tr cov Same as above
205.3	210.5	5.2		.22				82						.02	.13	.04	.03	-	1		-								St	Md St	4	9	Tr					Tr Cu Ox several qtz veins mineralization as above
210.5	221.7	11.2		.26				75						.03	.20	.	.03	-	½		-								St	St	4	10	-					Tr Cu Ox on fractures. slickensides on some fracs.
221.7	231.5	9.8		.30				79						.03	.27			-	½		-								St	St	3	8	-					Tr Cu Ox. St'ly brecciated & granulated 227.0 - 231.5
231.5	241.3	9.8		.31				91						.03	.28			-	½		-						Sulfides		Md St	St	4	9			M2			Tr Cu Ox in veins & along fracs cc & py diss.
241.3	252.3	11.0		1.45		.01		72							1.40		.05	-	4-5		-								St	St	2	6						Brecciated & granulated 244.3-246.3' w/st cc & py one 4.5" cc & py vein @ 2490
253.3	261.5	9.2		.76	163.8 @	.01		74							.63	.05	.08	-	1-2		-								Md St	St	4	9						St cc & py throughout as veins & diss. one 5" Qtz vein
261.5	271.3	9.8		.33	0.36	.01		88							.33			-	1		-								St	St	8	15						St'ly silicified from 261.5-262.5' St cc in veins & diss.
271.3	281.3	10.0		.52	0.01	.01		90							.40	.06	.06	-	½		-								Md	St	1-2	6						cc mostly finely diss. slickensides on some fractures
281.3	291.4	10.1		.47		.01		91							.39	.04	.04	-	½		-								Md	Md	1	5						As above gouge at 286.0 to 286.4
291.4	302.0	10.6		.18				88							.14	.04		-	1½		-								Md	Md	3	8	wk					cc & py finely diss. broken and brecciated from 299.0-300.0'
302.0	312.0	10.0		.20				92							.12	.04	.04	-	1½		-								Md	Md	2	15	wk					St'ly silicified from 303.0' to 309.0' fresh K spar throughout
312.0	316.8	4.8		.47		.01		79						.01	.39	.03	.04	-	2		-								Md	St	3	10	wk					St silicification Locally broken intvl from 314.0-316.4. cc finely diss
316.8	326.2	9.4		.26				99							.13	.05	.08	-	2		-								Md	Md	2	10	wk					" " " wk cov. cc as veins & diss. Abundant sec. K-spar
326.2	336.0	9.8		.64		.01		94							.19	.20	.25	-	4		-								Md	Md	1	10	wk					Locally silicified one 1" vein of cc, cpy, & py also diss.
336.0	345.5	9.5		.43		.01		81							.25	.06	.12	-	3		-								Md	Md	2	8	wk					" " broken & brecciated from 339.0-345.5 diss py, cc, & cpy
345.5	354.4	8.9		.19				100							.15	.04		-	1½		-								Md	Md	2	7	Md					½" gouge at 347.0' broken & brecciated from 350.0-352.4'
354.4	365.0	10.6		.12				85							.07	.05		-	2		-			Tr					Md	Md	3	9	Md					Chlorite alt becoming stronger py, cc & cpy finely diss
365.0	374.6	9.6		.09				92							.03	.06		-	2		-								Md	Md	3	8	St		M2			Locally brecciated & healed, Local silicification py, cc & cpy diss.
374.6	383.8	9.2		.04				90								.04		-	2		-								Md	Md	4	15	St		SP?			silicified throughout rock is finer grained than above
383.8	392.6	8.8		.04				97								.04		-	2½		-								Md	wk	3	15	Md					Same as above breccia from 390.6 to 392.6
392.6	400.7	8.1		.04				96								.04		-	2		-								Md	wk	6	16	wk					same as above several qtz veins py & cc diss No cpy observed
400.7	410.5	9.8		.05				84								.05		-	2		-								Md	Md	2	7	Md					Locally silicified cpy, py & cc as veins and diss.
410.5	419.7	9.2		.04				100								.04		-	½		-								Md	wk	5	20	wk					St silicification throughout several Qtz veins wk. cc.
419.7	427.0	7.3		.05				86								.05		-	2½		-								Md	Md	3	15	Md		SP?			" " up to 424.0' cpy, py & cc as veins & diss

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. F-169
Page 2 of 2 Pages
Collar Elev 3110.55 Final Depth 490.8
Coords. N 28,358.43 E 28,134.16
Inclination 59° S75°E
Logged by KPE
Date: Start 1-3-69 Finish 1-18-69

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green		Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem.	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE		(3) Rock Type	Structures (4) Depth	True Dip	Remarks
427.0	437.0	10.0		.04				84								.04		–	2		–								md	wk	2	13	md		SP?			Fine grained, no texture. st silicification throughout (Split prior to log)
437.0	446.8	9.8		.05				95								.05		–	3		–								wk	wk	2	14	st		"			As ABOVE st chl alt Tr cpy
446.8	455.7	8.9		.06				100								.06													wk	wk	1	15	md		"			Fine grained, stly silicified, stly fractured.
455.7	465.4	9.7		.07				96								.07													wk	md	1	10	md		Mz'SP			Broken, gouge: 463.0-466.3. Fine grained Mz dike cuts SP 455.7-465.7
465.4	471.3	5.9		.07				81								.07													wk	md	3	10	md		"			Fine grained Mz f'SP, both cut by white barren qtz veins
471.3	481.0	9.7		.06				95								.06													wk	wk md	3	10	md		"			Textures are crushed, recrystallized. wk alt of groundmass
481.0	490.8	9.8		.06				93								.06													wk	wk md	1	8	md		Mz?			md.gr. rock with anhedral texture. stly broken. Tr of Cc.
Average Rec: 90%																																						
Inclination at collar: 59°																																						
" at 480': 58°																																						

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Note (3)
Tt - Tactite
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Bx - Breccia
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Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. F-170
Page 2 of 2 Pages
Collar Elev 3153.14 Final Depth 425.7
Coords. N 28,537.15 E 28,571.02
Inclination 60°, N 0° E
Logged by RE, PB
Date: Start 1-17-69 Finish 1-31-69

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	N.S.	Cc.	Cpy.	Covellite Born	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
377.0	382.0	5.0		.39	Nil		203.1' @ 0.11 opt	62							.32	.07			2									Md	st	2	12	Tr		Sp?			fine gr. rk. cc as veinlets & diss
382.0	392.0	10.0		.58	.01			52						.01	.47	.10			2									st	md	3	15						" " " many small py & cc veinlets tr. cov. wk. cpy.
392.0	401.6	9.6		.41	.01			91						.01		.15	.25		3									st	md	3	18	wk					AS ABOVE wk'y silicified throughout
401.6	410.7	9.1		.44	.01			100						.01	.28	.15			4									st	md	3	16	md					wk cc many py veined veinlets local st sil
410.7	421.0	10.3		.37	.01			81						.01	.21	.15			3									st	md	3	15	md					AS ABOVE wk cpy
421.0	425.7	4.7		.34	Nil			91							.24?	.10			1					Tr				Md	Md	3	12	Md					silicified throughout, many Qtz veinlets wk py & cc. T-cpy
EOH																																					

Inclination at 415': 62°
Average Rec: 88%

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Note (3)
Tt - Tactite
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Bx - Breccia
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Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

* Drilled from site of F-162

Hole No. F-170
Page 1 of 2 Pages
Collar Elev 3153.14 Final Depth 425.7
*Coords. N 28,537.15 E 28,571.02
Inclination 60°, N 0° E
Logged by RE, PB
Date: Start 1-17-69 Finish 1-31-69

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Unknown N.S.	Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem.	Spec.	Other (2) Galena	Sphal.	Molyb.	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0	5.0	5.0																																			Rockbit
5.0	10.6	5.6		.01				100						.01				ST			md								md	md	2	20	-	SP?			fine grained porphyritic 15% phenos. stly silicified
10.6	19.6	9.0		.01				92						.01				ST			md								md	md	1	10					" " " zones of ST sil abundant fine boxwork
19.6	27.0	7.4		.02				73						.02	Tr			ST	Tr		md								md	ST	2	10					As above Tr of remnant py & cc in silicified interval
27.0	33.1	6.1		.01				100						.01				md	Tr		wk								wk	md	2	20					Poorly fractured, stly silicified, 15% large phenos.
33.1	39.8	6.7		.01				70						.01				md	Tr		wk								wk	md	?	20					13x 38.5-39.8, Jarosite on some fractures
39.8	47.5	7.7		.04				95						.04				Md	Tr		md								wk	md	-	20					Locally Brecciated " " " " Local sl. silicification
47.5	56.5	9.0		.03				83						.03				Md			St								St	md		15					" " Boxwork between frags in bx. " " " some Jarosite
56.5	62.8	6.3		.03				88						.03	Tr			Md	tr		St								md	md	3	18					As Above Tr cc. many very small qtz veins
62.8	72.6	9.8		.04				92						.04	Tr			wk	tr		md st	tr							md	md	4	18					65% oxidized. wk cc py in unoxidized zone porphyrite from 65.5-72.6 Several alunite vns.
72.6	81.6	9.0		.03				96						.03				wk	Tr		st								md	st	4	20					90% oxidized porphyrite from 72.6-78.0 Bx from 78.0-81.6
81.6	90.8	9.2		.04				88						.02	.02			md			md	tr							md	st	4	18					70% " Locally Bx'd Jarosite on some fracs. wk py cc as veins & diss
90.8	99.4	8.6		.07				100						.02	.05			md			wk								md	ST	5	20					70% " stly brecciated, cemented. 1" vein of alunite
99.4	106.5	7.1		.07				100							.07			wk	5		-								md	ST	7	20					30% " brecciated then silicified 3:1" py veins
106.5	116.6	10.1		.13				92							.13			wk	4		-								ST	ST	4	10		SP (definite)			less brecciated & silicified than above. several ¼" py veins 10% " Texture is recognizable as SP. most py unreplaced by cc
116.6	126.3	9.7		.31		.01		89						.01	.30			wk	1		-								ST	ST	2	15		SP; MZ	Fault	60°	10% " one fault along axis. Mz dikes cut SP. soft & min. 116.6-121.4
126.3	135.6	9.3		.24				95							.24	Tr		Tr	2		-								Ma	ST	5	15		SP; MZ			irregular barren qtz veins. cc. on dis. py, cpy
135.6	140.5	4.9		.24				72							.24			-	2										ST	ST	2	15		MZ			ST cc on finely dis sulfides
140.5	149.0	8.5		.19				91							.19			Tr	½		Tr								st	st	4	20		Mz & SP			Mz to 149.0 then SP to end of intvl st sil in SP cc finely diss
149.0	158.4	9.4		.23				100							.23			Tr	2		Tr								st	st	3	18		Mz & SP			MIXED intvl of Mz & SP " " " cc diss & as veins
158.4	165.1	6.7		.14				84							.14			Tr	½		Tr								Md	st	50	70		Mz & sp			" " " " one 3½ft Qtz vein Mz & sp stly sil'd wk cc
165.1	176.0	10.9		.05				95						.05				—	1		Tr								—	85	90			Qtz			Intvl is almost completely vein Qtz 174.0-176.0 silicified Bx w/ Mz frags
176.0	184.0	8.0		.06				100							.06			Tr	1		½								Md	Md	25	50		Bx			Silicified Bx w/ frags of Mz 35% Qtz vein wk cc in Mz frags
184.0	194.3	10.3		.09				87							.09			Tr	2		Tr								Md	Md	20	75		Bx			" " " " " some alunite veins cc in Mz frags
194.3	201.0	6.7		.10				75							.10			—	4		—								wk	-	25	85		Bx			" " st sil obscures rk type of frags st py in veins & dis
201.0	209.4	8.4		.81		.04		95						.04	.75	.02		—	3		—								St	Md	20	60		Mz?			st sil Locally two 1ft Qtz veins st cc in unsilicified portion. partially Bx'd.
209.4	216.8	7.4		.98		.05		87						.05	.92	.02		—	2		—				Tr				st	st	20	35		"			one 2ft Qtz vein Locally bx'd py & cc as veins & diss.
216.8	225.6	8.8		.56		.04		93						.04	.49	.05		—	2		—								Md	st	2	10		Mz (definite)			good Mz w/ large phenos. sil Bx from 220.0-223.0. st cc
225.6	234.3	8.7		.45		.04		100						.04	.36	.05		—	3		—								St	st	8	20		Mz			Locally Bx'd & silicified Py & cc as veins & diss
234.3	244.0	9.7		.41		.03		95						.03	.33	.05		—	3		—								St	st	7	20					234.3-240.0 unsilicified, good Mz. 240.0-244.0 as above
244.0	254.0	10.0		.25		.03		75						.03	.17	.05		—	6		-								Md	Md	10	50					Silicified & brecciated throughout st cc as veins & diss st py veins
254.0	263.3	9.3		.58		.01		91						.01	.52	.05			2		-								Md	ST	2	10					Coarse grained Mz, ST cc replacement of dis cpy, less on py
263.3	271.5	8.2		.57		.04		90						.04	.48	.05			2		-								ST	ST	3	12					ST cc on some veinlets and replacing cpy
271.5	282.0	10.5		.62		.04		78						.04	.56	.02			2										ST	ST	3	12					silicified 13x 277.4-277.6. stronger alt & min than above
282.0	290.7	8.7		.74	203.1 Cu 0.71 Out	.02		100						.02	.68	.04			2										st	st	2	12	tr				Coarse grained Mz st diss. cc
290.7	299.7	9.0		.81		.04		98						.04	.71	.06			3										st	st	2	10					As Above tr cov
299.7	309.6	9.9		.90		.09		79						.09	.76	.05			2										st	st	3	15					Locally silicified Bx st diss cc
309.6	321.3	11.7		.86		.09		72						.09	.75	.02			3										st	st	4	12					intvl is stly broken & bx'd one ½" vein of py & cc st. diss cc
321.3	331.0	9.7		.59		.07		81						.07	.47	.05			2										st	st	2	10					f. cc. as veinlets & diss stly alt'd
331.0	339.6	8.6		.83		.01		94						.01	.80	.02			2										st	st	2	10					Coarse grained Mz st cc as diss & veinlets
339.6	347.2	7.6		.72		.01		100						.01	.66	.05			2										st	st	2	12					As Above tr cov. some cc as coatings on py
347.2	355.1	7.9		.55		Nil		88							.50	.05			2										st	st	1	10					As Above tr. cpy " " "
355.1	365.2	10.1		2.00		.06		92						.06	1.89	.05			5										st	st	3	15		Sp?			As Above to 357.0 then rk becomes fine grd Sp? Locally silicified st py & cc
365.2	377.0	11.8		.93		.06		80						.06	.87														st	Mo	2	12					rk is generally fine gr. 367.0-374.5. Bx & gouge. st. cc

Strong oxidation

Strong CC

wk CC

ST silicification, pyr & oxidation

Strong CC

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Note (3)
Tt - Tactite
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Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. F-171
Page 2 of 2 Pages
Collar Elev. 3186.72 Final Depth 425.9
Coords. N 28,487.41 E 28,092.10
Inclination Vertical
Logged by PB
Date: Start 1-28-69 Finish 2-5-69

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Cu (1) Pitch	Cu (1) Black	Cu (1) Blue Green		Cu (1) Cc.	Cu (1) Cpy.	Cu (1) Born	Fe (2) Lim.	Fe (2) Py	Fe (2) Mag.	Fe (2) Hem	Fe (2) Spec.	Other (2) Galena	Other (2) Sphal.	Other (2) Molyb	Other (2) Calcite	Other (2) Garnet	Other (2) Silicates	Other (2) Sericite	Other (2) Clay	Other (2) Vn. Qtz	Other (2) QUARTZ	Other (2) CHLORITE		(3) Rock Type	Structures (4) Depth	Structures (4) True Dip	Remarks
396.0	402.4	6.4		.20				88							.20				2										st	st	-	10			Mz	fracs	60°	As above Tr cpy. some sec. K-spar
402.4	411.3	8.9		.30				89							.30				2										st	st	1	10				"	"	Broken from 410.0-411.3 Tr cpy.
411.3	420.5	9.2		.23				80							.23				3										st	st	-	10						high angle shears locally broken w/gouge wk cc
420.5	425.9	5.4		.21				80							.21				2										st	st	2	2			Mz			As above Tr cpy. bio. altered to hydro mica
E.O.H.																																						
Average Recovery: 84%																																						

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO- SILVER BELL UNIT

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Tt - Tactite
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Hole No. F-171
Page 1 of 2 Pages
Collar Elev. 3186.72 Final Depth 425.9
Coords. N 28,487.41 E 28,092.10
Inclination Vertical
Logged by RE, PB
Date: Start 1-28-69 Finish 2-5-69

Depth From	Depth To	Depth Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	N.S.	Cc.	Cpy.	Born	Fe (2) Jarosite Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0	5.0	5.0																																			Rockbit
5.0	15.0	10.0		.03				88						.03				md	-		st							md	st	2	10			SP(?)			Fine grained to porphyritic, hem stained G.M., md Jarosite
15.0	24.8	9.8		.01				100						.01				st	-		md							md	st	2	20			Dacit			Strong Silicification, small qtz eyes. st Jarosite, marginal lim
24.8	34.3	9.5		.02				97						.02				md	-		md							md	st	-	20			" "			md. gr., abundant QTZ eyes. Alunite filling fracts. md Jarosite
34.3	44.1	9.8		.01				97						.01				md			md							md	st	-	15			Dacit	Shears	≥90°	Texture varies fine to md gr. few leached sulfide veinlets
44.1	51.6	7.5		.02				95						.02				st			wk							md	st	-	15			Mz?			st Jarosite, md gr altd fspars in glassy G.M.
51.6	61.5	9.9		.01				79						.01				st			wk							md	st	-	15			Mz?			Leached veins filled with crystalline Jarosite, Tr of dis. cc
61.5	71.0	9.5		.02				93						.02				st			md							m-l	st	2	15			?			st hem, lt lim 61.5-63.0. silicified Bx 70.5-71.0
71.0	80.3	9.3		.02				93						.02				st			wk							md	st	-	15			Da?			Very strong Jarosite, md gr. porphyritic. Numerous qtz eyes
80.3	89.8	9.5		.03				100						.03				st			wk							md	st	1	15			Da?			stly broken, hard st Jarosite
89.8	99.0	9.2		.02				100						.02				st			-							md	st	-	10			Da?			Da? is cut by dikes with 7% large altd phenos in f.gr. G.M.
99.0	108.0	9.0		.03				97						.03	Tr			st			wk							st	st	2	15			Da?			As above Tr diss cc st Jarosite
108.0	117.5	9.5		.03				97						.03	Tr			st			md							md	md	4	25			Da?			siliceous breccia w/ Da? frags st Jarosite w/ boxwork between frags Tr cc
117.5	126.3	8.8		.02				90						.02				st	2		wk							md	md	5	40			Da?			Qtz vein from 119.5 - 121.3 Da? cut by dike of well mined Mz?
126.3	135.3	9.0		.02				95						.02				st			wk							md	md	3	30			"	Sulfides		Siliceous Bx w/ Da? frags st Jarosite w/ boxwork between frags vuggy
135.3	144.5	9.2		.07				84						.02	.05			md	3		-							st	st	2	12			Mz?			st'ly bleached Mz? w/ 15% large phenos. wk cc & py several Alunite vns.
144.5	154.0	9.5		.96		.01		93						.01	.88	.07		wk	4		-							md	st	2	15			Mz?			Less porphyritic than above Locally silicified st cc & py. Tr cpy
154.0	162.8	8.8		1.87		.01		95						.01	1.79	.07		Tr			-							st	st		12			Mz			Locally silicified st cc & py as veinlets & diss.
162.8	171.6	8.8		1.48		.02		92						.02	1.41	.05		-	2		-							md	st	2	12	wk		"			As Above
171.6	181.1	9.5		1.49		.02		88						.02	1.42	.05			2									md	st	4	14	wk		"			gouge at 173.6 st cc as veins & diss locally silicified
181.1	190.4	9.3		1.36	1.663 @ 0.95 0.02	.02		93						.02	1.29	.05			3									st	st	2	12			Mz & Sp?			one 4" cc & py vein at 184.8' generally Mz w/ some fine grained rk sp? st cc
190.4	199.2	8.8		1.45		.02		100						.02	1.38	.05			2									st	st	2	10			"			rock type as above st cc as veinlets & diss.
199.2	204.5	5.3		1.15		.03		72						.03	1.10	.02			2									st	st	-	10			"			" " " gouge at 202.5 St. cc.
204.5	213.7	9.2		.97		.02		77						.02	.93	.02			3									st	st	2	12			"			" " " several Py veins " "
213.7	223.0	9.3		.75		.02		100						.02	.71	.02			4									st	st	2	12			"			" " " Locally silicified Broken from 218.2 - 218.1 st cc
223.0	232.2	9.2		.50		.02		99						.02	.46	.02			2									st	st	-	10			Mz			Coarse grained Mz w/ 30% large phenos st cc as veinlets & diss
232.2	241.6	9.4		.45		.02		92						.02	.41	.02			2									st	st	-	9			"			Locally breccia & gouge. Tr cov. diss cc.
241.6	250.8	9.2		.47		.01		91						.01	.44	.02			2									ST	ST	2	10			MZ	py veins	40°	stly altd, broken and gougey. sulfides mostly dis.
250.8	260.3	9.5		.22				91							.20	.02			2									ST	ST	-	10				Shears	40°-60°	stly broken to 256.' sulfides v.f.g. uniformly dis.
260.3	269.3	9.0		.28				97							.24	.04			2									ST	ST	-	10				"	60°	Soft, stly Altd sulfides as above
269.3	278.0	8.7		.22				83							.13	.04	.05		2									ST	ST	-	10				Py vein	60°	" " "
278.0	285.6	7.6		.16				79							.14	.02			2									st	st		0				fracs	60°	" " " Local Bx & gouge diss cc
285.6	296.6	11.0		.31				68							.29	.02			3									st	st		12				"	"	Bx & gouge from 288.5 - 295.0 py veins w/ cov. diss cc
296.6	307.6	11.0		.33				73							.31	.02			2									st	st	-	10				"	"	Local Bx & gouge see K-spar tr cpy diss cc as coatings on py
307.6	313.6	6.0		.22				52							.20	.02			2									st	st		"				Shears		" " " tr cov " " " " "
313.6	321.9	8.3		.10				74							.08	.02			2									st	st	-	10				Fracs/shrs.	"	" " " some see K-spar
321.9	331.1	9.2		.07				65							.06	.01			2									st	st	2	0				"	"	As Above
331.1	340.8	9.7		.06				88							.05	.01			2									st	st	2	10				"		Local gouge & broken vtuls. cc mostly as coatings on py. See K-spar
340.8	349.6	8.8		.10				92							.09	.01			2									st	st	2	10						As Above
349.6	358.5	8.9		.08				98							.07	.01			2									st	st	3	12						As Above. bio. altered to chlorite
358.5	367.6	9.1		.24				89							.22	.02			2									st	st	2	10				fracs	60°	granulated & gougey from 358.5 - 363.5 Tr cov cc as above
367.6	377.1	9.5		.33		.01		96						.01	.32				4									st	st	3	15				Py veins	75°	Local gouge & Bx one st py & cc vein Tr Jalcoutnite
377.1	387.0	9.9		.32		.01		95						.01	.31				2									st	st	-	10						coarse grained, 20% large phenos cc as veins & diss mostly coatings on py
387.0	396.0	9.0		.29				96							.29				2									st	st	2	12			MZ			" " " " " Local gouge & Bx wk cc

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO- SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

F-172

Hole No. F-172
Page 1 of 1 Pages
*Collar Elev. 3186.72 Final Depth 445.5
*Coords. N 24 487.41 E 29 092.10
Inclination 60° (59° @ collar; 63° @ 435') Due East
Logged by RF & PB
Date: Start 2-8-69 Finish 2-18-69

*Coordinates are for collar of F-171.

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	N.S	Cc.	Cpy.	Cov Born	Fe (2) Jarosite Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE			(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0	9.0	9.0																																					Collar
9.0	16.7	7.7		.01				97						.01				ST	-	-	md								md	ST	3	20			SP?				ST Jarosite, Alunite. F.gr., st'ly silicified
16.7	26.2	9.5		.01				97						.01				ST	-	-	-								md	md	1	20							" " " only two joints; silicified
26.2	35.2	9.0		.01				69						.01				ST	-	-	-								md	ST	1	15							" " " wk L.lim. Med gr., Less silicified
35.2	45.2	10.0		.01				65						.01				ST											ST	ST	-	15							" " " md'ly broken, 35.2-40.4. As above
45.2	49.6	4.4		.01				100						.01				ST											md	ST	-	15							" " " wk'ly broken, As above
49.6	62.0	12.4		.01				62						.01				st			Md								Md	Md	3	15							Fine grained st'ly silicified st. jarosite as veins & along fracs.
62.0	73.1	11.1		.01				77						.01				st			Md								Md	Md	-	15							med grained " " " " " " "
73.1	82.8	9.7		.01				82						.01				st			Md								Md	Md		12							As Above to 82.0, then dike of f.gr. ck w/ 5% large phenos. Tr L.Lim
82.8	91.9	9.1		.01				93						.01				st			wk								st	Md	2	15							f.gr. dike to 84.0. med.gr., st.sil. Jarosite & Alunite veins. 3 f.gr. dikes Less than 6" wide
91.9	100.8	8.9		.01				93						.01				st			Md								st	Md	3	4							wk'ly broken " " " " " wk L.lim.
100.8	109.9	9.1		.01				93						.01				Md			st								st	st	2	12							md'ly broken Less silicified st L.lim one 6" f.gr. dike
109.9	115.1	5.2		.01				70						.01				wk			Md								st	st	2	12							Local silicified bx. md L.lim two 8" f.gr. dikes
115.1	124.6	9.5		.02				87						.02				wk			wk								st	st	3	15							" " " 115.1-118.0 f.gr. dike; several veins of Qtz & Alunite
124.6	134.1	9.5		.01				89						.01				wk	Tr		-								st	st	-	15			Sp?				st'ly silicified Fine-med gr Sp? Tr py & cc
134.1	143.1	9.0		.03				96						.01	.02			Tr	4		-								st	st	-	18							" " st py w/ Trace one Alunite vein
143.1	152.6	9.5		.07				92						.01	.06			-	3		-								st	st	2	18							" " med gr. Sp? cc as veinlets & diss, st py, wk'ly broken
152.6	162.3	9.7		.22				92						.02	.20			-	3		-								st	st	-	15							Less sil than above 153.4-154.6 f.gr. porphyritic ck. md-st cc as veins & diss
162.3	171.5	9.2		.21				95							.21				2										st	st	-	15							" " " " Moderately broken " " " "
171.5	180.2	8.7		.07				77							.07				2										st	st		18							st. silicification wk'ly broken Md. cc as veinlets & diss.
180.2	192.8	12.6		1.97		.03		62						.03	1.94				6										st	md	20	40							" " Qtz vein from 185.2-192.8 w/ very st cc & py & veinlets in Qtz
192.8	202.3	9.5		3.85		.01		92						.01	3.84				5										st	md	10	40							" " Sil. Bx w/ very st cc between frags & as veins.
202.3	212.4	10.1		.17				85							.17				4										st	md	10	40							st silicification obscures rk type. py & cc as veinlets & diss. Much less than above
212.4	224.0	11.6		.37	96.5 @ 1.15 0.01	.01		80						.01	.36				4										st	st	10	35							" " " " " st'ly broken w/ intuls. of gouge st cc.
224.0	235.9	11.9		.19				75							.19				2										st	st	10	35							As Above wk cc
235.9	245.7	9.8		.29				92							.29				2										st	st	5	25							As Above To 240.0 fault zone w/ gouge from 240.0-244.0 Mz w/ diss cc. 244.0-245.7
245.7	255.2	9.5		1.57		.01		90						.01	1.56				2		-								st	st	2	12			Mz				Coarse gr. Mz. Locally granulated & gougey st cc as diss & veinlets.
255.2	267.0	11.8		1.55		Nil		89							1.45	.05	.05		2										st	st	-	10							" " " wk'ly broken st diss cc. throughout
267.0	276.7	9.7		.56				86							.46	.06	.04		2										st	st	-	10							" " " cc as veinlets & diss. Tr cov. wk sec K-spar
276.7	286.4	9.7		.25				98							.22	.03			2										st	st	-	10							As Above st'ly fractured & sheared No cov. observed.
286.4	296.7	10.3		.22				90							.17		.05		2										st	st	-	10							Coarse gr. Mz. cc as veins & diss wk sec. K-spar Tr. cov.
296.7	306.1	9.4		.43		Nil		88							.40		.03		2					Tr					st	st	5	20							Local st. sil. wk'ly broken " " " diss. cc.
306.1	316.3	10.2		.18				75							.16		.02		2										st	st	5	20							" " " md'ly " cc. as veinlets & diss. Local Bx
316.3	325.7	9.4		.24				88							.20	.03	.01		2					wk					st	st	2	15							" " " gouged Bx from 318.8-323.0 cc. as above
325.7	334.9	9.2		.18				96							.13	.02	.03		1					wk					st	st	:	12							Coarse gr Mz grn. clay min. Tr. cov. cc as above
334.9	343.9	9.0		.13				91							.11	.0	.01		1					wk					st	st	-	10							" " " " " " some sec. K-spar cc. as above
343.9	352.8	8.9		.57	19.4 @ 67% Nil	.01		100						.01	.46	.02	.08		2										ST	md	2	15							md silicification, wk dis cc.
352.8	363.3	10.5		.67		Nil		95							.57	.02	.05		2										ST	ST	3	10							md-st'ly broken, gougey. px, cpx, wk cc.
363.3	373.7	10.4		.28				94							.24	.0	.03		2										ST	ST	3	10							Shear zone 365.0-367.0. md cc., irregular white qtz veins (Pre-min)
373.7	382.4	8.7		.16				88							.14		.02		1										ST	ST	1	10							soft, st'ly altd, md cc. sulfides along thin, small fracts.
382.4	392.0	9.6		.13				80							.13		.01		<1										ST	ST	-	7							" very st'ly altd, f broken
392.0	404.0	12.0		.23				64							.20	.01	.02		3										st	st	2	8	Tr						md'ly broken st'ly altd. wk diss cc.
404.0	417.0	13.0		.69		.05		73						.05	.58	.0	.05		2										st	st	2	10							st'ly broken w/ gouge, wk cc as veinlets & diss, Tr cov, wk sec K-spar.
417.0	426.0	9.0		.21				91							.19		.02		2										st	st	1	8							granulated & gougey 417-419 st'ly altd abundant grn clay min. wk sulfides
426.0	436.4	9.6		.12				89							.11	.0			3										ST	ST	2	10							st'ly altd md'ly broken Abundant green clay. wk 2nd K spar. wk cc
436.4	445.5	9.1	EOH	.15				120							.14	.0			2										ST	ST	-	8			Mz				As above

Average Rec.: 85%

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO- SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. F-173
Page 1 of 1 Pages

Collar Elev. 3165.16 Final Depth 376.4
Coords. N 28,458.02 E 27,848.32
Inclination Vertical
Logged by RE, PB
Date: Start 2-14-69 Finish 2-24-69

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	N.S.	Cc.	Cpy.	Covellite	Born	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0	11.0	11.0																																				No recovery
11.0	22.0	11.0		.01				82						.01					ST	-		-								mdST	2	15			SP?			fine grained, Porphyritic, small qtz eyes. mdly fractured.
22.0	32.0	10.0		.01				96						.01					ST	-		-								mdST	2	20						mdly fractured, md silicification, yellow earthy lim.
32.0	39.3	7.3		.01				82						.01					ST			md								mdST	2	15						Md Live Lim, otherwise as above.
39.3	50.0	10.7		.02				82						.02					Md			St								St	St	2	12					" " " stly broken Boxwork on some fracs
50.0	62.0	12.0		.02				77						.02					md			St								md	st							wk Live Lim. mdly broken rk. becomes coarser gr. at 57.3 some boxwork
62.0	70.2	8.2		.03				86						.03					ST			ST								md	ST	1	8		SP?	fracts 70.0	45-50	stly altd, stly broken. wk Lim, md jarosite calcite.
70.2	78.9	8.7		.02				97						.02					ST			ST								ST	ST	-	12		MZ			MZ is Coarse grained w/ vst clay alt & hem staining
78.9	87.6	8.7		.08				100						.03	.05				md	Tr		wk								ST	wk md	-	15		SP?	82.0		Below 82.0 Rk is f. gr, stly silicified, flushed with Jarosite
87.6	96.0	8.4		.30				97						.01	.22	.02	.05		wk	wk		-								ST	wk md	-	15?		MZ (SP?)	sulfides		V. stly silicified, Rk Types as above, md oxidation, wk sulfides
96.0	106.0	10.0		1.04		.01		93						.01	.99	.04			wk	2		-								md	wk md	-	20		MZ?			ST sil, md gr., wk oxidation, md-ST dis. CC.
106.0	117.0	11.0		1.40		.01		[illegible]						.01	1.34	.05			Tr	2		-								md	md	-	10		MZ			less sil, abundant green waxy alt min, becoming coarser gr.
117.0	126.5	9.5		.80		.01		100						.01	.79				-	4										md	md ST	2	10			Py vein	80°	Definite Coarse gr MZ. Sericite, sil. border 1" Py vein
126.5	134.4	7.9		.48		Nil		91							.48					2										Md	St	-	10					" " " " stly altd wk-md cc as veinlets & diss.
134.4	143.6	9.2		.78		Nil		97							.73	.05				2										St	St	-	10					" " " " Several small Alunite veins md cc.
143.6	152.0	8.4		.42		Nil		100							.37	.05				2										St	St	2	12			Shear	85-90	As above md-st diss cc.
152.0	161.2	9.2		.57		Nil		95							.55	.02				2										St	St	-	10			"	"	Coarse gr. Mz w/ 20% Large phenos. md diss cc Tr cpy
161.2	170.2	9.0		.43		Nil		97							.41	.02				2										St	St	3	12					As above Sheared & broken from 168.7-170.2
170.2	176.0	5.8		.27				63							.25	.02				2										St	St	-	10					Sheared & broken 170.2-170.8 stly altd coarse gr. Mz md cc as veinlets & diss
176.0	182.0	6.0		No recovery				0							-																							
182.0	192.4	10.4		.40	193.6' @	.01		55						.01	.37	.02				1½										St	St		10					stly altd Mz. stly broken md diss. cc
192.4	203.0	10.6		.65	0.63 / 0.01	.01		68						.01	.64					2										St	St		10					generally as above. cc. is stronger than above
203.0	210.9	7.9		.43		Nil		100							.41	.02				2										St	St	2	12					wk'ly broken, wk sil. St cc as veinlets & diss.
210.9	220.0	9.1		.81		.01		96						.01	.80					2										St	St	2	12			Pyrite vein	70°	Coarse gr Mz to 217.0 then becomes fine gr to end of int'vl. st-md cc throughout
220.0	229.0	9.0		.87		.01		100						.01	.86					2										St	Md	2	15					Med-Coarse gr Mz wk-md silicification st diss. cc.
229.0	237.0	8.0		.46		Nil		94							.46					2										St	St	-	0			Shear	80°	Coarse gr Mz stly altd md cc.
237.0	247.0	10.0		.70		.01		64						.01	.67	.02				1										St	St	-	10					" " " " " Locally broken w/gouge md cc
247.0	259.4	12.4		.71		Nil		27							.69	.02				2										Md	St	2	12					Coarse gr Mz wk'ly silicified md diss. cc.
259.4	267.0	7.6		.63		.01		100						.01	.62					2										St	St		10			Shear	70-80	Mdly broken. Abundant grn clay min wk-md diss. cc
267.0	274.8	7.8		.21		Nil		85							.21					4										St	St	3	13					Stly broken & granulated w/gouge 267.0-273.0. stly altd wk-sil. md diss cc.
274.8	283.7	8.9		.31		Nil		92							.31					2										St	St	1	8					273.0-282.0 med. gr. rk. w/ 20% large phenos, st K-spar, alt'd bio. wk cc
283.7	294.6	10.9		.55		.01		68							—					2										St	St		10			Shear	50°	Coarse gr. Mz stly broken & granulated w/gouge wk-md cc
294.6	304.2	9.6		.21		.01		83						.01	.20					3										Md	St	2	10					As above
304.2	311.0	6.8		.12				26							.05	.07				1										Md	Md	-	8					Soft, md 2nd K-spar flooding. stly broken, No core: 306.3-307.8
311.0	317.0	6.0		.13				96							.04	.09	.01			1										Md	Md	-	6					wk-md CC, very stly broken: 311.0-314.
317.0	322.0	5.0		No sample				0							-																							No recovery, evidently due to mechanical failure
322.0	332.0	10.0		.18				97							.09	.09				3										Md	Md		8					Mdly broken wk sec K-spar veins of Py, cpy & cc
332.0	341.6	9.6		.09				84							.01	.08				2										Md	Md	8	16	Md				md sec K-spar flooding. wk-md sil. wk cc
341.6	348.2	6.6		.11				74							.01	.10				1					Tr					wk	wk	2	10	St		Fault	70°	" " " " wk'ly broken wk sil Tr cc.
348.2	357.0	8.8		.10				91								.10				1										wk	wk	3	15	Md				" " " " Mdly silicified mdly broken Tr cpy
357.0	367.0	10.0		.08				94								.08				1										wk	wk	-	13	Md				As above bio alt to chl also some fresh bio.
367.0	376.4	9.4		.06				72								.06				1										wk	wk	2	13		MZ			As above stly broken
	EOH																																					EOH

Average Recovery: 86 %

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO-SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undifigneous

Hole No. F-174
Page 1 of 1 Pages
Collar Elev. 3016.42 Final Depth 300.0
Coords. N 28,241.76 E 28,030.81
Inclination Vertical
Logged by RE
Date: Start 2-24-69 Finish 3-3-69

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Cu (1) Unknown	N.S.	Cc.	Cpy.	Cov Born	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0	9.0	9.0																																				Rockbit
9.0	18.6	9.6		.03				64							03				ST	-	md								ST	ST	-	15		SP?	21.0			md. gr., elongate clay altd. Fspar phenos. md-st. silicification in
18.6	28.3	9.7		.04				97							02	.02			ST	Tr	ST								md	ST	-	5		Mz	22.0			dis. cc. in unleached Mz. 21.0-22.0.
28.3	38.0	9.7		.09				100							.01	.08			ST	Tr	md								md	V-ST	1	5		Mz, SP	leached 1.3'-V.	85°		Fgr. rk cut by c.gr. porphyry. Some cc., leached vein w/ lazurite 36-38'
38.0	47.8	9.8		.34				98							.04	.30			md	1/2	wk								wk md	wk st	-	20		SP?				Fgr. st'ly sil., unoxidized. To 45.8. Followed by soft, st'l altd, leached rk.
47.8	57.0	9.2		.04				85							.03	.01			wk	-	md								Md	Md		20		Sp?				general fine-med gr rk partially porphyritic. Md'ly sil. Local breccia
57.0	66.0	9.0		.02				72							.02				wk	-	md-st								Md	Md	3	20		Mz	Shear	85°		rk type as above. St iron staining 57-59. Mz 62.0-63.8 St. sil.
66.0	76.2	10.2		.03				56							.01	.02			Tr	1/2	wk md								wk Md	Md	5	60		Sp?				rk type as above when not obscured by very st silicification. wk py Tr cc
76.2	85.1	8.9		.03				92							.01	.02			wk	1/2	wk								wk md	md	20	40		Mz?	79.0			med-coarse gr rk w/ sl. sil. 79.0-85.1 wk py. Tr cc. st qtz vein
85.1	94.8	9.7		.08				96							.01	.07			wk	1	wk								Md	md	5	25		SP?	92			As above to 87.1, Then f.gr. rk w/ diss. sulfides. Sp? Local st. sil.
94.8	104.7	9.9		.09				82							.01	.08			Tr	1	wk								Md	Md	-	20		Mz	100.5			f.gr. rk to 100.5 then c.gr. Mz to end of int. wk-md diss. cc in Mz
104.7	115.7	11.0		.07				75							.01	.06			Tr	1	wk								Md st	Md	12	20		SP Mz	104.7			fgr. rk. sp? 104.7-106.7. c.gr Mz md-st silicification. md diss. cc
115.7	120.8	5.1		.02				92								.02			wk	1	wk								Md	Md	12	25		Mz	119			Coarse gr. Mz. St. sil. throughout wk-md cc
120.8	132.0	11.2		.07				74								.07			wk	Tr	wk								Md	Md	8	20		SP	126			f.gr. SP. st'ly silicified. md'ly broken. Tr cc. Mz at 131.6
132.0	143.5	11.5		.14				52								.14			Tr	1	-								St	St	5	15		Mz				Coarse gr. Mz., st'ly altd. md. sil. Locally broken w/ gouge wk-md cc
143.5	155.9	12.4		.19				70								.19			Tr	1	-								St	St	2	15		Mz	154.0			" " " " " " " " " " " " " md. cc. broken w/ gouge 154.0 to end of int.
155.9	165.9	10.0		.64		.07		92							.07	.57			-	1	Tr								St	St	10	18		Mz	Fault Zone			rk type as above. st'ly altd. wk-md sil. st'ly broken st. cc
165.9	175.8	9.9		.29				78								.29			-		tr								St	St	15	25		Mz	173.5			Coarse gr. Mz st'ly granulated w/ gouge 165.9-173.5 st. cc. Qtz vein 173.5-175.8
175.8	182.6	6.8		.01				19								.01			-	Tr	Tr								Md	-	90	90		Qtz Bx	185			Qtz vein & silicified Bx. w/ frags. of f.gr. rk.
182.6	191.8	9.2		.08				95								.08			-	1-2	-								md	md	5	15		SP?				As above to 185'. f.g. rk w/ numerous small qtz veins, md alt to 191.8.
191.8	200.8	9.0		.11				62								.10	.01		Tr	1									md	md	10	20		SP or Vole				Has been shattered, cemented by barren qtz. RK may be Vole
200.8	207.0	6.2		.10				68								.08	.02		-	1									md	md	10	20						As above, shattered-recemented. May be ignimbrite
207.0	216.5	9.5		.08				99								.07	.01			1									Md	wk	10	20						f.gr rk SP? md'ly silicified. numerous small qtz veins wk cc as veinlets.
216.5	225.5	9.0		.07				94								.06	.01			2									md	md	12	20						" " " md-st'ly silicified " " " " md cc. diss'd sulfides.
225.5	234.8	9.3		.12				92								.10	.02			2½									md	md	12	20						As above. md'ly broken
234.8	244.6	9.8		.03				90								.03				2½									Md	Md	13	20						f.gr. rk. SP? md'ly silicified. st'ly broken wk cc. md soc K-spar
244.6	254.5	9.9		.04				90								.04				2									md	md	18	25						As above. wk-md cc
254.5	258.0	3.5		.11				93								.10	.01			2									md	md								f.gr. st'ly silicified. wk cc.
258.0	267.7	9.7		.12				79								.12				<1									md	md	2	20?		SP or Vole				As above, f.g., st'ly broken. Low sulfide content
267.7	277.8	10.1		.08				85								.08				<1									md	md	-	25?						As above; hard, silicified. minor sulfides, Tr of 2nd Cu
277.8	288.2	10.4		.12				86								.09	.03			1									md	md	-	25?						As above
288.2	300.0	11.8		.23				81								.13			10	1									St	md	-	25?		SP or Vole	Py veins	75°		As above, 2: ¼" py veins. Tr of covellite
	EOH																																					

Average Recovery: 79%

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO-SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. F-175
Page 1 of 2 Pages
Collar Elev. 3165.16 Final Depth 468.4
Coords. N 28,500.01 E 27,581.14
Inclination Vertical
Logged by PB, RE
Date: Start 2-26-69 Finish 3-12-69

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Cu (1) Pitch	Cu (1) Black	Cu (1) Blue Green	Cu (1) N. W.	Cu (1) Cc.	Cu (1) Cpy.	Born	Fe (2) Lim.	Fe (2) Py	Fe (2) Mag.	Fe (2) Hem	Fe (2) Spec.	Other (2) Galena	Other (2) Sphal.	Other (2) Molyb	Other (2) Calcite	Other (2) Garnet	Other (2) Silicates	Other (2) Sericite	Other (2) Clay	Other (2) Vn. Qtz	Other (2) QUARTZ	Other (2) CHLORITE	(3) Rock Type	Structures (4) Depth	Structures (4) True Dip	Remarks
0	8.7	8.7																s																			* Rock bit
8.7	17.5	8.8		.01				81						.01				st			Md								wk	Md	15	35		Sp?			Med gr. feldspar phenos altd to clay. Sl. silicification. Local Bx w/ Qtz vn. frags.
17.5	24.4	6.9		.01				60						.01				Md			St								Md	wk	40	50		Diaus	20.0 24.5		As above to 20.0. Then Qtz vein w/ st. hem along fracs.
24.4	34.7	10.3		.02				80						.02				Md			St								Md	Md	7	12		Mz			med gr. porphyritic rk. phenos altd to clay. st hem flooding.
34.7	47.0	12.3		.02				55						.02				Md			Md								Md	Md	10	40					" " " sl. silicification. Jarosite along fracs.
47.0	57.0	10.0		.01				39						.01				ST			ST								Md	ST	2	10		MZ			" " " Md sil.
57.0	67.0	10.0		.01				89						.01				ST			Md								Md	ST	4	15			Fracture veins	45° 80°	As above, md-st Jarosite in leached veins. 20% large, clay altd. phenos.
67.0	77.0	10.0		.01				68						.01				Md			ST								Md	ST	4	12		QTZV		80°	Groundmass is stained red to maroon, spotty silicification, less Jarosite than above.
77.0	84.0	7.0		.02				69						.02				ST			ST								Md	ST	2	10					As above. st altd. Grain size varies. Jarosite in thin veinlets
84.0	92.8	8.8		.01				91						.01				Md			Md								St	St	2	12					med-coarse gr. rk. 20% large plag. phenos, altd to clay. Jarosite as above
92.8	102.0	9.2		.02				89						.02				Md	½		wk								St	Md	4	15					AS ABOVE grain size varies. Aplite dike 94.4-94.8 md sil. wk diss cc
102.0	111.0	9.0		.01				97						.01				Md	½		wk								St	Md	7	20		MZ	111.0		Numerous Jarosite veins. Md silicification. Numerous Qtz veins. Local hem stain groundmass. wk diss cc
111.0	121.7	10.7		.05				98						.05				Md	½		Md								Md	wk-Md	7	25		Sp?			F. grit st'ly silicified. Local hem stain. Jarosite on fracs. wk diss cc.
121.7	131.5	9.8		.02				92						.02				wk	½	Tr	Md								Md	Md	2	20					As Above st'ly broken w/ st hem 125.4-127.8. Jarosite as veinlets wk cc
131.5	136.2	4.7		.01				98						.01				wk	Tr		Md								Md	Md	5	25		Sp?			F. gr. st'ly SILICIFIED. LOCAL hem stain. Tr. cc
136.2	145.4	9.2		.04				96						.04				Tr	½		wk-Md								Md	wk	25	50		Sp? Grain size varies			AS ABOVE Qtz vein 142.7-145.0
145.4	154.0	8.6		.03				95						.03				wk	½		wk-Md								Md	wk	5	40		Sp			F. gr. Sl. silicification. Mz dike w/ hem stain & sl. sil. 145.8-146.4 Tr. cc
154.0	163.0	9.0		.01				88						.01				St	Tr		Tr								Md	wk	-	50		Sp			" " " " 2% large phenos alt to clay, 161.5-162.0 st. Jaro., bands or veins after pg.
163.0	173.1	10.1		.07				80						.07				wk	½		—								Md	wk	-	60					f. gr. rk w/a few large phenos v. sl. silicification. wk Jarosite on fracs. wk diss. cc.
173.1	181.1	8.0		.08				100						.08				wk	1		—								Md	wk	-	60					as above
181.1	186.6	5.5		.06				96						.06				wk	1		—								Md	wk	-	60					as above
186.6	195.8	9.2		.02				85						.02				wk	1		—								Md	wk	5	60					f. gr. rk, 1-2% plag. phenos altd to clay. st'ly silicified. Jaro. on fracs. Tr. cc
195.8	204.2	8.4		.01				97						.01				wk	1		—								Md	wk	10	65					As above. Numerous small Qtz veins & veinlets
204.2	213.3	9.1		.08				93							.08			wk	1½										Md	wk	7	55					as above wk cc as veinlets & diss.
213.3	221.9	8.6		.39				94							.36	.03		Tr	2		—								Md	wk	12	55			parallel Qtz veinlets	60°	f. gr. sp., st silicification. wk-md cc. diss. & veinlets. Tr. cpy
221.9	231.7	9.8		.28				73							.28			—	2		—								Md	Md	5	60					As above, md cc. st'ly broken 225.2-227.6.
231.7	241.1	9.4		.24				78							.24				2										Md	Md	5	60					rk. type as above. st. sil. wk'ly broken. one 3" vein w/ cc & py. md-st cc
241.1	245.1	4.0		.17				98							.17				2										Md	wk	5	50		Silicified Sp?			" " " " " " " " md'ly broken. md-st cc
245.1	254.0	8.9		.30				81							.30				2										St	St	-	25		Mz			Coarse gr. Mz. Local sl. silicification. md'ly broken w/some gouge. md-st cc.
254.0	262.0	8.0		.68			.04	66						.04	.64				2										St	St		20					As Above. Tr. cpy.
262.0	273.8	11.8		.60			.01	51						.01	.57	.03			2½										St	St		10					Coarse gr. Mz. st'ly altd. st'ly broken w/some gouge. st cc, diss & veinlets.
273.8	282.6	8.8		.61			Nil	86							.59	.02			2										St	St	2	10			Qtz vn Shears	70-80°	As Above
282.6	292.0	9.4		.32			Nil	82							.32				2½										St	St	2	15			Shears	"	Rk. Type as above. Locally silicified. st'ly altd. wk'ly broken. st cc.
292.0	300.4	8.4		.60			Nil	100							.60				2½										St	St	4	15			"	"	As Above
300.4	305.9	5.5		.37			Nil	100							.37				2										St	St	8	12			Qtz units	10°	C. gr. mz. 20% large phenos - alt to clay. Numerous parallel Qtz units. st cc
305.9	315.5	9.6		.35			.01	96						.01	.34				2-3										ST	ST	1	10			"	"	evenly dis. sulf. w/ md-st cc. bi 100% hydromica
315.5	324.9	9.4		.51			.01	98						.01	.50				2-3										ST	ST	1	8			Fault 324.8	60°	As above, silicif. along thin veinlets
324.9	333.6	8.7		.52		160ppm @ 0.66 0.01	.01	99						.01	.37				2-3										ST	ST	1	8					very frac, uniformly dis. sulf with even cc. replacement
333.6	342.5	8.9		.44			Nil	93							.44				2-3										Md ST	ST	2	10					md. st. alt. few joints
342.5	350.7	8.2		.45			Nil	92							.45				2-3										ST	ST	2	10			sulf v.	60°	md-st'ly broken, st cc., silicification along veinlets
350.7	359.8	9.1		.96			Nil	98							.96				2-3										ST	ST	2	12					mdly sheared. irregular qtz veins
359.8	368.9	9.1		.47			.01	97						.01	.46				3										St	Md	5	20			Shear	60°	mid-st silicification. st c.c. as veins w/ py & diss.
368.9	377.6	8.7		.51			.01	100						.01	.50				4										St	Md	10	40			Shear	75°	st. silicification " " " " " "
377.6	387.1	9.5		.30				83							.30				2-3										St	Wk	10	40		MZ			As Above. Broken w/some gouge 386.1-387.1.

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. F-175
Page 2 of 2 Pages
Collar Elev. 3165.16
Final Depth 468.4
Coords. N 28,500.01 E 27,581.14
Inclination Vertical
Logged by P.B.
Date: Start 2-26-69 Finish 3-12-69

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green		Cc.	Cpy.	Cov. Born	Fe (2) Lim.	Py	Mag.	Hem.	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE		(3) Rock Type	Structures (4) Depth	True Dip	Remarks
387.1	395.3	8.2		.50	.03 .06 .01	.01		100						.01	.47		.02		2										st	nd	3	15			Mz			c. gr. mz wk-mod silicification wk'ly broken st cc
395.3	404.1	8.8		.63		.01		91						.01	.62				1-2										st	st	3	15			"			local st. sil. fault gouge 400.2-401.0 mod-st cc
404.1	414.9	10.8		1.08		.01		93						.01	1.02	.05			1-2										st	wk-mod	10	40			Mz	414.0		st sil throughout mod'ly broken mod-st cc. Tr cpy
414.9	423.4	8.5		.22				100							.22				2										st	wk	8	20			sp?			f.gr ck. Sp? mod. silicified numerous small qtz units wk'ly broken wk cc
423.4	431.5	8.1		.33				100							.29	.02	.02		2										st	wk	10	40						" " " " st sil st'ly broken wk cc. Tr cpy & cov.
431.5	440.7	9.2		.18				92							.10		.08		4-5										st	wk	10	40				Dg veins	90°	f.gr. st. sil st. py. veining breccia & gouge 438.0-440.7
440.7	452.0	11.3		.24				50							.24				3										st	st st	5	30			sp?	450.0		st'ly broken w/ bx & gouge wk cc
452.0	461.5	9.5		.19				91							.11	.06			3										st	st	10	30			Mz			C. gr. ck. Mz st'ly talk'd. st. sil. st'ly broken w/ bx & gouge wk cc
461.5	468.4	6.9		.14				96							.12	.02													st	st	-	20			Mz			" " " wk-mod sil. wk'ly broken wk cc.
	EOH																																					
Average Recovery: 87%																																						

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
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Mz - Monzonite
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Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. F-176
Page 1 of 1 Pages
Collar Elev. 3016.42 Final Depth 340.3
Coords. N 28,241.76 E 28,030.81
Inclination 60°, S 80°E
Logged by RE
Date: Start 3-5-69 Finish 3-13-69

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green		Cc.	Cpy.	Bornite	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0	15.0	15.0																																			Rockbit
15.0	25.8	10.8		.02				100						.02				ST	Tr	ST								md	ST	-	5			MZ,SS?			Fine to med gr porphyritic stly hem stained. Remnant py & cc.
25.8	35.4	9.6		.04				85						.02	.02			ST	Tr	ST								ST	ST	2	10			"			Thin MZ dikes cut finer gr silicified rk. Remnant sulf in MZ
35.4	45.2	9.8		.04				95						.02	.02			ST	wk	ST								ST	ST	2	10			"			V f gr, stly silicified 42.0'-45.2' w/ py & cc
45.2	52.8	7.6		.59		Nil		97							.57	.02		wk	1	wk								md	md	1	8			Sulfides 45.2 MZ			md gr, mod altd porphyry w/wk oxidation, dis py, mod stg.c.
52.8	59.6	6.8		.44		.01		84						.01	.42	.01		md	1	md								md	md	2	10						As above oxidation 55.5-57.5
59.6	69.5	9.9		.18				90							.17	.01		wk	1	wk								md	md	2	10						md alt MZ silicified f gr 57.0-59.5
69.5	79.5	10.0		.58		.03		85						.03	.33	.02	.20	wk	1	wk								md	md	-	15?						As above, spotty silicification. Partial ox of dis py, cpy, cc.
79.5	90.8	11.3		.11				74							.11			wk	1	md								md	wk md	2	15?						md oxidation, f.-md gr., md-st silicification.
90.8	100.1	9.3		.03				94							.03			md	½	ST								md	md	6	15			MZ			md-st oxidation. Irregular bacon white qtz veins
100.1	105.1	5.0		.10				33							.06		.04	md	½	md								wk	wk	8	30			QTZ V. 101.0 105.1			white QTZ vein contains sub-angular mineralized MZ fragments
105.1	114.0	8.9		.10				91					.03		.07	Tr		wk	½	md								st	st	4	15			MZ & SP			Mixed MZ & SP 105.1-114.0. C. gr. MZ. 25% large phenos md-st alt. wk sulf dis
114.0	123.1	9.1		.17				93					.02		.14	.01		wk	1	wk								md	wk-md	2	12	nd		MZ			Bx w/hem staining 114.0-116.0 C. gr MZ fresher than above wk diss sul. No alt to chl
123.1	132.6	9.5		.22				92							.20	.02		wk-md	1	–								md	wk-md	-	10	nd					C. gr. MZ wk'ly alt. wk diss. sulf. Jarosite on fracs.
132.6	145.2	12.6		.24				83							.24			wk	1	wk								md	md-st	3	12						As above, local hem flooding to 140.1 then becomes stly alt'd w/md-st cc
145.2	155.3	10.1		.09				11							.09			wk	1	Tr								st	st	2	12						C. gr. MZ stly alt'd md-st cc. stly broken
155.3	166.3	11.0		.08				81							.08			ST	½	md								ST	ST	3	10						Strong (90%) oxidation. Deep brown clk cod limonite
166.3	176.0	9.7		.14				93							.14			md ST	½	wk								ST	ST	2	12						oxidation on fractures and app sat of Cu, malachite on fracts. md-st, f cc. 174-175
176.0	187.5	11.5		.14				84							.12	.02		wk	1	–								wk	md	2	8	ST					Much less altered where unoxidized st chlorite, wk-md alt
187.5	198.2	10.7		.28				91							.26	.02		wk	1									md	ST	3	15?	-					Increase in alt, f silicification, wk oxidation, some c.c.
198.2	208.5	10.3		.59		.01		93						.01	.55	.03		–	2									md	ST	2	12?	-					md-st alt, stl dis py, c cc
208.5	218.8	10.3		.29				92							.26	.03			1									md pink	md wk	2	10	wk ST					RK is fresh from 216.0-218.8 w/ wk clay, st chlorite, no sericite
218.8	225.6	6.8		.31				59							.28	.03		Tr	1									nil	wk	2	8	ST					As above, wk clay, st chlorite, dis py w/ md cc
225.6	234.3	8.7		.13				86							.08	.05		–	1	Tr								nil	wk	1	10	md					slightly more alt'd than above. dis py, cpy, c cc. Tr of magnetite
234.3	243.4	9.1		.25				80							.20	.05		–	1									nil	wk md	3	10	md ST		MZ	243.2		RK is very fine grained near white, bacon vein QTZ: 234.3-235.2
243.4	252.8	9.4		.13				69							.08	.05			3(?)									wk	wk	?	90	–		Fault	252.8		Very stly broken, silicified & mineralized 243.2-256.7
252.8	262.8	10.1		.18				89							.13	.05			1									wk	wk	3	15	md		MZ			wk'ly altd below 256.2. wk clay, st chlorite, dis py, c cpy
262.8	272.7	9.8		.12				94							.08	.04			1			Tr						wk	wk	?	25?	md					ST silicification 266.6-272.7. High py cpy ratio
272.7	282.2	9.5		.15				88							.09	.06			1									wk	wk	2	10	md ST					More cpy in zones of silicification. Some chlorite definitely 2nd
282.2	290.8	8.6		.11				87							.05	.06			1									nil	wk	3	12	md					As above, wk'ly altd. most cpy in QTZ veins
290.8	297.2	6.4		.22				95							.16	.06			1									wk	wk	4	15	md					Spotty silicification. Numerous small QTZ veins.
297.2	305.8	8.6		.15				98							.10	.05			1									wk	wk	4	12	md					C gr MZ 20% large phenos wk'ly alt'd from f-gr. Several QTZ veins
305.8	315.7	9.9		.13				87							.08	.05			1									wk	wk	2	10	md					AS ABOVE To 309
315.7	324.7	9.0		.08				84							.03	.05			1									wk	wk	3	18	md					AS ABOVE To 320.5. Then rk becomes v f gr & stly siliceous greyish color. (320.5-324.7) wk'ly broken
324.7	335.5	10.8		.06				100							.02	.04			1									wk	wk	3	5	md			Shear	75°	C. gr MZ Locally f gr & siliceous. Several small QTZ vns.
335.5	340.3	4.8		.04				71							.01	.03			1									wk	wk	3	12	nd		MZ			AS ABOVE wk'ly altd

Average Recovery: 84%

Inclination at collar: 60°
" " 330': 60°

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. F-177
Page 1 of 1 Pages
Collar Elev. 3017.28 Final Depth 406.5
Coords. N 28,287.17 E 27,886.46
Inclination Vertical
Logged by P.B
Date: Start 3-14-69 Finish 3-24-69

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Unknown N.S.	Cc.	Cpy.	Cov. Born	Fe (2) Lim.	Py.	Mag.	Hem.	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0	12.0																																				Rockbit
12.0	22.0	10.0		.09				44					.09					Tr	Tr										-	wk	-	-		Post-min And.			f.g. dk gray Post-min Andesite. wk Cu Ox. Tr of py
22.0	32.0	10.0		.19				83					.19					Tr	Tr											"				"			As above minute grains of dis. py
32.0	41.6	9.6		.36		.22		81					.36					Tr	Tr											"				"			As above, brown limonite on fractures
41.6	52.0	10.4		.55		.48		93					.55					Tr	Tr						Tr					"				"			" " Calcite & malachite on fractures
52.0	61.6	9.6		.20				84					.20					wk	Tr											md							rk type as above Very soft. limon. on fracs.
61.6	76.0	14.4		.05				83					.05					Tr												md				Post-Min. And.	76.0		" " " " md'ly broken wk Cu Ox
76.0	86.8	10.8		.04				73							.04						st							md	wk		70		Sil'd Bx			Qtz Bx w/ Qtz frags & frags of f.g. silicified rk. st. hem between frags. Local gouge.
86.8	96.7	9.9		.05				88							.05			wk	Tr		st							md	wk		75		Qtz vein			As above Jarosite on some fracs wk sulfides 94.7-96.7
96.7	105.0	8.3		.03				85							.03			Tr	1		st							md	wk		70					Qtz vein w/ hem alone fracs. 98.7-101.7 Bx w/v. st hem & Qtz frags wk sulfides
105.0	112.0	7.0		.03				87							.03			Tr	1		md							md	-		85					Qtz vein w/ silicified Bx w/ f.g. silified frags. wk py & cc
112.0	121.3	9.3		.01				96						.01				-	Tr		st							md	wk		70					Silicified Bx w/ frags of Qtz vein & sil. f.gr. rk. st hem. between frags. md Lim.
121.3	131.1	9.8		.03				93							.03			Tr	1		wk md							md	wk		75		Sp?	123.0 131.1		As above to 123.0 Then f.gr. rk Sp? st'ly silicified local sil'd Bx wk-md sulfides
131.1	140.8	9.7		.03				98							.03			wk	½		st md							md	wk		80		Sil'd Bx			Silicified Bx, frags of Qtz vein & sil. f.gr. rk Sp? hem between frags. wk limoline. wk sul.
140.8	152.4	11.6		.01				69							.01			wk	½		md							md	wk		80					As above md'ly broken
152.4	162.0	9.6		.05				94						.01	.04			Tr	½		md							md	md		50		Sp?	159.8		Less silicified than above. 159.8-162 f.gr. Sp w/ numerous Qtz vnlts. md-st cc
162.0	171.1	9.1		.22				91						.02	.20			-	½	-								st	md	5	12		Sp	Shear	80°	f.gr. Sp. several Qtz veinlets. md-st cc as veinlets & diss.
171.1	180.0	8.9		.36				99						.04	.32			-	½									st	md	15	20					" " " md'ly silicified numerous Qtz vnlts. st cc.
180.0	190.8	10.8		.19				73							.19			-	2	-								st	md st	4	12		Fault	184.7 Shear	85°	f.gr. Sp wk'ly silicified st'ly broken w/ some gouge 184.7-190.8 st. cc
190.8	200.2	9.4		.20				87							.20			-	1	-								st	md st	4	12		Sp Fault	192.9 195 205.2		st'ly broken w/ gouge to 192.8. wk'ly silicified md'ly broken. md cc
200.2	210.8	10.6		.21				86							.19		.02	wk	2									st	wk md		60		Sp?			st'ly broken & sandy to 205.2 f.gr. rk st'ly silicified hem. limon. on fracs. mdcc
210.8	217.0	6.2		.03				90							.03			-	4	-								st	wk	5	80					st'ly silicified f.gr. rk. Sp? st py wk-md cc
217.0	225.7	8.7		.02				89						.02				wk	Tr		st							md	md	10	15					f.gr. Sp st'ly oxidized w/ hem. flooding throughout. Jarosite on some fracs.
225.7	232.0	6.3		.21				54							.18		.03	-	1	-								st	md	10	15					UN OXIDIZED Sp. wk'ly silicified numerous Qtz vnlts wk-md cc
232.0	239.3	7.3		.18				100							.18			wk	½									st	wk		40					md-st. sil. partially oxidized Jarosite on some fracs wk-md cc
239.3	248.1	8.8		.24				91							.20		.04	Tr	3	wk								st	wk	5	55					As Above Numerous small Qtz vnlts md cc
248.1	257.0	8.9		.10				90							.09		.01	Tr	1	wk md								st	md	5	20					OXIDIZED w/ st hem flooding 248.1-250.5 md sil md'ly broken wk-mdcc
257.0	266.0	9.0		.23				99							.20	.01	.02	-	1½	-								st	wk	10	40		Sp	fracs 267.5 271.6	90°	f.gr. Sp md-st'ly silicified numerous small Qtz vnlts mdcc. as vnlts & diss
266.0	274.9	8.9		.21				100							.21				1½									md	wk	10	45					unusual porphyry f.gr. tan groundmass w/ 20% large phenos. of plag. & K spar. 267.5-271.6 md-st sil. md cc
274.9	284.4	9.5		.22				100							.21		.01	-	5	-								-	-	95	95		Qtz vein			vein Qtz w/ vnlts of py & cc one ½" py vein
284.4	294.1	9.7		.08				96							.08			-	2	-								wk	-		85					" " " " " 285.0-286.0 f.gr. rk Sp? st'ly silicified
294.1	299.0	4.9		.11				79							.11				1									-	-		85					" " " " " wk cc
299.0	308.0	9.0		.26				100							.24	.02		-	1	-								md	wk	5	70		Sp	300.5		f.gr. Sp st'ly silicified numerous Qtz vns. & vnlts wk cc
308.0	317.4	9.4		.36				96							.30	.02	.04		1									md	wk	20	95			fracs 310.0	60°	As above md'ly silicified
317.4	326.8	9.4		.63		.02		100						.02	.53	.03	.05		1									md	wk	15	45			" 323.8	"	f.gr. rk. w/ tan groundmass plag. & K spar. phenos. inclusions of Sp. md cc.
326.8	334.5	7.7		.19				100							.17	.01	.01		1									-	-		90		Qtz			Intense silicification. Resembles quartzite
334.5	343.0	8.5		.37				100							.37				1									wk	Tr		50					Less silicified than above dis. px & wk cc. clay & ser on fracts
343.0	352.2	9.2		.25				86							.25				1									md	wk	30	50		Bx			Qtz cemented Bx w/ fragments of f.gr. rock.
352.2	361.4	9.2		.50	19.8' @ 0.53		.13	90	0.10						.48		.02		1									md	Tr	20	50		Bx	Fault @ 357'	60°	As above. Occasional zone of md-st cc.
361.4	372.0	10.6		.55			.07	68							.52		.03		1									md	wk md	25	50		Bx	Fault @ 365	40°	Sand & clay 365.0-366. Bx: 367-367.5. st cc. at bottom of run.
372.0	381.1	9.1		.36				90							.26	.02	.08		1									md	wk md	15	35		Sp	Shear	60°	f.gr. Sp. Local st. silification & silicified Bx wk-md cc
381.1	390.0	8.9		.23				93							.18	.05			1									md	wk md	15	30			"	"	As Above numerous Qtz vnlts md'ly broken
390.0	399.0	9.0		.22				98							.17	.03	.02		1									st	wk md	10	35					Less silicified than above st'ly broken clay & ser on fracs. wk cc
399.0	406.5	7.5		.06				89							.06				1									md	wk md	8	20		Sp	Shear	60°	md'ly silicified numerous small Qtz vnlts wk cc

E.O.H.

Average Recovery: 88%

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Note (3)
Tt - Tactite
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Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. F-178
Page 2 of 2 Pages
Collar Elev. 3098.44 Final Depth 436.4
Coords. N 28,384.43 E 27,521.76
Inclination vertical
Logged by RE
Date: Start 3-19-69 Finish 3-29-69

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Unknown N.S.	Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
389.6	397.0	7.4		.14				89							.14				1									md	ST	-	10			SP			md-st alt, wk c.c.
397.0	405.1	8.1		.34				87							.30	.02	.02		1									md	ST	-	10						As above, spotty silicification
405.1	413.7	8.6		.32				82							.30		.02		1									ST	ST	2	10						stly broken, calcite wk c.c. spotty silicification
413.7	421.6	7.9		.15				91							.14		.01		2									ST	ST	3	10			4" Py Vein	60°		Py vein w/ md c.c. @421. otherwise as above.
421.6	429.8	8.2		.09				100							.05		.04		1									ST	ST	1	8						wk c.c. on fractures
429.8	436.4	6.6		.09				94							.02		.02		1									md	md	1	8			SP			spotty silicification, md alt, wk c.c.
	EOH																																				

PRELIMINARY GEOLOGIC LOG

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Hole No. F-178
Page 1 of 2 Pages
Collar Elev. 3098.44 Final Depth 436.4
Coords. N 28,384.41 E 27,521.76
Inclination Vertical
Logged by RE & PB
Date: Start 3-19-69 Finish 3-29-69

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Unknown N.S.	Cc.	Cpy.	Cov. Born	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0	6.0	6.0																																			Rotbit
6.0	14.3	8.3		.03				93						.03				ST	Tr	md				30 ppm				ST	ST	4	20		SP?	Leached veins	60°-70°	ST lim & hem staining of groundmass. Remnant PY & covellite in silicified zones. Leached veins contain Jarosite, FeO x (Turquois?)
14.3	23.3	9.0		.02				88						.02				ST	-	wk								wk	md	?	25		MZ	Foliation	40°	f.g. siliceous rk with parallel, elongate phenocrysts
23.3	31.6	8.3		.03				100						.03				ST	Tr	md								md	md	2	20		?			less silicified intervals are monzonite. Less foliation than above. ST Jarosite
31.6	42.3	10.7		.02				71						.02				ST	Tr	md md	ST							md	md	1	15		SP?	40°		Becoming less silicified. G.M. stly hem stained. Large blebs of Turquois
42.3	50.9	8.6		.03				100						.03				ST	Tr		ST							md	md	2	10		SP?			Red stained f.g. groundmass cut by yellow Jarosite filled veins
50.9	60.2	9.3		.02				83						.02				ST	-		ST							md	md	4	8		SP?	Leached veins	40°-60	Completely leached SP stained deep red-purple. cut by QTZ silf veins.
60.2	71.6	11.4		.06				79						.06				wk	Tr	md								md	wk	8	25					50% oxidized w/ hem flooding groundmass & Jarosite on fracs. md. sil. Tr cc
71.6	81.0	9.4		.03				89						.03				md	Tr	md	-							st	wk		25					65% oxidized local hem flooding. Lim. limon. some fracs. mdly silicified
81.0	90.9	9.9		.03				86						.03				wk	Tr	st								st	wk		25					stly oxidized st. hem staining groundmass & fracs. wk Jarosite " "
90.9	100.9	10.0		.03				76							.03			md	½	wk								st	wk		25					wkly oxidized Jarosite on fracs. mdly silicified Tr cc
100.9	109.3	8.4		.02				100							.02			md-st	1½	Tr								md	wk		50					st Jarosite along fracs. several PY vns. st. silicification
109.3	118.2	8.9		.08				89							.08			wk	1	-								st	md		40		SP?			f.gr. SP? stly silicified w/ a few small dikes of c.gr. MZ. Tr cc
118.2	126.8	8.6		.27				100							.27			-	1½	-								st	md	5	20					f-med gr SP? md. sec. K-spar. wkly silicified. md-st cc as veins & diss
126.8	135.9	9.1		.14				85							.14				1									md	wk		25		SP?			md-st silicification: 132-135.9. otherwise large altd phenos in fresh G.M.
135.9	146.0	10.1		.13				86							.13				½									md	wk	4	15			Fault? 143.7	55°	f-md gr. salmon pink (and K-spar?) rk cut by QTZ veins & silicification
146.0	156.7	10.7		.12				100							.12				1									md	md	3	10					As above, md-st CC on PY veinlets.
156.7	166.5	9.8		.33				86							.33				1									md	md	8	15		Bx	158.7 161.7		Cemented Bx w/ md-st mineralization in matrix: 158.7-161.7
166.5	175.0	8.5		.11				99							.10		.01	Tr	1	Tr	-							md	md	8	20			Shear	70°	f-med gr. salmon pink. Numerous Qtz vns & local silicification wk-md cc
175.0	182.4	7.4		.26				100							.24		.02		1									st	md		45		Sp?			f.gr. md. stly silicified wk diss cc. ccv. on some fracs.
182.4	191.3	8.9		.15				87							.13		.02	wk	1	wk								st	md		45			fracs	70°	" " " lim. hem on fracs. clay & ser on some fracs.
191.3	199.9	8.6		.21				91							.20		.01		1									st	wk		75			Fault 198.6		Intense silicification wk diss cc. Tr ccv. mdly broken
199.9	208.7	8.8		.12				86							.12				1									md	md	8	15					f-med. gr. salmon pink altd phenos in fresh G.M. md cc as veinlets & diss
208.7	216.6	7.9		.30				91							.30			-	½	-								st	st	10	15			fault 214.6		" " " " " stly altd mdly broken md cc
216.6	224.5	7.9		.60	32.9 @ 0.55	.01	Nil	99						.01	.58	.01			1									st	st	6	12			222.8		As Above. Clay on fracs. md-st cc
224.5	233.0	8.5		.59		Nil	Nil	89							.59				1									md	md-st	8	15		Sp	229.2		Sp to 229.2 w/ md-st cc. f med gr. salmon pink rk. wk cc
233.0	240.8	7.8		.42				100							.42				1									md	md-st	10	15					f-med gr. local st silicification. numerous Qtz vns & units. md cc
240.8	249.5	8.7		.59		Nil		95							.59				1									md	md-st	5	2			fracs	70°	As Above. clay on fracs. cc finely diss. & as units.
249.5	258.1	8.6		.18				99							.18				1									md	st		8			Accr.	80°	med gr. rk. salmon pink. stly altd. st cc
258.1	267.2	9.1		.26				79							.26				1									st	st	4	12					As Above. st. clay alteration. stly broken. st cc
267.2	275.7	8.5		.28				100							.26		.02											st	md-st	8	30					md-st silicification 268.5-272.0. md-st 2nd K-spar. cc as vns & diss
275.7	283.8	8.1		.09				95							.09				1									md	md	3	12			fracs.	60°	f-med gr. salmon pink rk. 2nd K-spar? wkly altd. wk cc
283.8	289.5	5.7		.06				92							.06				1									md	md	3	10			285.5		As Above. numerous Qtz veins. veinlets of py w/ metallic hem.
289.5	301.4	11.9		.01				100						.01															st				Post min. Rad.	fracs 295.5	45°	f.gr. grey AND. 5% small plag. phenos. spec. lim. on some fracs.
301.4	308.9	7.5		.04				93							.04														st				Fault	308.9		As Above to 305.5. 305.5-308.9 fault gouge
308.9	315.5	6.6		.08				100							.08				34									st	md		70		Sp?			f.gr. rk. sp? stly silicified. st. py veinlets w/ cc. clay on fracs.
315.5	326.6	11.1		.31		Nil		97							.31				2									st	md	20	60					As Above. mdly broken. st cc as veinlets & diss.
326.6	336.8	10.2		.49	56.9 @ 0.48	Nil		95							.49				6									st	md	30	75		Qtz vn. & silicified Bx w/ frags of f.gr. rk.				Qtz vn. & silicified Bx w/ frags of f.gr. rk. v. st. py & cc between frags. diss. & as veinlets
336.8	346.7	9.9		.09				100							.09			Tr	3-3									st	md	25	75			345.0?		As Above. wk lim developed on some py & cc veinlets. clay on fracs.
346.7	355.8	9.1		.45		Nil		96							.45				1									st	md	?	75		Sp?			Stly silicified f.gr. rk. sp? st diss cc. clay on fracs.
355.8	364.8	9.0		.92		Nil		92							.88		.04		1									md-st	md		40		Sp			f.gr. Sp. mdly silicified. md-st diss cc
364.8	371.9	7.1		.76		Nil		95							.74		.02		1									md-st	md		55			371.9		As Above. clay on fracs.
371.9	378.3	6.4		.12				70						.12															st				Post min. AND.	378.3		Post min. AND. f.gr. mdly broken
378.3	389.6	11.3		.10				62						.02	.06		.02		1									md-st	wk		70		Sp?			f.gr. rk. sp? stly silicified. partially oxidized. lim. on fracs. & units

PRELIMINARY GEOLOGIC LOG
(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. F-179
Page 1 of 1 Pages
Collar Elev. 2891.23 Final Depth 390.5
Coords. N 28,591.40 E 26,836.91
Inclination Vertical
Logged by RE
Date: Start 3-25-69 Finish 3-31-69

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Unknown N.S.	Cc.	Cpy.	Cov Born	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0	7.0																																				Rockbit
7.0	16.0	9.0		Tr				100						Tr				ST			md				(accy) Tr			md	md	2	10	Tr		MZ?			f.g. Monzonite stained deep maroon, lva lim. in thin veinlets
16.0	26.0	10.0		Nil				77						Nil				ST			md							ST	ST	3	10	-		"	leached veinlets	30°-80°	f.g. anhedral, numerous thin crosscutting leached veinlets.
26.0	31.0	5.0		No sample				0																										Fault?			No recovery (Fault Zone?)
31.0	40.0	9.0		.02				62						.02				ST			md							ST	v ST	?	10?			Fault	Shears	70°	Fault Gouge & breccia. Appearance of gravel in a clay matrix
40.0	47.3	7.3		Tr				90						Tr				ST			md							ST	v ST	2	15			BX	"	80°	RK has been stly sheared, rehealed, mineralized. soft, stly alt'd.
47.3	56.9	9.6		Nil				95						Nil				ST			md							ST	v ST	2	15			BX	56.5		Gouge: 48.0-50.0, 56.5-57.0, f.g. rock between is brecciated, silicified
56.9	66.3	9.4		.01				93						.01				ST	Tr		md							ST	ST	45	50			Fault Bx	59.0		vein QTZ 59.0-61.7 followed by MZ cut by QTZ veins w/ py
66.3	75.8	9.5		Nil				89						Nil				ST	Tr		md							ST	ST	3	10			MZ	61.7		unoxidized 75.0-78.9 Numerous thin leached veinlets w/ sericite. ST alt of groundmass
75.8	83.0	7.2		.01				100						.01				wk md	½		wk							ST	ST	5	15			MZ	leached veinlets	70°	wk oxidation to 78.9 w/ py & wk C.C. otherwise leached as above.
83.0	90.0	7.0		.01				97						.01				md	½		md							ST	md	5	25			F.G. AK			This f.g. rk, with no matrix, becomes increasingly coarse grained until at about 190 it has the appearance of typical AK
90.0	98.0	8.0		.02				89						.02				ST	Tr		md							ST	md	5	25			"	leached veinlets	45°-90°	f to m. gr. st oxidation, numerous leached veinlets.
98.0	107.5	9.5		.06				84							.06				1-2		-							ST	md	3	30			Tr to AK			md gr. AK, md dis. CC, Plag → clay, Kspar unaltered
107.5	117.0	9.5		.10				95							.10				1-2		-							ST	md	5	30			"			" " Texture typical AK. spotty silicification, dis CC
117.0	129.4	12.4		.07				96							.07				2		-							md	md	6	30				QTZ-py veins	70°	less alt than above, much py is uncapped by CC
129.4	138.8	9.4		.06				100							.06				2									md	md	10	35				"	70-90	QTZ-py veining to 133 has only wk CC. followed by Md CC and dis grains and thin veinlets.
138.8	148.0	9.2		.09				97							.09				1									md	md	3	30			AK			Coarse grained AK with st CC replacing thin py veinlets
148.0	160.5	12.5		.13				91							.12		.01		1									md	md	4	30			AK			As above Thin partially replaced veinlets and dis. grains
160.5	170.0	9.5		.20				89							.19		.01		1									md	md	4	35						As above
170.0	179.5	9.5		.14				95							.14				1									md	md	2	35						As above, md alt, wk sulfides
179.5	187.9	8.4		.05				91							.05				3									md ST	md ST	2	35						very st alt, & dis py, CC 180.5-183.5
187.9	197.7	9.8		.09				92							.09				1-2									md	md	1	35				Fault @195	80°	oxidation along fault, st CC replacement of thin py veinlets
197.7	206.4	8.7		.06				93							.06				1									md	md	0	40				@201	70°	st CC 199-201, followed by intense silicification
206.4	215.0	8.6		.17				93							.15		.02		1									md	wk		50						ST silicification, md sulfides.
215.0	224.6	9.6		.14				89							.14				2									md	wk		50+						" " and QTZ veining. Texture slightly
224.6	233.7	9.1		.36		Nil		84							.30	.04	.02		2									md	wk md		40						BX 232-233 with matrix of QTZ, barite, & sulfides
233.7	243.1	9.4		.10				88							.09	.01			1									md	md	2	35			AK			Coarse grained AK w/ numerous thin veinlets of cc & py
243.1	252.5	9.4		.19				83							.19				2									st	md st	3	45						md-st silicification 243.1-248.4 st cc in silicified portion
252.5	262.0	9.5		.08				91							.08				1½									st	md	3	40						locally silicified wk cc as veinlets
262.0	272.0	10.0		.08				90							.04	.03	.01		1½									st	md	5	38						Coarse gr AK. As Above
272.0	280.6	8.6		.09				100							.07		.02		2									st	md	8	40						" " " numerous Qtz vns & veins. wk cc
280.6	289.8	9.2		.13				100							.11		.02		2									st	md	10	48						" " " md silicification wk-md cc Tr cov
289.8	299.0	9.2		.11				100							.10		.01		3									st	md	8	50						As Above md-st cc Tr cov & cpy
299.0	308.5	9.5		.13				100							.10	.02	.01		6									st	wk md	8	48						As Above st py
308.5	316.0	7.5		.08				97							.05		.03		3									st	md st	3	35						As Above to 311.5. 311.5-316.0 Bx st'ly alt'd. & partially silicified st cc
316.0	325.8	9.8		.08				77							.07	.01			1									md ST	md	3	35				shears	40°-80°	st'ly sheared, partially silicified, st. C.C. along shears
325.8	335.3	9.5		.14				93							.13	.01			1									md	md	2	30						As above. well developed 80° shears. Cemented BX.
335.3	342.0	6.7		.12				90							.12				1									md	md	4	35				QTZ. veins	60°-80°	Kspar wkly alt'd, Plag 100% → clay. wk C.C. on py
342.0	350.0	8.0		.06				84							.06				1									md	md	3	30			AK 350	shears	20°, 65°	As above except for flat shears
350.0	357.0	7.0		.08				68							.08				1?									ST	ST	-	?			Fault Zone			Rounded BX fragments in a gouge matrix
357.0	366.0	9.0		.15				84							.15				1?									ST	ST	-	?			-----	362.0		Gouge ends @ 3620. Angular large BX w/ py, CC @ 365.
366.0	377.3	11.3		.21				79							.21				1									St	St	-	30			AK			C. gr. AK. st'ly alt'd. fault gouge 369.0-372.0 wk cc Tr cpy
377.3	390.5	13.2		.29				67							.29				1									St	St	2	35						st'ly alt'd. 386.0-389.0 st. s/B w/ md c.c.
E.O.H				Average Recovery: 92%																																	

PRELIMINARY GEOLOGIC LOG
(Subject to Revised Logging)

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Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Portland Ridge

Hole No. F-180
Page 1 of 2 Pages
Collar Elev 3065.51 Final Depth 455.8'
Coords. N 28,535.00 E 27,336.73
Inclination Vertical
Logged by PB
Date: Start 4-1-69 Finish 4-16-69

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Cu (1) Pitch	Cu (1) Black	Cu (1) Blue Green		Cu (1) Cc.	Cu (1) Cpy.	Cu (1) Born	Fe (2) Lim.	Fe (2) Py	Fe (2) Mag.	Fe (2) Hem.	Fe (2) Spec.	Other (2) Galena	Other (2) Sphal.	Other (2) Molyb	Other (2) Calcite	Other (2) Garnet	Other (2) Silicates	Other (2) Sericite	Other (2) Clay	Other (2) Vn. Qtz	Other (2) QUARTZ	Other (2) CHLORITE		(3) Rock Type	Structures (4) Depth	Structures (4) True Dip	Remarks
0	10.2	10.2																																				Rock bit
10.2	17.7	7.5		.01				100										wk	-	Md								wk	md	18	30				Sp? 7.5 9.0			wk-md silicification. Fgr. tk. red hem stain. wk jarosite on fracs. leached sul. units.
17.7	27.6	9.9		.01				85										wk	-	Md								wk	md	25	55				Sp?			Qtz. vn. w/ hem stn & jarosite on fracs. to 31.0 Sp? as above. Numerous Qtz vnlts.
27.6	41.2	13.6		.01				34										wk	-	Md								wk	wk	?	60				Sp?			v. st silicification. md. hem stn. st'ly broken
41.2	49.0	7.8		.01				35										st	Tt	Md					.0078			md	md	50	60				"			Poor recovery of fragments of Quartz (average size 3/4") and Sp.
49.0	59.1	10.1		.01				53										st	-	St					.0063			md	md	5	20				Sp	34.5 34.0 56.0 57.5	Leached veinlets 50°	Lim mainly in fractures. md live lim. Zones of silicification
59.1	66.6	7.5		nil				85										st	Tt	St					.0085			st	st	5	20				Mz	65.5	"	Mz is more st'ly altd than Sp(?). st. live lim., dis. lim veins, Remnant sulf.
66.6	73.3	6.7		.02				100										st	1/2	St					.0085			st	st	27	70				Mz			Md. st silicification. v.s.t. sericite throughout. st live lim.
73.3	81.9	8.6		.02				86										st	1/2	St					.0091			st	st	3	15					Leached veinlets 60°-80°		st oxidation along vertical veins. Partial ox. at dis. py & cc
81.9	90.5	8.6		.03				91										st	Tr.	St					.0069			st	st	-	15					"	50°-60	st Jarosite 73.3-78, followed by intense sericite & live lim.
90.5	99.9	9.4		.03				92										st	Tr	Md St					.003			st	st	3	15					@ 93.5	60°	Patches of remnant py & cc. strong vein @ 92.5. st live lim.
99.9	108.9	9.0		.13				84										st	1/2	St					.002			st	st	10	25							sulf. st cc: 102.0-105.8. st s/l w/sulf. 107.5-108.9
108.9	117.7	8.8		.02				100										st	3	-					.002			st	st	3	15					Py veins	65°-80°	Thick (4-1") py veins: 108.5-112.5 followed by leached equivalent jarosite
117.7	127.8	10.1		.07				82										st	Tr	St					.003			st	st	1	10							most st'ly leached & hem stained. Some dis. py & sulf. Tr. cc.
127.8	140.8	13.0		.02				98										st	Tr	St					.002			md	st	1	10							st'ly ox. & hem stained. all feldspars stained red to purple. Numerous clay filled veinlets. thin
140.8	150.5	9.7		.02				90										st	-	St					.016			md	st	-	10				Sulf.	150.5		As above to sharp sulfide contact @ 150.5.
150.5	160.4	9.9		.35				97							.35			nil	2	nil					.002			md	st	-	10							st'ly bleached & altd Mz. st (≈3%) dis. sulf grains w/ st cc.
160.4	166.6	6.2		.48		Nil		100							.48			-	2	-					.001			md	st	-	10							As above.
166.6	174.2	7.6		.49		Nil		94							.49				1-2						.001			st	st	-	10							" " soft and st'ly broken.
174.2	183.0	8.8		.65		.01		100						.01	.64				1-2						.003			st	st	10								st'ly altd. st sec. st. cc as uns. & diss grains.
183.0	196.4	13.4		.96		.01		55						.01	.95				1-2						.003			st	st	12								As above. st'ly broken. Tr. Cu SO4
196.4	205.6	9.2		.62		Nil		95							.62				1-2						.004			st	st	10								st'ly brecciated & altd. st. cc uns. & diss grains.
205.6	214.6	9.0		1.12		Nil		56							1.12				2						.003			st	st	8								As above. wk sec. K-spar
214.6	224.4	9.8		.40	130.5 @ 0.67	Nil		56							.40				3						.003			st	st	25								" " md'ly silicified.
224.4	234.8	10.4		.46		Nil		69							.46				2						.002			st	st	25						Shear	80°	md-st'ly silicified. wk Cu SO4 on fracs. md'ly broken. st cc
234.8	243.4	8.6		.81		Nil		96							.81				2						.002			st	st	12								st'ly altd. bio → hydromica. st cc
243.4	252.8	9.4		.77				85							.77				2						.002			st	st	10								As above. cc as uns. & diss grains
252.8	261.8	9.0		.80				82							.80				2						.002			st	st	10								As above.
261.8	271.0	9.2		.66				97							.66				2						.002			st	st	12								C.gr. Mz. st'ly altd. bio → hydromica. abundant grn clay min. cc as coatings and diss grains
271.0	280.0	9.0		.59				96							.55		.04		2						.002			st	st	10								As above. Tr. cov.
280.0	290.9	10.9		.40				78							.35		.05		2						.003			st	st	10								As above. wk'ly broken.
290.9	300.4	9.5		.25				83							.17	.04	.04		2						.002			md	st	10								Plag. phenos altd to light grn clay. md. diss. cc. Tr. cpy & cov.
300.4	313.5	13.1		.15				80							.12	.01	.02		2						.001			st	st	10						Shear	60°	As above.
313.5	323.3	9.8		.11				92							.11				2						.002			st	st	10								st'ly bleached & altd Mz. clay on fracs. wk cc. on py
323.3	332.0	8.7		.23				90							.21	.02			2						.002			st	st	10								As above. Fault gouge at 324.0. Several parallel fracs ≈ 50°.
332.0	341.0	9.0		.14				88							.12	.02			2						.001			md-st	st	10								md'ly sheared & broken. wk cc. Tr. cpy
341.0	348.4	7.4		.13				100							.13				2						.001			st	st	10								st'ly broken. abundant clay on fracs. cc as thin coatings on py
348.4	357.2	8.8		.16				90							.14	.02			2						.001			md-st	st	10								st'ly altd & sheared. wk cc. Tr. cpy.
357.2	365.8	8.6		1.18		Nil		97							1.18				2						.003			st	st	20								" " " wk'ly silicified. md-st. diss. cc.
365.8	376.1	10.3		.67	4.8 @ 0.70	Nil		70							.67				3						.004			st	md	15	30							st'ly broken w/ v. st cc. to 370.0. md. diss. cc.
376.1	385.5	9.4		.45		Nil		76							.45				2.5						.005			md	wk	20	50							70% of rk st'ly silicified & broken. st. cc. in silicified portion
385.5	394.4	8.9		.75		Nil		90							.75				3						.003			md-st	md	15	45							Generally as above. clay on fracs.
394.4	404.0	9.6		.50		Nil		70							.50				3.5						.003			md	md	-	35							As above to 397.3. md'ly altd. cc. w/ wk-md diss. cc.
404.0	412.6	8.6		.24				75							.22	.02			2						.002			md	md		10							Altd. c.gr. Mz. wk sec. K-spar. wk diss. cc.

PRELIMINARY GEOLOGIC LOG

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F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Portland Ridge

Hole No. F-180

Page 2 of 2 Pages

Collar Elev. 3065.51 Final Depth 455.8'

Coords. N 28 535.00 E 29,336.73

Inclination Vertical

Logged by PB

Date: Start 4-1-69 Finish 4-16-69

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green		Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem.	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE		(3) Rock Type	Structures (4) Depth	True Dip	Remarks
412.6	421.8	9.2		.18				78							.14	.04		2						.002				Nd	Nd	-	10	Tr		Mz			sl'ly broken & sheared clay on fracs. mod sec. K-spar wk cc. Tr cpy
421.8	431.5	9.7		.20				86							.16	.04		1-2						.003				Nd	Nd		10	wk					As Above bio altd to chlorite, some fresh bios, possibly secondary
431.5	441.3	9.8		.19				67							.12	.07		1-2						.004				Nd	Nd		10	wk					As Above mod-sl secondary K-spar
441.3	451.6	10.3		.32				65							.10	.12		1-2						.003				Nd	sl	2	10	wk					v sl'ly broken & sheared. wk sec. K-spar wk disc cpy
451.6	455.8	4.2		.18				76							.08	.10		1½						.004				Nd	Nd	2	12	wk					As Above clay on fracs.
	E.O.H.																																					
	AVERAGE		RECOVERY: 81%																																			

PRELIMINARY GEOLOGIC LOG

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Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. F-181
Page 1 of 1 Pages
Collar Elev. 2761.92 Final Depth 246.5
Coords. N 27,998.10 E 24,408.92
Inclination Vertical
Logged by A.E., P.B.
Date: Start 4-1-69 Finish 4-5-69

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	N.S.	Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb*	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0	14.0	14.0																																			Rockbit
14.0	22.8	8.8		1.55		1.23		94					1.23		.32			wk	-	Tr	wk				.0110			wk	md	-	30	wk	AK				wk/altd AK w/chlorite. st molon fractures. Tr of c.c.?
22.8	32.2	9.4		.93	45.1' @ 1.30	.56	45.1' @ 0.14	96					.56		.32	.05		wk	Tr	?	-				.0103			-	md	-	30	wk					Remnant dis cpy, c.c. oxidizing to Cu pitch & mal.
32.2	41.0	8.8		.86		.39		91					.39		.42	.05		md	-	?	-				.0186			-	md	-	30	wk					As above, cpy, c.c. → cu pitch, mal. md brown limonites
41.0	49.8	8.8		.73		.48		96					.48		.22	.03		md	-		-				.0136			-	md	-	30	wk		Fracts	40-60	" " fractures about 4" apart.
49.8	59.1	9.3		2.40		1.04		93					1.04		1.30	.06		md	-		-				.0266			-	md	-	30	-					" " ¼" c.c. vein, 45° @ 58.6'. Very st mal.
59.1	68.6	9.5		2.27	31.2' @ 1.83	.18	31.2' @ 0.07	94					.18		2.00	.09		md	Tr						.0210			?	st	-	30	-	AK	67.0		st dis c.c. visible above fault.
68.6	81.0	12.4		1.91		.03		62					.03		1.80	.08		wk	Tr						.0105			wk	st	-	?	-	Fault BX	81.0		BX & Gouge: 67.0-79.5. Followed by AK w/dis cpy & cc
81.0	90.3	9.3		2.48		.01		84					.01		.30	.17		wk	¾						.0110			md	st		30		AK				AK, mdly altd, plag → clay. diss cpy & cc Tr Mo on fracs
90.3	99.8	9.5		.27				87							.12	.10		Tr	Tr						.005			md	st	2	30	wk					As Above
99.8	108.5	8.7		.21				93							.11	.10		Tr	Tr						.019			md	md		30	wk					less altd than above st diss cpy & cc wk'ly broken
108.5	118.1	9.6		.17				81							.08	.09			½						.006			md	md		30	wk					mdly altd st'ly broken 110.5-114.5 - diss cpy & cc
118.1	127.8	9.7		.21				85							.10	.11			½						.006			md	md		30	wk					" " Local st alt. & vuggy.
127.8	137.0	9.2		.19				85							.09	.10			½						.004			md	st		30	md-st					st'ly altd & vuggy md-st chl cpy & cc as veinlets & diss.
137.0	149.5	12.5		.18				85							.07	.11			½						.002			md	md		25	md-st	AK 99.1 AK 122.5 AK 131.0				Less altd than above. 139.3-142.2 Mz w/bio → chl.
149.5	159.0	9.5		.05				86							.01	.04			½						.002			md	wk-md		10	st	Mz 146.6				Mz dike 20% large plag phenos st chl throughout wk cpy & cc
159.0	167.9	8.9		.10				77							.03	.07			½						.004			md	wk		30	md	AK				AK wk'ly altd md chl. md diss cc & cpy
167.9	179.0	11.1		.09				54							.03	.06			½						.003			md	wk		30	md					As Above cc & cpy also as small veinlets
179.0	189.0	10.0		.05				99							.01	.04			1						.001			md	wk		30	wk					As Above less chl than Above
189.0	197.0	8.0		.06				86							.01	.05			1						.002			md	wk		30	wk					As Above
197.0	205.1	8.1		.03				96								.03			<1	Tr					.001			-	wk	-	30	md					25% chlorite, low sulfide content (<1%) Kspar unaltered
205.1	214.7	9.6		.04				75								.04			1	Tr					.002			-	md	-	30	md		py veinlet	40°		mdly sheared, chlorite on fractures weakly magnetic
214.7	223.5	8.8		.05				89								.05			1	Tr					.001			-	wk	½	40	md	AK	py-cpy veinlet	40°		wk clay alt of plag Kspar is fresh blebs of cpy in qtz-py veln
223.5	233.0	9.5		.09				84							.02	.07			1	Tr					.005			-	wk	-	40	md	AK 223.5 AK 228.10				As above. Some mdly 'paint' on fractures
233.0	241.5	8.5		.10				96							.02	.08			<1	Tr					.003			-	wk	1	40	md	AK mdly veinlet		40°		Thin veinlets of chlorite w/blebs of py, cpy wk clay alt of plag
241.5	246.5	5.0		.13				93							.04	.09			1	Tr					.002			wk	wk	8	45	md	AK				qtz vein 241.8-242.8 w/ser, chl. otherwise as above
	EOH																																				

Average Recovery: 86%

* This hole was located on the basis of anomalous molybdenum, moly was assayed for continuously to check the source of the anomaly.

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO- SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. F-182
Page 1 of 2 Pages

Collar Elev. 3077.19 Final Depth 397.0
Coords. N 28,330.19 E 27,371.23
Inclination vertical
Logged by RE
Date: Start 4-1-69 Finish 4-21-69

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov	Sp. Gr.	Cu (1) Chrys-	Cu (1) Pitch	Cu (1) Black	Cu (1) Blue Green	Cu (1)	Cu (1) Cc.	Cu (1) Cpy.	Cu (1) Born	Fe (2) Lim.	Fe (2) Py	Fe (2) Mag.	Fe (2) Hem.	Fe (2) Spec	Other (2) Galena	Other (2) Sphal.	Other (2) Molyb	Other (2) Calc	Other (2) Garnet	Other (2) Silicates	Other (2) Sericite	Other (2) Clay	Other (2) Vn. Qtz	Other (2) QUARTZ	Other (2) CHLORITE	(3) Rock Type	Structures (4) Depth	Structures (4) True Dip	Remarks
0	7.0	7.0																																			Rock bit
7.0	15.1	8.1		.01				91						.01				md		ST.									md	md	1	7		SP	Leached veins	70°	Fine grained porphyritic texture. stained deep red-purple. Blue CuOx
15.1	21.9	6.8		.01				96						.01				md		md									md st md	md	1	10					Turquois colored CuOx with Jarosite in veins. Sericite along leached veinlets.
21.9	29.9	8.0		.01				97						.01				md	Tr	ST.									md st	md	1	10					As above. Remnant Sulfides in sil interval 27.9-28.21.
29.9	38.8	8.9		.01				98						.01				st	Tr	wk									st	md	3	12			Leached veins	60°-70°	leached veinlets w/thick live lim. Dis. py & wk cc. in sil zones
38.8	47.2	8.4		.01				85						.01				md	-	wk.									md	wk	?	30					less boiwork than above. Fgr. md-stly silicified.
47.2	56.7	9.5		.02				79						.02				md	-	md									md	md	?	12			sheets	55°-80°	silicified to 49.0, then soft, c stly broken w/more lim.
56.7	66.7	10.0		.01				83						.01				wk md	Tr	wk									wk	wk		80					st silicification: 60.0-69.0. Texture 20% obscured
66.7	75.4	8.7		.01				100						.01				md	Tr	md									wk md	wk md	2	20					f.gr., stly bom stained below sil. zone.
75.4	84.4	9.0		.02				94						.02				md	-	md									md	wk	2	20					As above, bom stained except for sil. intervals. CuOxes flasts.
84.4	93.2	8.8		.01				86						.01				md	-	wk									md st	wk		30			Leached veins	50°-75°	" " st sil, c live lim; 81.5-88.5 and veinlets of Jarosite, a(with(?) light blue CuOx
93.2	102.0	8.8		.01				97						.01				md		md									wk md		1	8					Overall appearance light tan, f.gr. rock cut by numerous bom stained veinlets
102.0	110.9	8.9		.01				99						.01				md		md									wk md			5					As above. CuOx of 3-5, Color: light blue; probably Turquois
110.9	119.5	8.6		.18				100							.18			Tr	s.l.	wk									wk md			8			110.9 Sul Fides		f.gr. Tan colored ch. cut by uns of clay & blue CuOx. units i dissemination
119.5	128.6	9.1		.15				94							.15				½	wk									wk md			8					As above wk cc.
128.6	137.3	8.7		.07				100							.07			Tr	½	-									wk	wk md		12			Sp?		f.gr ch. salmon pink color. sl sec k-spar? mdly broken clay on fracs. wk cc
137.3	145.7	8.4		.04				86							.04			Tr	½	wk									md wk		2	12					As above partially oxidized wk hemstain. leached sul units. wk bioxim
145.7	154.1	8.4		.04				84							.04			wk	½	wk md									md wk		5	15					As above Qtz. vn. w/leached sul units 150.0-152.0
154.1	162.3	8.2		.07				97							.07			Tr	½	c									wk md	wk		20					f.gr. salmon pink ch. mdly broken, clay on fracs. wk-md diss. cc.
162.3	172.1	9.8		.05				61							.05			Tr	½										md	wk md		20					stly broken. Tr bom. lim on fracs. cc as thin units & diss.
172.1	181.2	9.1		.06				87							.06			wk	½										md	-		85					f.gr ch. intensly silicified. Leached sul units. Jarosite on fracs. wk disse
181.2	189.5	8.3		.06				89							.06			wk	½										md	wk		50					As above to 185.0 Then f.gr. salmon pink ch. clay on fracs. thin units of py
189.5	196.0	6.5		.04				72							.04			-	½	-									wk-md	-		75					v.stly silicified f.gr. ch. wk diss py & cc. ccas coatings on py
196.0	205.1	9.1		.06				80							.06				½										md	-		85					" " " " " wk-md diss cc & py
205.1	213.9	8.8		.04				90							.04				½										md	-		85					As above ⅜" py & cc vn at 205.3 md diss cc
213.9	222.8	8.9		.04				98							.04				½										md	-		85					v.st silicification of f.gr. ch. wk'ly diss py & cc. Tr cov.
222.8	232.2	9.4		.02				92							.02				½										md wk			60					Less silicified than above. Several py & cc uns. clay on fracs
232.2	240.6	8.4		.03				96							.03			md	-										md st	wk		50			Sp?		md-st silicification Leached sulfide veins w/jarosite. Barite on fracs.
240.6	249.8	9.2		.02				94							.02			md	½										md st	wk		45					As above finely diss py & cc
249.8	258.6	8.8		.25				95							.25				½										md	wk		40					md-st silicification st. py. veining w/cc coatings
258.6	267.7	9.1		.45		Nil		85							.45				½										md	wk		30					As above to 264.3 fault gouge & breccia. 264.3 trend of int'l
267.7	276.1	8.4		.15				88							.15				½-1										md	md st		15			Sp		Alt'd & bleached f.gr. Sp. cc. as finely diss. grains
276.1	283.7	7.6		.06				89							.06				½										st st	md		20					" " " " wk-mod. sec k-spar Bx: 280.5 - 283.0
283.7	292.0	8.3		.03				100							.03				½										md wk	wk md	5	30					wk-md. silicification md sec k-spar cc as units & diss. grns.
292.0	302.2	10.2		.05				72							.05				2										md wk	wk md		40					mdly silicified stly broken, clay on fracs wk cc
302.2	313.3	11.1		.06				70							.06				½										md	wk md	3	20					wk silicification mdly broken " " " wk cc & uns.
313.3	324.3	11.0		.08				65							.08				1-2										md	md	3	25			Sheers	60°-80°	gouge & bx 314.2-315.0. Local st. silicification wk. sul.
324.3	334.9	10.6		.04				80							.04				1-2										md	md	3	20					st sec k-spar mdly broken & sheared clay on fracs.
334.9	344.5	9.6		.10				71							.03	.01			3										md	wk	5	40					mdly silicified & broken wk cc & sov. Tr cpy
344.5	352.7	8.2		.04				92							.04				1										md	wk	-	40					f.-med gr. Sp? local st sec. k-spar. md-st silicification
352.7	361.2	8.5		.02				93							.02				1										md	wk	-	30					f.med to wk Sp? ground mass qtz & k-spar. Sp. plag. phenos alt'd rocks
361.2	369.0	7.8		.04				89							.02	.02			1-2										wk	wk	-	30					As above clay on fracs. wk alt. Fresh Kspar
369.0	376.0	7.0		.03				82								.03			1-2										wk	wk	5	30					" " qtz vns w/py Tr cc
376.0	384.5	8.5		.04				92								.04			1										wk	wk	0	20					" " wk'ly silicified Numerous Qtz vns.
384.5	397.0	12.5		.04				89								.04			1										wk	wk	5	25		SP			as above mdly sheared clay on fracs.
	EOH			Average Recovery - 88%																																	

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4) (West Oxide Area)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. E-183
Page 1 of 1 Pages
Collar Elev. 2762.22 Final Depth 301.0
Coords. N 28,033.96 E 27,207.67
Inclination Vertical
Logged by RE, PB.
Date: Start 4-17-69 Finish 5-3-69

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Cu (1) Pitch.	Cu (1) Black	Cu (1) Blue Green	Cu (1)	Cu (1) Cc.	Cu (1) Cpy.	Cu (1) Born	Fe (2) Lim.	Fe (2) Py.	Fe (2) Mag.	Fe (2) Hem	Fe (2) Spec.	Other (2) Galena	Other (2) Sphal.	Other (2) Molyb.	Other (2) Calcite	Other (2) Garnet	Other (2) Silicates	Other (2) Sericite	Other (2) Clay	Other (2) Vn. Qtz	Other (2) QUARTZ	Other (2) CHLORITE	Other (2) K-spar	(3) Rock Type	Structures (4) Depth	Structures (4) True Dip	Remarks
0	5.0	5.0																																				Rock bit
5.0	15.0	10.0		.14				92					.14					Sx		wk				.021				wk	md	-	30				AK			C gr AK st brn lim on fracs. Mk live lim. Tr. Cu ox (chrys)
15.0	24.8	9.8		.13				81					.13					ST		wk				.001				wk	md	-	30							As above "
24.8	34.4	9.6		.16				90					.16					ST		-				.002				wk	md	-	30	wk						plag → clay; kspar unaltered, wk chlorite. Brown limonite on fracs
34.4	44.2	9.8		.07				82					.07					ST		-				.003				wk	md	-	30	wk						As above
44.2	53.7	9.5		.10				92					.10					ST	Tr	-				.006				wk	md	-	30	wk						" " Tr of py, wk CuO_x
53.7	62.9	9.2		.20				92					.20					ST		-				.008				wk	md	-	30	wk						" " Barite on fractures. wk CuO_x
62.9	71.2	8.3		.65	1.0 @ 0.53	.49	1.0 @ 0.39	98					.49		.12	.04		ST	Tr	-				.005				wk	md	-	30	wk						" " cpy, cc. on same fractures. Radiating xtals of mal.
71.2	80.7	9.5		.54		.30		92					.30		.21	.03		ST	Tr					.005				wk	md	-	30	wk				veinlets	45°	" " cpy, cc oxidizing to mal on fractures
80.7	86.0	5.3		.69		.07		72					.07		.57	.05		wk	1/2					.006				wk	md	-	30	wk			AK	Sulfide Vein	35°	dis. py, cpy w/ cc. wk oxidation along fracs. Kspar fresh
86.0	95.7	9.7		.76		.02		98					.02		.64	.10		wk	1/2					.009				wk	md	5	35	wk			Sil. Zone			F.gr. silicified interval 92.1-95.0 md dis cc. alt. as above
95.7	104.8	9.1		.44		.04		74					.04		.30	.10		wk	1/2					.016				wk	md	5	30	wk			Sil. Zone	102.0 104.0		Bx; fault gouge 102.0-104.0. Texture silicified, indistinct
104.8	113.9	9.1		.34	89.3 @ 0.54	.01	89.3 @ 0.01	84					.01		.18	.15		-	1/2					.041				-	md	-	30	Al			AK			dis blebs of cpy. wk alt of plag. Kspar unaltered. 4% chlorite
113.9	123.5	9.6		.30		Nil		89							.15	.15		-	1/2					.027				-	wk md	-	30	Al				Mz dike	25°	Mz 116.1-116.2. cc. on dis blebs of cpy. Very fresh looking
123.5	133.0	9.5		.34		Nil		65							.19	.15		-	1/2					.017				-	wk	Tr	30	2			AK			As above. moly in thin (<1/32") qtz veinlets
133.0	142.5	9.5		.46		Nil		88							.36	.10			1/2				104.3 @ .080% Mo	.039				wk	md	-	10	10			Mz			ST. cpy, wk py. "moly paint" on fracs. wk-md alt of Mz
142.5	151.9	9.4		.67		Nil		80							.37	.30			1/2					.160				wk	md	5	15	4	md			Qtz-cpy-moly vein	≈ 90°	Loc. more steep qtz-cpy-moly veins. 2nd kspar alt of Mz
151.9	160.5	8.6		.67		Nil		97							.37	.30			1/2					.290					Tr md	2	10	5	md			"		60°	Stly broken, vst moly as "paint" and in qtz veins w/ cpy.
160.5	170.0	9.5		.80		Nil		89							.45	.35			1/2					.270				wk	md	2	10	5	md			"	55°	sheared & gouge 165.5-167.6. St. moly as above. py: cpy = 4:1
170.0	178.9	8.9		.26		Nil		81							.11	.15			1/4					.038				-	md	<1	5	5	md			"	55°	less visible moly than above. md kspar alt. Trace native Cu
178.9	189.0	10.1		.31				96							.10	.21			1/2					.046				-	wk md	<1	5	5	wk			"	65-75°	cpy dis. & in veinlets with moly. md kspar alt along fracts.
189.0	200.0	11.0		.23				61							.08	.15			1/2					.046				-	md	Tr	5	5	md			"	60-80	As above. clay alt. pale green plag in fresh matrix. More cpy & moly than py
	EOH			(Reopened 5-1-69)																																		
200.0	209.0	9.0		.12				81							.05	.07			1/2	Tr				.002				-	wk md	-	30	3	md		MZ-AK	202.0		Together in small clumps. wk clay alt of plag. in AK, Kspar fresh. Magnetite, chlorite
209.0	215.5	6.5		.13				61							.04	.09			1/2	Tr				.005				-	md	-	15	5	md		MZ	208.7		MZ becomes fine grained @ 218. Py: cpy = 1:1.5. Stly broken
215.5	222.0	6.5		.21				81							.02	.19			1/2	Tr				.006				-	wk md	-	10	5	md					occur w/ chlorite, md gr. MZ. md Kspar, chl. weaker clay. large cpy spot blebs
222.0	230.8	8.8		.11				80								.11			1/2	Tr				.002				wk	md	-	10	5	md					" " " plag. alt. to grn clay mix. bio & chl. chlor fracs. Tr Mo
230.8	239.5	8.7		.18				100							.03	.15			1/2					.002				Tr	wk	5	10	4	md					several shears, calcite on fracs. wk Qtz veining. Tr Mo. Vk sulf cpy
239.5	247.9	8.4		.15				91							.04	.11			1/2					.002				-	wk	2	12	3	md					" " wkly broken. Tr cc coatings on cpy. Md kspar
247.9	256.4	8.5		.10				75							.05	.05			1/4					.006				-	wk md	2	12	3	wk					wk kspar plag alt to grn clay. Thin veins of cpy, pyrite
256.4	264.0	7.6		.09				81							.02	.07			1/4					.002				-	wk md	2	12	2	wk					as above. fault zone 260.5-261.8. calcite on fracs.
264.0	273.7	9.7		.10				99								.10			1/2	Tr				.002				-	wk	-	10	4	wk					Coarse grained MZ, large Qtz eyes. Bands of kspar
273.7	281.8	8.1		.12				100								.12			1/2	Tr				.003				-	wk	-	10	4	wk			chlorite filled frac	50°	As above. fractures filled with chlorite
281.8	290.9	9.1		.11				97								.11			1/2	Tr				.002				-	wk	-	8	5	wk					weakly magnetic. md chlorite, & 2nd kspar alt.
290.9	301.0	10.1		.12				94								.12			1/2	Tr				.002				-	wk	2	15	5	md		MZ-AK	2990		MZ changes in color & texture @ 299. Becomes darker, & more porphyritic. Typical AK @ 299.0 w/ sharp intrusive contact.
	EOH																																		EOH			

Average Recovery: 81%

PRELIMINARY GEOLOGIC LOG
(Subject to Revised Logging)

ASARCO-SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Portland Ridge — Hole No. F-184
Page 1 of 1 Pages
Collar Elev 3083.414 — Final Depth 350.4
Coords. N 28,710.74 — E 29,356.66
Inclination Vertical
Logged by RE
Date: Start 4-21-69 — Finish 4-30-69

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg.	% Core Recov	Sp. Gr.	Cu (1) Chrys.	Cu (1) Pitch	Cu (1) Black	Cu (1) Blue-Green	Cu (1) Grn-Blue	Cu (1) N.S.	Cu (1) Cc.	Cu (1) Cpy.	Cu (1) Born	Fe (2) Limo.	Fe (2) Py	Fe (2) Mag.	Fe (2) Hem	Fe (2) Spec.	Other (2) Galena	Other (2) Sphal.	Other (2) Molyb	Other (2) Calcite	Other (2) Garnet	Other (2) Silicates	Other (2) Sericite	Other (2) Clay	Other (2) Vn. Qtz	Other (2) QUARTZ	Other (2) CHLORITE	(3) Rock Type	Structures (4) Depth	Structures (4) True Dip	Remarks
0	10.5	10.5																																				Rock bit
10.5	25.1	14.6		.01				51											V ST			-								md	md	1	8		SP			f. gr. SP very strong Jarosite, generic basework
25.1	35.4	10.3		.01				81											V ST	-		-								md	md	-	5			leached veins	65°	Bleached SP cut by numerous leached veinlets of py.
35.4	45.1	9.7		.01				86											V ST	-		-								md	md	1	5					As above
45.1	55.3	10.2		.01				69											V ST	-		-								md	md	-	<5					Very fine grained, stained deep orange-brown. Broken 51.0-52.3
55.3	60.4	5.1		.01				74											V ST	-		-								md	md	-	<5			leached vein	70°	As above. Strong Jarosite, no Cu ox or lim. lim.
60.4	70.3	9.9		.02				84											V ST	-		-								md	md	1	<5			"	50°	As above.
70.3	80.4	10.1		.07				79											ST	1-2		-								md	md	1	5		SPF	75.5		First py 55.5 & 75.5. ST dis. CC in unoxidized intervals
80.4	90.2	9.8		.09				100											md	2										md	md	Tr	5					50% oxidation. rock is f.g., mdly soft. several alunite veins
90.2	99.6	9.4		.72		.01		89							.01	.68	.03		-	5										md	md	1	5					ST py & CC. Py : CPY : 10:1. 2% Alunite in veins
99.6	109.1	9.5		.74	6.6 @ 0.62	.04		83							.04	.70			-	3										md	ST md	-	5					sulfides dis. & in irregular braided veinlets
109.1	118.8	9.7		.39		.04		82							.04	.35			wk	5										ST	ST	-	<5					Very soft, f. stly alt'd. vertical shears and oxidation 117-118.
118.8	129.8	11.0		.91	0.03	.03		75							.03	.88			wk	3										ST	ST	-	<5					stly broken. ST dis. CC on py
129.8	141.8	12.0		.38		(.01)		86							.01	.37			-	3										ST	ST	-	<5					As above.
141.8	154.0	12.2		.36		N.		90								.36			-	3										ST	ST	-	<5					soft, easily broken by hand. less CC, CPY favors walls of py-cpy veinlets
154.0	163.3	9.3		.30				100								.30				3										ST	ST	-	<5					Uniformly disseminated fine gr. py w/ thin CC replacement
163.3	173.0	9.7		.21				95								.21				3										ST	ST	1	5			Shears	70°	Some silicification along py veins.
173.0	182.1	9.1		.12				89								.12				2										md ST	md	1-2	5					harder, less altered, less py & CC than above.
182.1	190.4	8.3		.20			221.2 @ 0.22 / 0.01	96								.20				1										md	wk	3	15					mdly silicified. wk py f.c.c. stly broken.
190.4	199.0	8.6		.26				91								.26				2										md	wk		20°					md-stly broken, stly silicified, wk CC.
199.0	208.0	9.0		.23				97								.23				2										wk-md	md	2	15°			PY vein	65°	stly broken. Gouge: 206.0-208.0 same CC on py veins.
208.0	218.1	10.1		.21				71								.21				1										md md	ST ST	2	10°		SP	216.5		As above, Bx 216.5-223.0 cemented by dense clay
218.1	228.0	9.9		.33				78								.33				1										ST	ST	-	5		Bx	223.0		stly alt'd, f. soft below Bx zone
228.0	237.6	9.6		.65	21.4 @ 0.67 / 0.01	.02		83							.02	.63				2										ST	ST		10		SP			ST CC on some dis py. Spotty silicification
237.6	249.4	11.8		.68		Nil		88								.68				1										ST	ST	-	5					stly alt'd, f. broken. CC on finely dis py.
249.4	261.9	12.5		.34				63								.34				1										ST	ST	-	10					" " " fragments average 1". some silicification
261.9	272.6	10.7		.31				73								.31				2										ST	ST	-	5					
272.6	282.4	9.8		.26				82								.26				2										ST	ST	-	5					" " " ST dis. CC on py
282.4	294.4	12.0		.49	21.1 @ 0.54 / 0.02	.01		71							.01	.48				2										ST	ST	1	5					" " " md CC on fractures.
294.4	303.5	9.1		.61		.03		98							.03	.58				2										ST	ST	-	5					" " " Thin CC on most fine dis. py grains.
303.5	311.4	7.9		.35		.01		97							.01	.34				1-2										ST	ST	-	5			311.4		Less broken than above. Stly bleached & alt'd.
311.4	321.8	10.4		.16				81												2?										ST	ST	-	<5		Bx	321.8	Shears 70°	Bx and gouge: 311.4-321.0. suggestive of shears 70°
321.8	331.9	10.1		.09				100												2										md md		3	10°					mdly sil., less alt'd, harder than above. thin irregular py veinlets
331.9	341.8	9.9		.13				84												2										ST	ST	3	10°			Qtz-PY veins	60-90	" " few joints. stly bleached & alt'd.
341.8	350.4	8.6		.24				80												3										ST	ST	-	5					As above. very wk CC.
EOH																																						
	Average			recovery - 83%																																		

PRELIMINARY GEOLOGIC LOG
(Subject to Revised Logging)
ASARCO-SILVER BELL UNIT

Note (3)
Tt - Tactite
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Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
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Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Portland Ridge

Hole No. F 185
Page 1 of 2 Pages
Collar Elev 3136.62 Final Depth 451.2
Coords. N 28449.22 E 22669.85
Inclination Vertical
Logged by P.B., RE
Date: Start 4-28-69 Finish 5-12-69

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green		Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE		(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0	11.6	11.6																																				Rock bit
11.6	20.2	8.6		.02				100										Wk			St								Md	Md St	3	12			Mz			Leached sul. units. Q qr Mz 20% large plag. phenos (Alt. to clay) St hem stain wk lim.
20.2	29.4	9.2		.01				93										Wk			St								St	Md St	3	15						St. hem flooding bands of Qtz-ser along leached sul. units. Tr. lim.
29.4	37.9	8.5		.01				90										Md			St								St	Wk	4	20						wk'ly silicified. numerous Alunite uns. Jarosite on fracs.
37.9	47.2	9.3		.01				88										Md			Md								Md	Md		30				Alunite Vein	85°	" " Less hem stn than above. 1" alunite vn. clay on some fracs.
47.2	56.5	9.3		.01				93										St			Wk Md								St	Md	4	25						st. yellow-brn lim as uns & on fracs. plag. alt. to clay
56.5	70.7	14.2		Tr				63										St			Wk								St	Md	4	25						As above. Lim. mostly after py. wk-md silicification.
70.7	79.8	9.1		.01				94										St			Wk								Md	Wk	3	30			MZ			73.4-74.0 aplite? frac. mdly silicified wk py & cc 75.6-76.4
79.8	89.1	9.3		Nil				92										St			Wk								Wk	Md	7	12				83.0		83.0. f.gr. tan color rk. 5% large plag. phenos alt. to clay. st. jarosite
89.1	98.2	9.1		Tr				87										St			Md								Mn	Md	2	8				95.3		as above, occasional large rounded Qtz phenos. 95.3 hem. stained Mz
98.2	107.0	8.8		.08				98										Wk			Wk								Md	Wk	8	30			Mz			30% oxidized. Local st. silicification. wk. py & cc as veinlets & diss grs.
107.0	114.0	7.0		.08				95										St			Md								Md	Md	1	12			MZ			100% " sharp sulfide contact @ 114.0
114.0	125.0	11.0		.38				100							.38			-			-								Md	Md	3	15			sulfides MZ	114.0		Fine dis. py of md-st c.c. Few sulfide veinlets
125.0	134.3	9.3		.38				88							.38														Md	Md	1	10						small blebs of cpy with thick rims of c.c.
134.3	143.6	9.3		.38	54.6 @ 0.46		54.6 @ Nil	93							.38														Md	Md	1	10						As above
143.6	152.8	9.2		.74		Tr		98							.74														Md	Md	?	20			MZ	143.0		Rk below 143.0 is f.g., stly silicified w/ more sulfides than above
152.8	159.9	7.1		.48		Nil		84							.48														Md	Wk	?	15			Aplite? Porph.	2" py vein	60°	silicified to 156.0 then f.g., light tan rk. w/ few large phenos.
159.9	168.7	8.8		.42		Nil		100							.42														Wk	Wk	1	10			"	Qtz pl vein	75°	rk as above. w.s. (5%) py partially replaced by c.c.
168.7	176.7	8.0		.29				95																					Wk	Wk	1	10			or SP			As above. fresh appearing groundmass w/ few large alt. phenos
176.7	181.6	4.9		.27				92																					Wk	Wk	1	10						As above
181.6	190.3	8.7		.27				84																					Wk	Wk	1	10						" " wk py partially replaced by c.c. stly broken
190.3	198.2	7.9		.76		Nil		100																					Wk	Wk		15						mdly silicified. st c.c. 192-193
198.2	205.5	7.3		.38				94																					Md	Wk		15						As above. low total sulfide. st replacement of some py
205.5	215.0	9.5		.14				76																					Wk	Wk		20						Large phenos (15%) in very f.g. G.M. to 208.4, then stly silicified.
215.0	223.2	8.2		.01				100																					Wk	Wk	5	40						Stly silicified f.gr. rk. wk cc as coatings on py
223.2	232.0	8.8		.30				88																					Wk	Wk	8	40						as above. Tr. cpy & cov.
232.0	240.7	8.7		.26				100																					Wk	Wk	8	35						numerous small qtz veinlets. py & cc as thin veinlets & diss. grains
240.7	250.0	9.3		.19				88																					Wk	Wk	3	60						intensely silicified. rk type obscure
250.0	260.5	10.5		.29				100																					Wk	Wk	8	30						f.gr. SP? md-st silicification. many qtz veinlets. clay on fracs
260.5	270.5	10.0		.64		Tr		87							.64														Md	Md	6	25						f.gr. SP. local st. silicification. md-st cc as diss. grains & veinlets
270.5	281.5	11.0		.40		Nil		71							.39	.01													Md	Md	5	20						Md-stly alt'd & bleached. Clay on fracs. md. cc
281.5	291.5	10.0		1.50	65.2 @ 0.66	Nil	65.2 @ Nil	87							1.50														Md	Md	5	20						as above. several qtz veinlets w/ py & cc
291.5	299.3	7.8		.36		Nil		95							.36														Wk	Wk		50						Stly silicified. Tr. lavender colored min. (possibly lepidolite) along fracs. md cc
299.3	307.8	8.5		.46		Nil		91							.46														Wk	St	8	40						Stly silicified to 302.0. Md lepidolite? on fracs. several qtz vns. md cc
307.8	315.8	8.0		.22				100							.22														Wk Md	Md	6	30						wk-md sil. Tr. lepidolite? clay on fracs.
315.8	325.7	9.9		.86		Nil		84							.86														Wk	Wk	6	38						Md silicification " " md cc as coatings on py
325.7	332.9	7.2		.13				100																					St	Wk	5	50						Stly silicified w/ numerous vugs. wk cc & py
332.9	341.5	8.6		.19				97																					St	Wk	5	30						Local st silicification. wk sec K-spar. md cc as diss grains
341.5	349.6	8.1		.32				90																					Wk	Wk	8	30						" " " wk lepidolite on fracs. st. Qtz veining
349.6	358.0	8.4		.52		Nil		96																					Md	Wk	5	40						Stly silicified throughout. 351.0-355.0 Bx w/ st set clipy between frags
358.0	366.5	8.5		.23				87																					St	St	5	35						" " " & wk cc
366.5	374.4	7.9		.15				100																					Wk	Wk	2	35						Alkspar phenos. Md st silicification. Lavender color min. on some fracs & staining some
374.4	383.3	8.9		.38				86																					St	Wk	4	35						St. sil. wk'ly broken. Clay on fracs. several py & cc veinlets
383.3	392.0	8.7		.26				100																					Wk	Wk	10	35						" " Local silicified Bx w/ Py & cc between frags.

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO- SILVER BELL UNIT

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Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. F-185
Page 2 of 2 Pages

Collar Elev 3135.62 Final Depth 451.2
Coords. N 28,449.22 E 27,669.85
Inclination vertical
Logged by RE, PB
Date: Start 4-28-69 Finish 5-12-69

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green		Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
392.0	401.0	9.0		.77		.01		93											2										st	md	20				mz			md gr porphyritic where not silicified. Lavender alt products.
401.0	409.0	8.0		.14				100											1										md	wk	1	10						Texture vague. Md alt overall. st Lavender staining
409.0	417.0	8.0		.15				90											1										md	wk	2	0						mdly silicified wk sulfides. little visible C.C.
417.0	425.0	8.0		.14				100											1										md	wk	-	10		mz				less sil., py is f.g. f. evenly dis.
425.0	437.0	12.0		.48		Nil		99											2										md st	wk	-	10		mz sp	427 py 437 vn	55°		1.2" py vein @ 435.0, wk C.C., st sericite 434-437
437.0	445.7	8.7		.12				85											2										md st	md	-	15		mz				mz with zones of sil.
445.7	451.2	5.5		.10				92											2										md	md	-	10		mz				stly broken, mdly altd mz w/ dis py, lavender alt. product.

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

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Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

West Oxide Area

Hole No. F-186
Page 1 of 1 Pages
Collar Elev 2772.11 Final Depth 180.0
Coords. N 38,100.65 E 23,983.18
Inclination Vertical
Logged by RE
Date: Start 4-24-69 Finish 4-25-69

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Covellite	N.S.	Cc.	Cpy.	Born	Fe (2) Lim.	Py.	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb.	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz.	QUARTZ	CHLORITE	Zeolite	Kspar	Barite	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0	3.5	3.5																																							Rockbit
3.5	15.1	11.6		.17				70											S						.004			-	md	-	10	5					MZ				wt-md altd mz. ST brown earthy lim on fractures.
15.1	24.2	9.1		.18				33											S						.006			-	md	-	10	5						Joints 25°-45°		Plag → clay, bi → chl, kspar fresh. ST/y. Jointed
24.2	33.4	9.2		.23				97											S						.015				wk md	-	10	5						leached veinlets 60°		As above except for leached vein w/ sericite
33.4	41.4	8.0		.20				100											ST						.004			-	md	-	10	5	Tr				MZ	41.0		md alt. sheared, gouge 41.0-49.5
41.4	50.7	9.3		.18				82											ST						.009				md	ST	-	?	5	-			BX	49.5		BX and gouge to 49.5
50.7	59.9	9.2		.25				99											S						.003			Tr	md	Tr	10	5	-	11			MZ			Mal in thin fractures. Irregular veins, patches of barite
59.9	69.0	9.1		.24				86											ST						.003			Tr	md	-	10	5	wk	31				Barite veins	40°	Barite vein 64.0-64.2. Several thinner barite veins
69.0	78.0	9.0		.84	18.7 @ 0.74	.71	18.7 @ 0.60	83					.71			.13			md						.006			-	md	-	10	5	-	-						Malachite as unusually wk green acicular tufts in open fractures.
78.0	87.7	9.7		.64		.50		91					.50			.14									.007			Tr	md	-	10	5	-	-			MZ	91.0		minor mal, chrysocolla. Lim continues to be brown, earthy
87.7	96.8	9.1		.30				90					.25			.05			ST			Tr			.005			Tr	ST	-	10	5	-	-			BX	95.0		ST/y broken w/ BX & gouge 91.0-95.0
96.8	103.0	6.2		.40	24.2 @ 0.61	.23	24.2 @ 0.35	85					.23			.17			ST			-			.009			?	ST	-	5	3	?				MZ BX	99 103		BX zone of gravel & clay 99-
103.0	112.0	9.0		.71		.32		94					.32			.39			St			Tr			.020			-	St	-	8						Sheared MZ			St/y broken w. Bi & some brown lim on fracs.
112.0	121.0	9.0		.66		.45		91					.20	.25		.21			St			Tr			.010				St	-	8									As above granulated & gouge, wk mal & azurite.
121.0	130.0	9.0		.56	9.0 @ 0.61	.03	9.0 @ 0.01	90						.03		.53			St	Tr		-			.024			wk St md	md	-	5	5	T							Very soft, ST/y sheared, gouge, CC on fine dis px
130.0	140.0	10.0		.66		Nil		82								.50	.16		St	Tr					.007			wk md	ST	-	10	8					MZ			BX gouge 134.6-138. Otherwise less broken than above. md alt dis sulf. CC appears to have completely replaced mafic px in this amphibolite MZ. Tr cpy.
140.0	150.0	10.9		.54				85								.20	.14			1/2					.013			Tr	md	-	10	8		Tr						Fine dis. px, cpy with veins of CC. Plag → clay, kspar fresh, Bi → chl.
150.0	158.8	8.8		.08				88												1/4					.005			wk md	-	10	8									ST/y sheared w/ px on few fractures.
158.8	168.2	9.4		.12				87												1/4	Tr				.002			wk md	-	10	10	Tr								Fine dis px, cpx. Total sulfide content ST/y wt/y magnetic.
168.2	180.0	11.8		.05				97												1/4	Tr				.005			-	md		10	10					MZ			As above. Some calcite is secondary, appears as fillings in hairline fractures.
E.O.H.																																									
	Average recovery - 89%																																								

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

West Oxide Area

Hole No. F-187

Page 1 of 1 Pages

Collar Elev. 2727.36 Final Depth

Coords. N 22,831.12 E 24,249.08

Inclination vertical

Logged by RE

Date: Start 4-26-69 Finish 4-30-69

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu N/S	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Cu (1) Mal. Cu Pitch	Cu (1) Black	Cu (1) Blue Green	Cu (1) Brown N/S	Cu (1) Cc.	Cu (1) Cpy.	Cu (1) Born	Fe (2) Lim.	Fe (2) Py.	Fe (2) Mag.	Fe (2) Hem	Fe (2) Spec.	Other (2) Galena	Other (2) Sphal.	Other (2) Molyb	Other (2) Calcite	Other (2) Garnet	Other (2) Silicates	Other (2) Sericite	Other (2) Clay	Other (2) Vn. Qtz	Other (2) QUARTZ	Other (2) CHLORITE		(3) Rock Type	Structures (4) Depth	Structures (4) True Dip	Remarks
0	4.0	4.0																																				Rockbit
4.0	14.0	10.0		.11										.11				ST		wk				018			md	ST	1	12	-			MZ	leached veins	55°-70°	mdly altd MZ ST yellow-brown lim. several leached veinlets
14.0	23.0	9.0		.11										.11				ST		Tr				.006			md	ST	-	10	-						stly broken, gouge. ST gouge @ 216'
23.0	32.8	9.8		.20										.20				ST		ST				.009			md	ST	-	10	-				Fault 30.8-31.4	60°	stly hem stained, around fault, from 25.7-31.0 Trace of hydrothermal
32.8	40.0	7.2		.19										.19				md		ST				.003				ST	ST	-	8	3					Kaol soft (crumples in hand). stly altd, hem stained.
40.0	49.0	9.0		.11										.11				St		md				.003				md	St		8	3			Fracs	80°	mdly broken St yellow-brn lim. bio. alt. to chl.
49.0	58.0	9.0		.35									.25	.10				St		Md				.003				md	St	-	8	4					fault gouge at 58.0 barite on some fracs wk CuOx as mal
58.0	66.4	8.4		.52		.35					.17		.35					St		wk				.003				Md	St		8	4					mdly fractured st. brn lim. on fracs wk sec. K-spar wk. mal
66.4	76.0	9.6		.40		.10					.10		.10		.06	.14		Md		Tr				.002				md	md St	3	12	4					md-st sec. K-spar wk Cu Ox as mal & wk diss sulfides.
76.0	85.4	9.4		.15											.09	.06		—		—								Md	Md	2	10	4			Fracs	60°	stly fractured & broken md sec. K-spar wk diss cpy
85.4	96.7	11.3		.42		.01					.20			.01	.11	.10		Wk		-								Md	Md		8	4					granulated & gouge 85.4-90.5 wk brn lim on fracs w/ Nat. Cu
96.7	106.0	9.3		.20							.12				.04	.04		Wk										Wk	Wk		8	5					stly broken, local gouge. bio → chl. wk Cu on fracs wk Nat. Cu & Cpy
106.0	115.7	9.7		.23											.15	.08		Tr										wk	Md		10	6					" " " wk sec. K-spar barite on some fracs w/cc
115.7	127.5	11.8		.71		.02					.30			.02	.32	.07		Wk										wk	Md		10	5					feldspars altd to grn. clay min. brn lim. w/Nat. Cu ON Fracs
127.5	135.2	7.7		.23											.18	.06		Tr										wk	Md		12	4					Bx & Gouge 132.0-134.6 Py & CC between frags.
135.2	141.2	6.0		.42		.01					.16			.01	.15	.10		Tr										wk	St		12	1					feld altd to clay bio → hydro mica wk sec. K-spar Tr. Nat. Cu
E	O.H.																																					
	Average		recovery - 85%																																			

PRELIMINARY GEOLOGIC LOG
(Subject to Revised Logging)
ASARCO - SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. F-188
Page 2 of 2 Pages
Collar Elev. 2981.16 Final Depth 456.2
Coords. N 28,582.01 E 29,487.86
Inclination vertical
Logged by RE, PB
Date: Start 5-1-69 Finish 5-9-69

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue-Green		Cc.	Cpy.	Born	Fe (2) Lim.	Fy.	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE		(3) Rock Type	Structures (4) Depth	True Dip	Remarks
407.0	416.8	9.8		.08				93							.06	02													ST	ST	-	5			SP			Fine disp. py with thin cc replacement
416.8	425.4	8.6		.10				90							.10														ST	ST	-	5			)	Shears	80°	Sheared, soft, p'stly altd. piece of pregpy vein @ 420.5
425.4	434.6	9.2		.06				97							.05	.01													ad	ST	-	5			SP	432.0		strongly sheared beginning @ 432 otherwise as above
434.6	444.7	10.1		.10				74							.10														ST	ST	-	5			BX			stly sheared and brecciated
444.7	456.2	11.5		.05				69							05														ST	ST	-	5				451.5		" " " To 451.5 followed by SP similar
	EOH																																					to above but with little cc.
Average Recovery: 91%																																						

PRELIMINARY GEOLOGIC LOG
(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
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Note (4)
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Petrified Ridge

Hole No. F-188
Page 1 of 2 Pages

Collar Elev. 2981.16 Final Depth 456.2
Coords. N 28,582.01 E 29,487.86
Inclination Vertical
Logged by RE, PB
Date: Start 5-1-69 Finish 5-9-69

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Chrys.	Pitch	Black	Blue Green	Cu (1) Cu Black	Cu (1) Al. S.	Cu (1) Cc.	Cu (1) Cpy.	Cu (1) Cu Bor	Fe (2) Lim.	Fe (2) Py	Fe (2) Mag.	Fe (2) Hem	Fe (2) Spec.	Other (2) Galena	Other (2) Sphal.	Other (2) Molyb.	Other (2) Calcite	Other (2) Garnet	Other (2) Silicates	Other (2) Sericite	Other (2) Clay	Other (2) Vn. Qtz	Other (2) QUARTZ	Other (2) CHLORITE	(3) Rock Type	Structures (4) Depth	Structures (4) True Dip	Remarks
0	13.7	13.7																																				
13.7	22.7	9.0		.01				94							.01				ST	Tr										md	md	1	6	-	SP			md'ly altd. SP. ST Jarosite, wk live lim. Roots in fractures.
22.7	31.5	8.8		.01				86							.01				md	Tr										st	st	20?						st'ly silicified to 29.5 leached vein 29.5-30.0. Common t. py
31.5	40.4	8.9		.02				86							.02				ST	Tr		md								ST	md	2	15					spotty sil, numerous thin qtz veinlets. Alunite filling fractures.
40.4	49.1	8.7		.01				90							.01				md			md								ST	md	2	15					ind sil, lim mostly on fractures
49.1	57.7	8.6		.03				87							.03				md	Tr		md								st	md	2	18					wk-md'ly silicified, 80% oxidized, Tr. sul., Tr. live lim.
57.7	66.7	9.0		.02				93							.02				md			md								st	wk-md	-	18					" " " 4" Mz dike @ 60.8 Alunite filling fracs. wk live lim.
66.7	75.2	8.5		.05				97							.05				md			st								md	md	2	8					fgr. sp. md'ly altd. st hem staining. md. live lim.
75.2	82.6	7.4		.09				100							.09				md			md								md	md	-	6					as above rust color lim. on fracs.
82.6	91.5	8.9		.66			.02	72							.02	.64			-	2-3		-								md	st		6					md-st'ly altd & bleached sp. md-st cc as fracs, units, & diss grains.
91.5	100.5	9.0		.69			.02	100							.02	.67			-	2-3		-								st	st	2	8					as above wk'ly broken, clay on fracs.
100.5	110.0	9.5		.70			.03	87							.03	.67				2										st	st	3	8					st'ly altd. St.cc as thin units & diss grains
110.0	119.2	9.2		.63			.02	88							.02	.61				2-4										st	st	4	10			frac	60°	as above numerous Qtz units. St cc
119.2	129.6	10.4		.36				88								.36				3										st	st	0	20					as above to 124.2, then md'ly silicified, brn lim of fracs
129.6	139.6	10.0		.42			Nil	82								.42			Tr	3										ST	ST	5	15					st'ly altered & bleached. Post-sulf. qtz veins mostly disp py
139.6	148.8	9.2		.74			Tr	96								.74			-	2-3										ST	ST	-	15					md'ly silicified. fine dis py w/ c.c. CuSO4 filling some fractures
148.8	157.5	8.7		.92			Nil	93								.92				2-3										st	st	-	10					As above
157.5	166.1	8.6		.80	190.4 @ 0.67		.01	99							.01	.79				2-3										st	md	2	10					" " Thin c.c. on fine dis py
166.1	175.4	9.3		1.04			.01	93							.01	1.03				2-3										ST	md	1	8					" "
175.4	185.9	10.5		.93			Tr	78								.93				2-3										md-st	md	2	8					md'ly broken fault gouge at 180.0 CuSO4 on some fracs. md-st cc
185.9	196.0	10.1		.83			Tr	91								.83				3										md	md	2	10					st'ly sheared and broken, wk'ly silicified. md-st cc as coatings on py
196.0	205.0	9.0		1.03			Nil	100								1.03				3										st	md	3	12					as above several qtz veins w/ py & cc
205.0	213.6	8.6		.60			Nil	79								.60				2-3										st	md	5	13					as above, 212.8-218.6 silicified bx w/ cc & py between fracs
213.6	223.9	10.3		.49			Nil	79								.49				2-4										md-st	wk-md	5	25					st'ly broken md-st silicification CuSO4 on some fracs, units of cc & py
223.9	229.3	5.4		.53			Nil	99								.53				3										st	md	3	15					" " wk-md sil. md-st cc
229.3	238.8	9.5		.62			102	95							.02	.60				3										st	st	2	8					md-st'ly altd. clay on fracs st cc as coatings on diss py grains
238.8	248.1	9.3		.52			.02	91							.02	.50				3										st	st		8					as above
248.1	257.0	8.9		.52			.02	100							.02	.37	.03	.10		2-3										st	md-st	2	12					wk'ly silicified wk. cc. & cov. clay on fracs
257.0	268.0	11.0		.22				77								.18		.04		2-3										st	md	2	14					as above
268.0	273.0	5.0		.58			Tr	100								.37	.03	.18		3										st	md	2	12					as above Tr cpy
273.0	282.3	9.3		.39				93								.14		.25		3										st	md	2	10					md-st'ly altered & bleached wk cov Tr. cc clay on fracs
282.3	291.0	8.7		.30				99								.14		.16		2-3										st	st		10					as above
291.0	299.8	8.8		.23				99								.11		.12		2-3										st	md	5	15					" " several qtz units
299.8	311.5	11.7		.23				100								.20	.03			2-3										st	md	5	20					Mdly silicified wk-md cc as coatings on py
311.5	320.9	9.4		.84			Nil	92								.84				3										st	md	4	20					" " mdly broken st diss py, wk cc
320.9	329.8	8.9		1.68			.01	100							.01	1.67				3										st	md	4	18					mdly altd. sp. 324.6-326.1 Qtz vein w/ st py & cc
329.8	340.3	10.5		.45			.01	89							.01	.44				2										st	md	-	10					" " " st'ly brecciated & broken w/ mod cc from 331.0
340.3	349.9	9.6		.26	196.6 @ 0.61			96								.26				2										md	st		10					as above to 346.0 md-st'ly altd. md-st. cc as coatings on py
349.9	362.3	12.4		.12			196.6 @ .01	98								.12				2-3										st	st	3	10					md-st'ly altd. 4" Qtz vn w/ st py & wk cc. at 361.0
362.3	372.0	9.7		.60			Tr	87								.60				2-3										ST	ST	2	8					As above. ST c.c. on py vein @ 370.
372.0	380.3	8.3		.42			.01	100							.01	.41				2-3										ST	ST	-	10					ST c.c. on dis py and py veins.
380.3	388.1	7.8		.75			Nil	100								.75				2										ST	ST	-	6					30%-50% replacement of py veins by c.c. rk is bleached, st'ly altd.
388.1	397.3	9.2		.13				100								.13				1-2										ST	ST	½	6					ST c.c. on dis. py. st'ly bleached, altd.
397.3	407.0	9.7		.22				100								.22				2										ST	ST	Tr	6		SP			Fine, evenly dis. py w/ c.c. coatings. definite sp texture.

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
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Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. F-189
Page 1 of 1 Pages
Collar Elev. 2942.86 Final Depth 229.0
Coords. N 28,482.50 E 24,399.35
Inclination Vertical
Logged by R.B.
Date: Start 5-5-69 Finish 5-8-69

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Cu (1) Pitch	Cu (1) Cuprite Black	Cu (1) Blue Green	Cu (1) Nat. Cu	Cu (1) Cc.	Cu (1) Cpy.	Cu (1) Born	Fe (2) Lim.	Fe (2) Py	Fe (2) Mag.	Fe (2) Hem	Fe (2) Spec.	Other (2) Galena	Other (2) Sphal.	Other (2) Molyb	Other (2) Calcite	Other (2) Garnet	Other (2) Silicates	Other (2) Sericite	Other (2) Clay	Other (2) Vn. Qtz	Other (2) QUARTZ	Other (2) CHLORITE	(3) Rock Type	Structures (4) Depth	Structures (4) True Dip	Remarks
0.0	5.0	5.0																																			Rock bit
5.0	14.5	9.5		.02				93										Md			St.							Md	wk Md		30			Ak	Fracs	60°	C. gr. Ak st hem stn. leached sul. units wk live lim.
14.5	26.0	11.5		.02				70										St			Md.							Md	Md		30						Mdly altd mdly broken w/local bx.
26.0	34.5	8.5		.02				86										Md			St.							wk Md	Md		20			Mz	31.0		Mz at 31.0 plag. phenos alt to clay w/st. hem stain. brn lim. on fracs.
34.5	43.5	9.0		.04				100										Md			Md							Md	St		15				42.0		Mz to 42.0 sil alt to hydro mica. wk chrys on fracs.
43.5	53.0	9.5		.02				97										wk Md			St.							wk Md	wk	2	30			Ak			St. hem stain throughout. Jarosite on some fracs. Tr diss py. Tr Cu (Mal)
53.0	63.2	10.2		.02				100										Md			Md.							Md	wk		30						Mdly broken. Md. yellow-brn. lim. Clay on fracs.
63.2	72.0	8.8		.04				100										wk Md			Md.							Md	wk		30						Md hem stain, leached sul. units. Tr live lim.
72.0	81.3	9.3		.03				94										wk			St.							wk	wk		30						as above wk live lim.
81.3	90.6	9.3		.02				100										wk			St.							wk	wk Md.	2	30						as above. Clay on fracs
90.6	99.0	8.4		.02				100										wk			St							Md	wk Md	2	30						as above. Jarosite on some fracs. Tr diss py & cc
99.0	109.0	10.0		.03				91										wk			St.							wk	wk		40						Md silicification locally less hem stn than above. Tr sulfides
109.0	119.0	10.0		.07				92										wk			St							wk	wk		30			Mz - Ak - Mz	113.5 113.0		Ak 50% oxidized to 113.5, 113.5 - 113.0 Mz w/intense hem. flooding
119.0	128.0	9.0		.05				100										Md			Md.							wk Md	Md		20						Ak w/ wk sul. to 123.9, then mdly altd. Mz bio alt. to hydromica
128.0	138.0	10.0		.15				93										Md			wk.							Md	Md		10						C. gr. Mz mdly broken. brn lim. on fracs. Tr Cu Ox as mal
138.0	146.0	8.0		.17				96										St			Tr							Md	Md		10						Locally broken & soggy. Mdly altd. wk mal.
146.0	155.4	9.4		.22				75										Md			Tr.							Md	Md		10	wk Md			fracs	55°	C. gr. Mz bio alt to chl. Chl. on fracs. wk sec. K-spar. Tr mal.
155.4	164.0	8.6		.21				87										Md			-							wk	Md	2	10	wk Md					as above, wkly broken. brn. lim. on fracs.
164.0	173.9	9.9		.80	27.0 @ 1.06	.48	27.0 @ 0.55	92						.48		.32		Md			-							wk	wk		12	wk					med-c gr. Mz wk chl. Tr magnetite. md Cu Ox on fracs.
173.9	182.8	8.9		.19		.49		89					.09	.40		.70		Md			Tr							wk	wk		12	md					" " " md sec K-spar. wk py & cc. md Cu Ox
182.8	191.0	8.2		.22		.70		81					.35	.35		.52		Md			Tr							wk	wk		10	wk Md					" " " Tr cuprite mixed with Cu Ox. St. azurite mal on fracs
191.0	200.0	9.0		.39				93					.05	.05		.27	.02	wk			1							wk	wk		10	Md					Clean sul. at 195.5. Chl. on fracs. wk py & cc. Tr cpy
200.0	209.5	9.5		.22				92							.04	.18		wk			1/2							wk	wk Md		12	Md					some feldspars alt. to grn clay. brn lim on fracs w/ Native Cu (Tenorite) at 203.3
209.5	219.0	9.5		.10				90										Tr			1/2							wk	wk Md		10	Md					Chl. on fracs. wk sec. K-spar. Tr Nat. Cu. wk py & cc.
219.0	229.0	10.0		.06				80										-			1/2							wk	Md		10	St					St. Chl. alt. " " " fault gouge at 226.0. Tr cpy
	EOH																																				

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO - SILVER BELL · UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
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Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. F-190
Page 1 of 1 Pages
Collar Elev. 2016.13 Final Depth 2479
Coords. N 29,247.20 E 29,483.24
Inclination Vertical
Logged by R.E., P.B.
Date: Start 5-3-69 Finish 5-15-69

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Cc.	Cpy.	Born	Fe (2) Pyrite Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb.	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0	5.0	5.0																																			Rock bit
5.0	18.0	13.0		.01				94									md		St.									wk md									f-md gr. SP mdly alt'd several blanket uns. ST CC Hem stain
18.0	28.4	10.4		.01				85									ST		wk									ST md	- 20				Da	leached veinlets	60-70°	numerous Qtz eyes leached veinlets filled with Jarosite, w/ser bands
28.4	37.4	9.0		.01				95									ST		wk									md md	- 15							As above leached veinlets w/ Jarosite, pyritic bxwork
37.4	47.0	9.6		Tr				81									ST		-									md. md	- 15							Gouge 45.6-46.8 As above
47.0	56.7	9.7		Tr				81									ST	Tr										md md	- 20					leached veins	60°	Talc leached vein @ 50°. ST. access. Tr of remnant py
56.7	66.7	10.0		Tr				86									ST	Tr										md md	- 25						65°	As above. with Lon from 620-640. Tr of remnant py
66.7	76.5	9.8		.09				88									md	1/2										md md	- 20				Da			Typical Da texture. Dis sulfides, partially oxidized. 73.0-76.5
76.5	84.5	8.0		.24				100									md	1										md md	- 15				Da?	84.5' clean fault		Abou + 30% oxidized mostly on fractures. Fine dis. py & CC
84.5	94.1	9.6		.38				96						.35	.03		-	2										md md	3-15				SP?			Py w/ser. finely dis and in thin veinlets. Texture less distinct
94.1	100.5	6.4		.41	12.9 @	Nil		[illegible]						.41			-	1-2										md md	- 8				SP?			Rk is fine gr. with fewer Qtz eyes. ST CC
100.5	107.0	6.5		.63	0.52	Nil		[illegible]						.63				1-2										ST ST	- 5							STly, broken c gouge 100.5-104.0
107.0	117.4	10.4		.31				[illegible]						.31				1-2										ST ST	- 5				Tt?			Bx c gouge 110.0-113.5 otherwise stly broken, f-m gr, fine dis py.
117.4	126.0	8.6		.09				97										1-2										md ST	- 15				Da			Md gr. Numerous large Qtz eyes. f gr. py, CPY tr of cc.
126.0	135.8	9.8		.14				76										1-2										ST ST	- 15							ST secondary bx 131.5-134.5. overall md. ST alt. wk CC
135.8	145.0	9.2		.20				99										1-2					Tr.					md md	- 15					shears	70-90°	Tr of molyb. STly broken w/ clay on most fractures.
145.0	155.0	10.0		.26				88										1-2					Tr.					md md	- 15							STly broken, wk visible CC & py
155.0	165.4	10.4		.36				81						.36				1-2										md md ST	- 15							As above
165.4	177.0	11.6		.83	20.5 @ 1.14	.02	20.5 @ 0.03	91										2										ST ST	- 15				L1			STly broken w/gouge 172.5-174.0. Stronger dis CC than above.
177.0	185.9	8.9		1.55		.04		88						.02				4										ST ST	- 15					Fault 178.5 Shears	55° 75-80°	ST py CC in veins 178.0-180.8 cut by Fault @ 178.5
185.9	195.5	9.6		.15				90						.04				2										ST md	- 20							Px w/ quartz ST. Finely dis. Fe in thin veinlets
195.5	204.9	9.4		.15				95						.15				2	Tr									md md	- 15							As above. Tr of Mag → hem
204.9	212.9	8.0		.09				100										2										md md	- 15							Zones of fg (secondary?) biotite. little visible CC.
212.9	223.0	10.1		.14				80										2										md md	< 15					shears	75-90	STly broken, numerous shears. No CC visible.
223.0	229.0	6.0		.13				80										2										md md	< 15							Tr of CC. Tr of cpy.
229.0	239.0	10.0		.17				87										2										md md	< 15							STly broken w/ Sh on fracs. tr cpy tr CC
239.0	247.0	8.0		.12				67										2-3										md md	< 5				L7	Py-Cpy lov	75°	as above CC on fracs. 4 lov of py, cpy & sov at 235.2
	E.O.H.																																				

PRELIMINARY GEOLOGIC LOG
(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. F-191
Page 1 of 1 Pages
Collar Elev. 3035.10 Final Depth 391.2
Coords. N 28,531.79 E 27,210.27
Inclination Vertical
Logged by RE, PB
Date: Start 5-14-69 Finish 5-22-69

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Cu (1) Pitch	Cu (1) Black	Cu (1) Blue Green	Cu (1) Unknown N.S.	Cu (1) Cc.	Cu (1) Cpy.	Cu (1) Cov. Born	Fe (2) Lim.	Fe (2) Py	Fe (2) Mag.	Fe (2) Hem	Fe (2) Spec.	Other (2) Galena	Other (2) Sphal.	Other (2) Molyb	Other (2) Calcite	Other (2) Garnet	Other (2) Silicates	Other (2) Sericite	Other (2) Clay	Other (2) Vn. Qtz	Other (2) QUARTZ	Other (2) CHLORITE	(3) Rock Type	Structures (4) Depth	Structures (4) True Dip	Remarks
0	6.0	6.0						✓																													Rock bit
6.0	15.6	9.6		.02			85											Md			Md								Md	Vl	15			Mz			Md-Stly altd Mz, numerous leached sul units, local st. sil. (parasite on fracs)
15.6	25.5	9.9		.02			90											Wk Md			St								St	Md	1	10					St. hem flood. ng. stly broken 24.5-25.5 Tr Turquoise
25.5	32.0	6.5		.02			87											Wk			St								St	Md	3	15					" " " wk silicification st. boxwork Md live lim.
32.0	41.7	9.7		.01			88											ST			Wk								ST	Md	4	15		SP	Leached veins	55°	ST Live limonite in veins. rk is f.g., bleached, mdly silicified
41.7	50.8	9.1		.01			89											ST			Wk								ST	Md	4	10		SP			" " " " " Cu Ox (Chrysocolla) in veinlet @ 49.5
50.8	59.3	8.5		.02			100											Md	Vl		Wk								Md	Md	1	10					unoxidized interval: 56.0-59.0 w/ px, c.c. rk is f.-m.gr. tan, porphyritic
59.3	69.4	10.1		.02			89											ST	Tr		Wk								ST	Md	2	15			Leached vein	40°	Stly silicified, veined: 61.5-64.0. Remnant px, c.c.
69.4	78.5	9.1		.03			95											Md	1		Md								Md	Md	4	30					" " " Md hem flood. ng. 60% oxidized wk py i c.c.
78.5	87.4	8.9		.05			100											Wk	1		Md								Md	Md	3	25					Md-stly silicified wk parasite on fracs. Tr py, cc i cov.
87.4	97.7	10.3		.03			82											Md	1		Wk								Md	Wk	3	35					Stly silicified 40% oxidized. Local st. hem stain.
97.7	107.1	9.4		.12			100											Md	1		Tr								Md	Wk		35					" " 20% oxidized wk diss. cc.
107.1	116.1	9.0		.09			95											ST	Tr+		Md								Md	Md	1	10		SP	125.1		Stly oxidized: 105.7-116.1.
116.1	125.1	9.0		.67		.03	95							.03	.54		.10	-	2		-								ST	Md	1	8		Mz?	130.7		ST dis. cc. Unusual rk w/ 20% large altd phenos (Kf) in Md gr ground mass.
125.1	134.1	9.0		.06			92											ST	Tr		ST								Md	Md	-	8		SP			F.-M.gr. SP, stly oxidized as above.
134.1	142.0	7.9		.07			97											ST	1		ST								Md	Md	5	12					Partially oxidized py vein: 133.1-141.3. 80% oxidized overall
142.0	151.7	9.7		.08			90											Md	1		Wk								Md	Md		15					30% oxidized. Md'y sil., dis py, wk cc.
151.7	161.0	9.3		.12			96											Wk	1-2		-								Md	Md		15					Mdly silicified, dis py, wk cc.
161.0	169.7	8.7		.06			100											Md	1		Tr								Md	Md	-	10		SP	168.0		Oxidation strong along veins. Rk below 168.0 has large (¾") Kf phenos like (interval from 135-154)
169.7	178.6	8.9		.16			100											Wk	1		Tr								Md	Wk	2	12		Mz?			Md.gr. salmon pink colored rk w/ occassional large phenos wk'ly silicified
178.6	187.9	9.3		.20			96												1-2		-								Md	Wk	3	20					as above. Md. spotty silicification. wk cc as coatings on py
187.9	197.3	9.4		.25			93												2										Md-St	Md-St	2	10					" " Md-stly altd. plag. phenos altd to clay Md cc
197.3	206.0	8.7		.24			100												1-2										Md	Wk-Md	2	20					" " local st silicification w/ wk cpy wk cc
206.0	212.0	6.0		.48		.03	96							.03	.25	.15	.05		1-2										Md	Wk	2	35		Mz?			Wk'ly broken Md-St. sil. clay on fracs
212.0	221.4	9.4		.31		.02	90							.02	.16	.10	.03		2-3										Md	Wk-Md		40		Sp?	213.0		f.gr. Sp? stly silicified throughout. Md-st cc as diss grns & films on py
221.4	230.5	9.1		.84	52.7 @ 0.71	.03	52.7 @ 0.02	89						.03	.66	.05	.10		2-3										Md	Md		25					Md-st. sil. stly broken clay on fracs wk cov. i cc Tr cpy
230.5	240.0	9.5		.41		.01		100							.31	.10			2-3										Md	Wk	3	35					St silicification. wk-Md cc Tr cpy
240.0	249.5	9.5		.49		.02		95						.02	.38	.04	.05		2-3										Md	Wk		35					" " wk-mdly broken wk-Md cc.
249.5	258.7	9.2		.07		Nil		95							.60		.07		4										Md	Wk		35			Py vein	80°	" " 1"-2" wide vert. py i cc vein 257.1-258.4 Tr cov.
258.7	267.9	9.2		.37				95							.27	.10			6-8										Md	Wk	?	30					wk-mdly broken stly qtz veined & silicified w/st py Tr cov. Md cc
267.9	276.7	8.8		.30				100							.22	.08			2-3										Md	Md		18			fracs	25°	mdly broken & altd local silicification
276.7	286.8	10.1		.06				92											3										Md-St	Md		20					stly broken local bx fault gouge at 280.0 wk cc
286.8	295.9	9.1		.10				89											3										Md-St	Md		20					" " Md silicification clay on fracs, Tr cov wk-Md cc
295.9	306.8	10.9		.02				83											4										Md	Wk		40					stly silicified w/st. py veining cc as thin films on py
306.8	315.0	8.2		.09				100											3-4										St	Wk-Md		35					as above clay on fracs Tr cov i cpy
315.0	323.8	8.8		.28				97											1-2										Md	Md		12		Mz?	316.0		Md.gr. rk Mz? salmon pink color w/ 5% large plag. phenos Md cc
323.8	329.7	5.9		.17				99											2										Md	Md		25		Sp?	325.0		f.gr. rk Sp? mdly silicified. mdly broken Tr borite Md cc.
329.7	339.1	9.4		.29				94											1-2										Md	Md	3	25					mdly silicified local wk lavender stain in ground mass & clay
339.1	347.6	8.5		.15				100											3										Md	Wk	? 5	40					Mz? d.gr. 339.9-341.3 St. sil. & Qtz veining w/st py wk cc Tr cov.
347.6	357.0	9.4		.07				94											1										Md	Wk	3	20		Mz?	350.0 fracs	25°	f.gr. & silicified to 351.0 Then Md gr. pink rk w/10% phenos Mz?
357.0	366.1	9.1		.10				95											1-2										Md	Wk	10	25			"	"	Md sil & Qtz veining clay on some fracs wk cc. tr. cpy
366.1	375.5	9.4		.07				94											1-2										Md	Wk	10	35			365.0		as above several Qtz-py units
375.5	385.0	9.5		.10				95											2										Md	Wk	6	40		Sp?			f.gr. rk, Sp? w/ rounded Qtz phenos in unsilicified portion. St S.I.
385.0	391.2	6.2		.06				100											1-2										Md	Wk	5	35		Mz?	388.0 py vein	80°	stly silicified to 388.4 Then Md gr. Mz?
	EOH						Ave:	94																													

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO- SILVER BELL UNIT

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Tt - Tactite
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Bx - Breccia
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Mz - Monzonite
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Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. F-192
Page 1 of 1 Pages
Collar Elev 2907.20 Final Depth 386.0
Coords. N 28,858.92 E 29,657.05
Inclination vertical
Logged by RE, PB.
Date: Start 5-15-69 Finish 5-24-69

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green		Cc.	Cpy.	Cov. Born	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE		(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0	5.0	5.0																																				
5.0	14.5	9.5		.04				78										ST			md								md	ST	3	10			SP			Cemented Bx 7.5-8.0, Loose Bx 11.0-14.5. Several leached veinlets
14.5	26.0	11.5		.03				91										md			wk								md	md	1	5°						mdly silicified. 10% Alunite in veins from 20°-70°.
26.0	33.8	7.8		.01				100										md	Tr		wk								md	md	8	25						mdly silicified w/ numerous qtz vnlts. Tr py & cc
33.8	42.5	8.7		.01				93										md	Tr		md								md	md	4	12						mdly altd. sp. local Bx w/ st. hem. Tr. live lim.
42.5	52.0	9.5		.02				89										wk	1		md								Md	Md	5	18						St. hem stain. Locally 70% oxidized. mdly silicified. wk sulfides
52.0	61.9	9.9		.02				76										md	Tr		md								md	md-st	3	12						wkly broken. Jarosite on some fracs. Tr live lim.
61.9	70.9	9.0		.02				88										md	1		wk								md	md	4	20						wk-md silicification. 40% oxidized. wk py & cc
70.9	80.4	9.5		.18				86										wk	1		Tr								St	md	5	20						" " " clean sulfides at 74.0. wk-md py & cc
80.4	89.2	8.8		.22				96											1										St	md	3	10						f.gr. & stly bleached. numerous rounded qtz phenos.
89.2	97.9	8.7		.39				96							.39				2										St	md	3	0						md. st cc on diss. py & py veins.
97.9	105.0	7.1		.31				92							.31				2										St	St	3	10						numerous qtz-py vnlts. clay on fracs. md cc
105.0	114.5	9.5		.80		.03		95						.03	.77				2										ST	ST	1	8			SP			ST cc on dis py. ct is f.g. & stly bleached.
114.5	124.0	9.5		.24				100							.24				2										ST	ST	1	8				veinlets 70°		f.g., light tan rt. py & cc mostly disseminated.
124.0	132.7	8.7		.57	69.0' @ 0.19	.03	63.0 @ 0.01	95						.03	.54				2										ST	ST	-	5				shears 70°-90°		stly sheared & gouged: 129.0-131.0.
132.7	143.4	10.7		.85		.01		100						.01	.84				2										ST	md	<1	5						stly broken 137.7-139.5. otherwise As above.
143.4	151.7	8.3		.37		.01		90						.01	.36				3										md	md	<1	5				py veins 70°		As above.
151.7	161.4	9.7		.48		.01		85						.01	.47				2										ST	ST	<1	5			SP	shears 70°-85°		Soft & strongly fractured.
161.4	174.0	12.6		1.84		.02		64						.02	1.82				4										ST	ST	30	35			SP	85° 265° 67 111		soft & brecciated to 162. followed by broken vein qtz w/ py & ST cc
174.0	185.8	11.8		.33		Nil		77							.25	.08			2										ST	ST	2	15			SP			f.g., stly altd., stly broken & gouged: 182.5-183.5. cc on sp, py, py
185.8	193.7	7.9		.25				92							.18	.05	.02		2										md	ST	<1	7						As above
193.7	201.0	7.3		.20				84							.20				2										ST	ST	<1	5						f.g., stly altd. py finely dis. & in very thin veinlets.
201.0	210.5	9.5		.28				100							.24	.04			2										md	md-st	1	5				py veins 50°		As above, md-st cc on thin py veinlets. Broken & gouged: 208.5-210.5
210.5	219.8	9.3		.15				94							.15				2-3										md	md	1	6						As above. f.g., light tan, md-stly altd. stly broken 210.5-212.5.
219.8	229.0	9.2		.18				93							.15	.03			2										md	md	5	10				qtz veinlets 90°		Numerous thin qtz veinlets. stly broken: 222.5-228.5
229.0	238.7	9.7		.94		.01		91						.01	.93				5										ST	ST	2	8				py veins 80°		One or more thick py veins w/ st cc
238.7	246.9	8.2		.25	46.0' @ 0.41		46.0 @ 0.01	95							.25				2										md	md	1	5				py veins 90°		mdly silicified, ST cc on py veins.
246.9	255.5	8.6		.44		Tr		98							.44				2										md	md	-	10						f.g., light tan, mdly altd & broken. Zones of st dis cc.
255.5	264.0	8.5		.53		Tr		98							.53				3-4										ST	ST	1	8				py veins 70-90		stly broken, ST cc on py veins.
264.0	275.0	11.0		1.20		.01		87						.01	1.19				3-4										ST	ST	-	6			SP	shears 75°		Soft & very stly altd & broken. ST cc on py veins
275.0	285.0	10.0		.15				91											1-2										St	St	1	8			Mz			md gr. Mz. 10% large phenos. stly altd & broken
285.0	294.9	9.9		.19				92											3										St	St	1	10						md-st alteration. numerous py vnlts w/ st. cc. Tr cpy
294.9	304.4	9.5		.15				93											2-3										St	md	2	12						as above. wk silicification
304.4	312.0	7.6		.10				95											2										md-sp	md	4	20						md silicification. numerous qtz vnlts. md cc. Tr cpy & cov.
312.0	320.5	8.5		.20				100											2										St	md	4	22						as above
320.5	329.7	9.2		.08				98											2										St	md	4	18						as above
329.7	339.1	9.4		.13				99											4-5										St	md	3	15						wk-md silicification. st py veining w/ md cc
339.1	344.0	4.9		.15				100											3										St	md	3	18						md-sil. clay on fracs. numerous qtz vnlts. wk-md cc.
344.0	353.5	9.5		.12				100											3										St	md	3	18						md-silicification. stly broken 351.5-353.5. chl on fracs. wk-md cc
353.5	363.0	9.5		.20				92											3										St	md	2	15			Mz			stly broken to 357.0. md sil. locally. wk-md cc
363.0	372.5	9.5		.14				95											2										St	md	1	12			Mz / SP	366.5		Mz to 366.5. then f.gr. mdly altd. SP. wk chl on fracs. wk-md
372.5	386.0	13.5		.13				90											3-4										St	md-st	3	15						mdly altd. wk sec k-spar. Bx from 382.8 to end of int'vl
	EOH						Ave=	91																														

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

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Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous !

Hole No. F-193
Page 1 of 1 Pages
Collar Elev 3017.04 Final Depth 310.8
Coords. N 28,905.09 E 29,332.60
Inclination Vertical
Logged by RE
Date: Start 5-19-69 Finish 5-27-69

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green		Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem.	Spec.	Other (2) Galena	Sphal.	Molyb.	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz.	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0	5.3	5.3																																			Rock bit
5.3	15.0	9.7		.01				83										ST			ST							ST	ST	1	5			SP	veinlets	45-50	f.g. SP stained deep red, cut by numerous thin leached veinlets
15.0	22.0	7.0		.01				89										ST			ST							ST	ST	2	6				"	60°	As above. Live lim. in leached veinlets. md-stly broken
22.0	30.6	8.6		.02				100										ST			ST							ST	ST	2	6				"	"	red stained SP cut by sericite bearing veinlets leached veinlets cut by slightly veins. stly broken.
30.6	38.7	8.1		.02				100										ST			ST							ST	ST	2	6			sulfide	38.7	60-75	As above, sharp sulfide contact @ 38.7.
38.7	48.0	9.3		.27				96										-	2-3		-							ST	md	1	6				py. cc veinlets		f.g., light tan, soft (H≈3). ST CC replacing py veinlets.
48.0	57.3	9.3		.39				91											4									ST	md	-	5						As above. Py vein 53.1-53.3.
57.3	67.0	9.7		.19				87											2-3									ST	md	-	5						CC on dis. py, thin py veinlets. Joint spacing ≈3"
67.0	74.8	7.8		.66		.01		74											2									ST	ST	-	5						soft, stly altd. chlorite, clay on fractures.
74.8	84.4	9.6		.26				92											2-3									st	st	-	5				fracs	45°	" " " numerous py veins w/md cc
84.4	92.9	8.5		.53				76											4-5									st	st		8						stly altd & broken local Bx clay on fracs md cc
92.9	101.7	8.8		.28				93											2-3									st	st		8						stly altd & soft. numerous small py veins wk-md cc
101.7	111.0	9.3		.15				91										wk	4-5									st	st		8						as above brn lim. on some fracs md cc
111.0	120.9	9.9		.23				79										wk	4-5									st	st	3	12						wk lim. on some fracs. wk silicification several Qtz-py. vns.
120.9	127.0	6.1		.32				95										Tr	3-4									st	st	2	10						Tr. lim. stly altd. cc as diss. grains & with thin py veins
127.0	135.7	8.7		.17				93										Tr	2-3									st	st	1	8						as above md-st cc
135.7	145.0	9.3		.51		.01		97										-	2-3									st	st		8						stly altd. clay on fracs. mdly brecciated from 142.0-145.0. md cc
145.0	153.7	8.7		.26				85											3									st	md	2	10						brecciated to 146.6. wkly silicified. ccas veins w/py & diss. grains
153.7	164.2	10.5		.21				86											3									st	st		8				fracs	80°	soft & stly altd. Numerous py & cc veins st cc
164.2	174.1	9.9		.20				85											3									st	st		10				fracs	45°	as above local wk silicification
174.1	185.5	11.4		.32				100											3-4									st	st		12						stly altd. wk silicification clay on fracs st py & cc
185.5	194.4	8.9		.18				95											2-3									md	md	-	10			SP			md tan-gray, f.g. small qtz exas. py in thin veinlets
194.4	203.4	9.0		.25				94											3-4									md	md	-	8						mdly altd. Thin S.C. on most dis & veined py
203.4	210.7	7.3		.48		.02		94											5-6									md	md	-	6				py-cpy vein	60°	ST dis & veined py (≈10%): 208.7-210.7 mdly altd (H≈4)
210.7	219.6	8.9		.37				100											5									md	md		8				fracs	35°	mdly altd. clay on fracs. st py & cc as diss. grns. & veins
219.6	228.7	9.1		.25				100											4									md	md-st		8				"	70	as above st. cc
228.7	237.5	8.8		.19				93											6									md	md		8				py veins	85°	mdly altd & wkly broken py veins ⅛-¾" thick w/st cc
237.5	245.1	7.6		.49		.02		73											4									st	md-md		9				"	"	st cc as thin films on diss. grains & veinlets of py
245.1	253.4	8.3		.38				90											3-4									md	st		8						stly altd. st. clay on fracs. st. cc
253.4	261.0	7.6		.20				86											4									md	st		6						st. clay on fracs less cc on py grains & veinlets.
261.0	269.8	8.8		.21				100											4									md	md		8				py veins	50°	mdly altd. wk chlorite on fracs. st. py. md-st cc
269.8	278.7	8.9		.10				93											3									md	md	-	6						f-m gr. porphyritic. Gray-dk brown. md alt overall
278.7	288.2	9.5		.08				93											3									wk	md	-	6				shears	80°	strongly sheared, f.g., as above, wk cc only.
288.2	297.1	8.9		.14				100											4									wk	md	-	10						st py, both dis and in veinlets, wk cc, spotty sil, mdly broken
297.1	305.8	8.7		.06				98											4									md	md	-	6				shears	60-90	stly broken, mdly bleached, altd. wk cc on some py.
305.8	310.8	5.0		.05				85											2									md	ST	-	6			SP			f.g., stly bleached. Tr only of visible cc.
	EOH						Ave	91																													

Copper mostly as chalcocite, minor chalcopyrite

PRELIMINARY GEOLOGIC LOG
(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. F-194
Page 1 of 1 Pages
Collar Elev 2367.41 Final Depth 281.0
Coords. N 28,325.17 E 29,339.39
Inclination Vertical
Logged by P.B.
Date: Start 5-23-69 Finish 6-5-69

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	1/4 S.	Cc.	Cpy.	Bornite	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0	7.4	7.4																																			Rock bit
7.4	15.1	7.7		.03					2.36									sl		md									st	md	4	14		Sp?			f.gr. tt sp? md-stly altd wk silicification md hem staining
15.1	24.7	9.6		.02					2.50									wk		st									st	md	10	35					mdly silicified, numerous small qtz vnlts wk live lim.
24.7	34.1	9.4		.01					2.56									Tr		md									md	wk	10	40					stly silicified st hem stain along fracs clay on some fracs.
34.1	43.0	8.9		.01					2.45									md		md									md	wk	5	25					thin qtz veins, zones of f st sil, otherwise f.g. stained light red
43.0	52.7	9.7		.02					2.62									md	Tr	wk									md	wk	5	25			leached veinlets	60°	As above, zones of f st sil, few leached veinlets.
52.7	61.6	8.9		.02					2.62									md	Tr	wk									md	wk	5	25			"	65°	" " px in silicified zones. Live lim. in several veinlets
61.6	69.4	7.8		.02					2.48									md	.	md									md	md	2	8				45-85°	hem staining along fracs. silicification stly along leached veinlets. rk is bleached with
69.4	78.4	9.0		.01					2.12									md	Tr+	md									md	md	2	10					dis py, cc. from 69.8-70.4, 74.4-75.0 otherwise as above
78.4	87.0	8.6		.02					2.63									md	<1/4	md									md	md	3	15					lin. sulfides 85.0-87.0, otherwise oxidized except for sil. laterals
87.0	93.5	6.5		.06					2.58									md	<1/4	md									md	wk-md	3	15					About 60% oxidized dis sulfides is sil zones, f.g. as above
93.5	105.4	11.9		.04					2.33									md-st	<1/4	md									st	md	3	10					75% " mdly broken. Live lim. in some veinlets of chrysocolla
105.4	114.5	9.1		.08					2.72									wk	1/2	Tr									md	wk	0	20		sulfides	105.4 SHEARS	55-60°	stly silicified, mdly broken, oxidation in fractures Tr of chrys.
114.5	123.4	8.9		.10					2.67									-	1	-									md	wk		30°		SP?	123.4		hard, siliceous, f.g.; cc on px. stly broken 118-122.
123.4	131.0	7.6		.10					2.62										1-2										md	md	2	10		MZ			Mz. porphyry altd plag in a light tan groundmass. cc on py
131.0	140.3	9.3		.07					2.75										1										md	wk-nil		40°					silicified and/or recrystallized beyond recognition from 135 to 143
140.3	149.3	9.0		.07					2.65										1										md	nil-md		30°					MZ as above
149.3	159.7	10.4		.21					2.64										1										st	st-md		10°		MZ FAULT	153 157		Bx; gouge 153-157 followed by f.g. rock with few large f.spars.
159.7	168.6	8.9		.24					2.96										1										md	wk	4	20		Mz?			Mz? md-st silicification, st qtz veining wk cc
168.6	178.0	9.4		.09					2.79										1										md	wk	?	50					v stly silicified md cc on py vnlts w/ occasional large blebs of cc
178.0	186.4	8.4		.06					2.78										1										md	wk	?	50					" " " clay on some fracs.
186.4	196.1	9.7		.16					2.53										1-2										md	wk	8	25					mod.-c gr Mz mdly silicified cc as thin vnlts w/ py
196.1	205.3	9.2		.04					2.59										1-2										md	wk	6	20					as above
205.3	214.2	8.9		.05					2.58										2										md	wk	5	15					wkly silicified numerous Qtz-py veins wkly broken
214.2	223.5	9.3		.05					2.58										1-2										md	wk	8	18					as above
223.5	232.0	8.5		.04					2.63										1										md	wk	8	18					as above wk chlorite clay on some fracs wk cc
232.0	242.0	10.0		.10					2.71										2										md	wk	5	15					stly broken & sheared wk cc Tr cov Tr Mo
242.0	249.1	7.1		.07					2.70										2										md-st	wk	8	45					stly silicified w/ numerous qtz vnlts wk cc on fracs
249.1	258.1	9.0		.11					2.63										<1										md-st	wk	10	45		Mz?	fracs 3580	70°	Mz? st silicification obscures texture. Numerous fracs & shears
258.1	267.0	8.9		.11					2.63										1										md	wk	8	20		SP?			f.-mod gr SP? Spotty silicification & Qtz veining wk cc
267.0	275.5	8.5		.09					2.61										1-2										md	wk	5	20			py vein	70°	as above wkly broken
275.5	281.0	5.5		.05					2.69										1-2										md	wk	5	20					as above
	EOH																																				

Average Recovery: 93%

PRELIMINARY GEOLOGIC LOG
(Subject to Revised Logging)
ASARCO- SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. F-195
Page 1 of 1 Pages
Collar Elev 2924.76 Final Depth 312.7
Coords. N 28,457.16 E 29,620.53
Inclination Vertical
Logged by PB, RE
Date: Start 5-26-69 Finish 5-31-69

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu N.S	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Cu (1) Wulfenite N.S.	Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	FS PAR	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0	5.0	5.0																																				Rock bit
5.0	14.3	9.3		.18				91										wk			md							st	md		20				Mz? Sp?	60		Mz? to 60. Then f gr. rk sp. mdly silicified, live lim. in cavities & on fractures
14.3	24.4	10.1		.13				83										wk			st							st	md	4	18							md. silicification. st hem stain. v.v. jarosite wkly broken
24.4	32.4	8.0		.12				100										wk			st							st	md	2	18							as above st. live lim.
32.4	41.0	8.6		.11				90										md			st							st	md	3	15							st hem flooding and jarosite on fracs. wk silicification
41.0	50.5	9.5		.01				91										wk			st							ma-st	md-st	2	8				Shears	80°		f-med gr. rk sp? several small Qtz veins, clay on fracs.
50.5	59.5	9.0		.01				100										md			md							md	st		8			Sp?	595			as above fault gouge at 570
59.5	69.2	9.7		.02				90										md			wk							md	st		10			Mz	Shear	60°		C.gr. Mz stly altd. md. jarosite wk Cu Ox
69.2	77.9	8.7		.01				94										md			wk							md	st		10							stly altd breccia & gouge 73.2 - 74.3 lim. mostly after py
77.9	87.0	9.1		.01				92										md			md							md	st		10							" " bio alt. to hydromica. md. hem stain. Bx @ 79. Bx 83-87.0
87.0	96.0	9.0		.02				96										ma			st							st	ma-st	1	10							Bx @ 99 to 87.5 st. hem flooding. Tr live lim. wk Cu Ox.
96.0	105.3	9.3		.02				90										st			wk							md	md	2	12							ma-st alteration sl jarosite wk Cu Ox along fracs.
105.3	111.0	5.7		.02				91										st			md							md	md	3	16							" " " spotty wk silicification
111.0	120.2	9.2		.03				100										st			st							st	st	1	12				leached veinlets 125.5	60°		stly altered st hem staining of alth. f spars. md live lim
120.2	132.0	11.8		.09				99										st	Tr		st							st	st	1	10			Sulfides sulfide	1270 1270			st dis CC 125.5-127.0 otherwise leached c gr. Mz as above
132.0	139.0	7.0		.79		.02		91						.03	.97			Tr	4		Tr							st	st	1	10				CC-py vein	60°		sharp sulfide contact. st CC, stly broken 127.0-139.0
139.0	148.7	9.7		.95		.02		99						.02	.93			–	1		–							st	st	1	10							over ½ of px has been replaced by CC, fault. Bx 142-143
148.7	158.2	9.5		3.47		.06		92						.06	3.41				1									st	st	-	10		wk	Mz				Typical Cg Mz texture. CC. py 2:1 wk kspar alt, 3% hydromica
158.2	167.7	9.5	93.0 @	.80		.01		93						.01	.77	.02			1									st	st	2	12		wk	Mz				As above, few cpx gneiss - mostly replaced by CC, Thin qtz veinlets
167.7	178.2	10.5	139 0.02	1.15		.02		85						.02	1.13				2									st	v st	-	10?		?	Bx (Mz)	171.8			Brecciated, f gouge. below 171.8 w/st CC
178.2	188.5	10.3		1.68		.02		87						.02	1.66				1									st	v st	-	?			Bx	187.4			Bx, f gouge to 187.4 Too strongly altd to identify
188.5	197.0	8.5		.89		.01		80						.01	.88				<1									st	st	-	8		–	Sp?				f.g. stly altd st dis CC has replaced most px
197.0	206.0	9.0		2.32	151.5 @ 1.01	.05	151.5 @ 0.01	88						.05	2.27				2									st	st	2	10	wk						" " " md. st diss CC wk chl on some fracs
206.0	215.5	9.5		.93		.02		95						.02	.91				2									st	ma-st	3	10	md			Shear	90°		numerous Qtz veins, md. CC. fault gouge at 215.3.
215.5	225.0	9.5		.77		.01		96						.01	.76				3									st	md	4	20	md						mdly silicified & Qtz veined md-st chlorite md. CC.
225.0	234.8	9.8		.43		Nil		91							.38	.05		wk	3									st	ma-st	4	2	st						Stly broken gouge at 227.0. wk brn lim on fracs. st. chl.
234.8	243.0	8.2		.39		Nil		96							.35	.04		md	3									md	wk	3	10	st						Stly broken & sheared wkly silicified md brn lim.
243.0	252.6	9.6		.40		Nil		93							.34	.06		md	34									md	md	6	15	v st						Breccia & gouge 249.4-251.4 wk CC " " "
252.6	266.0	13.4		.37		Nil		85							.30	.07		wk	4									wk	md	5	14	st						f.-med gr. sp? w/ very st. chl. alt. st. diss. py
266.0	274.5	8.5		.30				100							.23	.07		wk	5									wk md	md	5	13	st						as above
274.5	283.5	9.0		.50		Nil		93							.45	.05		wk	4									wk	wk	4	15	st			Pl vein	50°		wkly silicified wk-md diss CC Tr cpy
283.5	292.8	9.3		.36				100										wk	4									wk	wk	4	12	md-st						" " numerous Qtz vns md-st chl md. CC
292.8	302.5	9.7		.21				74										wk	3									wk	md	2	10	md			Qtz-py vein	70°		wk-mdly altd md CC on diss. grs & vnlts of Py
302.5	312.7	10.2		.31				100											3									wk	md	3	12	md						silicified breccia 311.0-312.7 wk-md CC on py vnlts Tr cpy
	EOH																																					

Average Recovery: 92%

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO- SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. F-196
Page 1 of 1 Pages

Collar Elev 2858.31 Final Depth 105.6
Coords. N 28,351.43 E 29,803.07
Inclination vertical
Logged by RE, JC
Date: Start 5-31-69 Finish 6-3-69

Depth From	Depth To	Depth Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Cu (1) Pitch	Cu (1) Black	Cu (1) Blue Green	Cu (1)	Cu (1) Cc.	Cu (1) Cpy.	Cu (1) Born	Fe (2) Lim.	Fe (2) Py	Fe (2) Mag.	Fe (2) Hem	Fe (2) Spec.	Other (2) Galena	Other (2) Sphal.	Other (2) Molyb	Other (2) Calcite	Other (2) Garnet	Other (2) Silicates	Other (2) Sericite	Other (2) Clay	Other (2) Vn. Qtz	Other (2) QUARTZ	Other (2) CHLORITE	(3) Rock Type	Structures (4) Depth	Structures (4) True Dip	Remarks
0	22.9	22.9																																			Rock bit through Gravel & loose rock fragments (fault?)
22.9	31.5	8.6		.18				74					.18					wk											-	wk	-	-		Post-Min Andesite			Bx & gouge (Pre Mn Andesite) to 22.9 followed by soft
31.5	41.2	9.7		.24				92					.24					wk											-	wk	-	2					5% altd fspars, 2% qtz "eyes" in a dark gray ground mass
41.2	52.0	10.8		.16				92					.16					wk											-	wk Md	-	4		"			5% altd fspars, 3-4% qz "eyes", dk gray g.m., w/wk lim on fracs.
52.0	60.4	8.4		.12				100					.12					wk											-	"	-	4		"			as above, trace malachite
60.4	70.9	10.5		.14				81					.14					wk											-	"	-	4		"			5% str altd fspars, as above; stronger lim staining
70.9	84.5	13.6		.38				100					.38					wk											-	"	-	5		"			as above, slight Cu content in altd fspars, Cu Ox on fracs.
84.5	93.6	9.1		.48				98					.48					wk											-	"	-	4		"			as above
93.6	105.6	12.0		.32				95					.32					wk											-	"	-	4		"			5% altd fspars-less altd, qz "eyes" rare, g.m. as above, little Cu Ox.
	50 M																																				

Average Recovery: 92%

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. F-197
Page 1 of 1 Pages
Collar Elev. 2859.77 Final Depth 228.5
Coords. N 28,335.69 E 29,771.50
Inclination vertical
Logged by J.C., R.E.
Date: Start 6-9-69 Finish 6-9-69

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	N S	Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem.	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0	10.0	10.0																																			No Core. Rock Bit
10.0	20.0	10.0		.04					2.47					.04				md			st							st	md	3	10			Sp?			F-Med. gr. rx., Sp?, St-md alt., numerous qtz veins, wk live lim, stain.
20.0	30.0	10.0		.02					2.48					.02				md			st							st	md	3	10						as above, w. orange to red-brown lim. on fracs, tr. Cu Ox.
30.0	39.0	9.0		.05					2.48					.05				md			md							st	md	4	20						Mod. silicified, jarosite - wk, local strong hem stain.
39.0	47.4	8.4		.03					2.51					.03				md			md							md	wk	2	25						Mod. silicified, uniform hem, Cu Ox along fracs w. bx lim, wk live lim
47.4	57.0	9.6		.03					2.49					.03				md			md							md	wk	2	25						as above
57.0	65.8	8.8		.05					2.47					.05				md			md							md	wk	2	25						st silicification otherwise as above.
65.8	70.9	5.1		.04					2.68					.04				md			md							st	wk	2	25						" " , no Cu Ox obvious, mod. live lim.
70.9	80.0	9.1		.01					2.61					.01				md			md							st	md	2	20						as above, less qtz, bx lim in open vugs.
80.0	88.4	8.4		.06					2.65					.02	.04			md	tr		md							st	md	2	20			54° SS			" " to 84.4, bx at 83; at 84.4 becomes wk oxidized, tr sul.
88.4	97.3	8.9		.41		Nil			2.69				Tr +		.41			wk	<1		wk							wk	wk	2	25						wk oxidized, trace Cu ox, wk sulfides
97.3	107.0	9.7		.35		Nil			2.65						.35			wk	<1		wk							wk	wk	2	25						as above, wk hem along fracs
107.0	116.2	9.2		.09					2.64						.09			wk	<1		wk							wk	md	3	30						wk-mod oxidation hem along fracs, increase in qtz & clay, wk or + Cu Ox
116.2	125.7	9.5		.26					2.63						.26			md	1		md				Tr			wk	md	3	25						as above, bx 118 - 22', wk-md cc on fracs
125.7	134.4	8.7		.40		Nil			2.55						.40			wk	1		wk							wk	md	3	20						wk-mod oxid. wk Cu Ox mod cc
134.4	143.7	9.3		.38		Nil			2.61						.37	.01		wk	<1		wk							wk	md	3	25						as above - or less Cu min.
143.7	150.0	6.3		.67	56.3 @ 0.48	Nil			2.63						.67			wk	1		wk							mod	st	3	20						wk-mod oxidation, wk Cu Ox, mod cc
150.0	159.0	9.0		.47		Nil			2.62				Tr +		.47			Tr	1		-							md	md	2	20						fg, mdly silicified, stly broken w. Cu Ox on fracts.
159.0	168.0	9.0		.46		Nil			2.57						.44	.02		-	1		-							md	md		20						As above
168.0	182.0	14.0		.53		Nil			2.55				Tr +		.53				1									md	md		15			51° Post Sulf.	Shears 90° 182.0		As above to 182.0
182.0	194.8	12.8		.08					2.37					.08				-										-	-	-	5			Dike			Dike is fg. dk gray at contact. Becomes more porphyritic away
194.8	206.7	11.9		.01					3.30?					.01				-										-	-	-	7			Latite?			from contact. Increasingly porphyritic. Resembles latite on map
206.7	215.7	9.0		.01					2.45					.01				-										N		8				PM			by Bailey, W. side of East Dike Area. 30% Qtz & plag phenos. plag alt. to clay
215.7	228.5	12.8		.02					2.26					.02				-										N		8				Dike			As above
	EOH																																				EOH

Average Recovery: 94%

PRELIMINARY GEOLOGIC LOG
(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Note (3): Tt - Tactite; Hf - Hornfels; Mb - Marble; Qt - Quartzite; Bx - Breccia; Da - Dacite; Mz - Monzonite; An - Andesite

Note (4): V - Vein; F - Fault; D - Dike; C - Contact; Ig - Undif igneous

Hole No. Q-1985 Re-Entry

Page 1 of 2 Pages

Collar Elev. 2820.59 Final Depth 908.8

Coords. N 38,102.17 E 15,751.91

Inclination Vertical

Logged by N.R.N + R.E.

Re Entry Date: Start 4-1-68 Finish 4-29-68

RE-ENTRY

Depth From	Depth To	Int'v	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Unidentified Non Sulfide Minls.	Cc.	Cpy.	Born	Fe (2) Lim. / Py / Mag. / Hem / Spec.	Other (2) Galena / Sphal. / Molyb. / Calcite / Garnet / Silicates / Sericite / Clay / Vn. Qtz / QUARTZ / CHLORITE / Gypsum	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
315.0	333.9	18.9		1.11		0.02		48	2.47					0.02		1.09		- 25% 15% - -	- - - St - ? ? St - ? St	Clay-Chlor Hf gouge			Intensely altd Hf. Rk now soft-gougy clay-chlorite matrix containing v.st. Py + Magnetite but almost no visible Cu minerals. Material believed Flt. zone material. Calcite as veining
333.9	342.4	8.5		0.22		Nil		95	2.43							0.22		- 3% ? - -	- - - Wk - Mod (?) - - Tr ? Mod	Sh.St., Hf + Mz			Intensely Brkn. and Gougy. Mixture of v.f.gr. Blk silic slt.st.(?), Lt-Med Grn slt.st. - Hf. and Mz.
342.4	352.5	10.1		0.58		0.02		74	2.93					0.02		0.56		- 5-6% Tr - -	- - - Sp - ? Wk ? Sp 2-3% ? Mod	Mz + Grn Hf	St G.G.		Rk Compose of about equal amts of Mz and Grn Hf. CPY + PY well dissem in Mz. Fract controlled in Hf
352.5	362.2	9.7		0.31		Nil		90	2.75							0.31		- 2% - - -	- - - Sp - Sp - Tr 1% ? St	Biot-Chlor Hf	357'→361'	70°	V.f.gr. Biot-chlor-clay(?) Hf. Cut by v. thin seams of CPY
362.2	369.7	7.5		0.28		Nil		84	2.70							0.28		- 2% - - -	- - - Wk - Tr Sp - ? - ? St	Chlor-Serp Hf	Bx		Stly Brkn v.f.gr Hf. Some 1/4" CPY-PY vns.
369.7	379.4	9.7		0.35				86	2.63							0.35		- 2-3% - - -	- - - Wk - - - ? - - Mod	Biot-Chlor Hf	378'		V.f.gr. Black and Green Hf. Somewhat soft. Cut by Py-Calcite + CPY-PY-vnlets. Moderately brkn
379.4	392.5	13.1		0.32				61	2.53							0.32		- 3% - - -	- - - Wk - - - ? - 2% Mod	Mz 382-390			St Brecciation throughout. Gouge 390-392
392.5	401.0	8.5		0.18				89	2.70							0.18		- 3% - - -	- - - - - ? - - 5% ? Mod	Mz + Silic Chlor Hf			Mz complexly intermixed and assimilating silic Chlor Hf. Mz predominates
401.0	410.0	9.0		0.16				88	2.61							0.16		- 1-2 - - -	- - - Wk - ? - - <1 10% Md	Silicified Hf			Silicified, fine grained, pale green Hf with cpy in thin QTZ veinlets ^ highly broken
410.0	420.7	10.1		0.19				76	2.49							0.19		- 1-2 - - -	- - - 1% - ? - - <1 Wk Md	Hf			Softer than above, still strongly broken, calcite filling fractures.
420.7	429.5	8.8		0.17				91	2.68							0.17		- 1-2 - - -	- - - 1-3% - >50% - - <1 Wk Md Md	Hf	Bedding?	60°	Some silicification, fine grained, dark green, hard; hardness in part due to silicate ^ minerals. Banding (60°) may represent bedding
429.5	438.4	8.9		0.20				88	2.77							0.20		- <1% - - -	- - - Sp - 50%? - - - Tr? Wk				V.f. gr. lt grey-green Hf. Med Hardness. Only v. sparse sulfs along fracts. Chlor assoc.
438.4	447.3	8.9		0.19				86	2.62							0.19		- <1% - - -	- - - Sp - 50%? - - - Tr? Wk				As Above. Few v. small patches of CPY. Rk is very f.gr. and compact.
447.3	456.4	9.1		0.11				93	2.55							0.11		- <1% - - -	- - - Wk - 90% - - - - Sp		Gouge zone 449-454		Rk Stly brkn. Gouge locally stly developed.
456.4	468.7	12.3		0.14				91	2.82							0.14		- <1% - - -	- - - Sp - 50% - - - - St				Generally as Above. Locally mod CPY development - v.f.gr. + assoc. w/ Chlor.
468.7	478.4	9.7		0.10				81	2.71							0.10		- 1% - - -	- - - Sp - ? - ? Sp - Mod ? Wk	Argillite (?)			This Rk is as above, but probably should more aptly be called argillite
478.4	488.1	9.7		0.09				85	2.72							0.09		- 1-2% - - -	- - - Sp - ? - ? Sp - ? Wk Sp				As above. Sulfs fract controlled and assoc. w/ Chlor-Serp.
488.1	497.8	9.7		0.13				78	2.62							0.13		- 1-2% - - -	- - - Sp - ? - ? Sp - ? Wk Sp				As Above
497.8	510.0	12.2		0.45		0.01		71	2.88					0.01		0.44		- 2% - - -	- - - Wk - ? Sp Wk - ? Wk Wk	Granodiorite	St. Flt. zone 498-503	≈70°	Some serpentine veining surrounding flt. zone.
510.0	525.3	15.3		0.24				56	2.14							0.24		- 2% Mod - -	- - - Wk - ? Mod Sp - ? Wk Wk	Mz 512-522 Hf and Mz	Flt. zone 522→752?	?	Stly sheared Brkn and altered intermixed wkly limey chlor-clay seds and Mz.
525.3	535.3	10.0		0.27				82	2.46							0.27		- 1% Sp - -	- - - Wk Mod Tr ? - Tr - ? Wk Mod				Completely intermixed Mz and Hf. Mz assimilating seds. St Flting Pre + Post Mz.
535.3	543.6	8.5		0.17				86	2.60							0.17		- 1% Tr - -	- - - Sp - Tr - Tr 1% ? Wk St Mod	Granodiorite Sp - Mz Por.			Rk is mainly a porphyry. Felds lath like 2mm long. Rk is what has been called Mz above, but is probably either Granodiorite or Syenodiorite. Still assimilating chlor seds.
543.6	559.8	16.2		0.95	0.12	0.03	0.03	40	2.71					0.03		0.92		- 4% 8% Tr -	- - - Wk Mod - Mod - Wk - ? Wk Mod St	Hf @ 546'			St Magnetite w/ assoc. Py + CPY. Hf is grey-green med. hard. Appears to have been a limy Arkosic slt. st. Magnetite content drops off from 557' on down
559.8	571.3	11.5		0.40		0.02		66	2.50					0.02		0.38		- 1% 4% - -	- Tr - Sp - Mod - Sp - ? Wk Mod				The Hf appears to be Tremolitic. Rk quite Brkn + mod-stly gougy
571.3	581.4	10.1		0.12				72	2.40							0.12		- <1% - - -	- - - Sp - Wk Mod - Sp Wk 1% ? Wk Wk				Hard v.f.gr. Hf. v.f.gr. CPY dissem. Rk quite Brkn
581.4	594.5	13.1		0.05				38	2.41							0.05		- 1-2% - - -	- - Tr Wk - Wk Mod - Sp 3% ? Wk Mod St				Hf becomes moderately chloritized. Py content increases with chlor content
594.5	604.5	10.0		0.04				84	2.69							0.04		- 1% - - -	- - - Tr - ? Mod - 1% - ? Wk Mod St				v.f.gr. biot-chlor Hf. Sp sulfs. Locally strongly broken
604.5	614.5	10.0		0.02				74	2.61							0.02		- <1% - - -	- - Sp Wk - ? Mod - Sp 2% ? Wk Wk				v.f.gr. Silic Hf. Some wkd Chlorite
614.5	624.2	9.7		0.06				79	2.69							0.06		- <1% 2% - -	- - - Tr Sp - ? Mod - - - ? Wk Mod				Grey-Black v.f.gr. Hf. No Sulfs of significance
624.2	631.1	6.9		0.06				91	2.74							0.06		- 0.5% - - -	- - - Tr Sp - ? Mod - Tr 1% ? Wk Mod St				V.f.gr. Black Biot-Chlor-Silicate Hf. As Above. Quite Broken
631.1	641.4	10.3		0.06				70	2.73							0.06		- 1% - - -	- - - Tr Sp - ? - Sp 5% Wk Mod St		Flt (Healed) 640-642	?	As Above. Numerous 1/4" white qtz vns. of all attitudes. Some sulfs in center. Large chlor. fracts. locally developed v. sparse acid reactivity
641.4	651.4	10.0		0.08				79	2.68							0.08		- <1% - - -	- - - Tr Sp - ? - - 2% ? Wk				Rk very light colored. (less Chlor-Biot.) Generally as above
651.4	660.0	8.6		0.07				90	2.74							0.07		- <1% - - -	- - - Tr - ? - - Tr ? Wk Sp	Intermixed Mz and Aplite in Hf			Rk is now and has been - either a v.f.gr. diopside-chlor. Hf. or a v.f.gr. qtzite w/ intermixed diopside + Chlor.
660.0	666.3	6.3		0.06				83	2.59							0.06		- 1% - - -	- - - Tr - ? - - - ? Wk Mod				Thin 1" seams of Biot Mz cut Hf at 660.4 and 665.8'. Aplite between 663-663.6'
666.3	675.7	9.4		0.18				82	2.64							0.18		- 1% - - -	- - - Sp - 20 Wk Wk - - Wk Md	Mz & Hf			Mz to 670.0; Hf to 672.8; Mz to 675.7; sulfide content of Mz exceeds that of Hf
675.7	690.0	14.3		0.12				65	2.62							0.12		1-2	Sp - 10% Wk Wk - - Md	"			Mixed Mz, Hf, with some qtzite, highly broken, occasional massive chlorite and py along contacts. Hf are dense, siliceous and weakly mineralized.
690.0	698.4	8.4		0.36				90	2.64							0.36		- 1-2 - - -	- - - Tr - 10? Sp - 1% ? Mod Sp	"			Generally as above. Sulfs in Qtz vns in seds and dissem in Mz. Interval 1/4 Mz 3/4 sed
698.4	703.8	5.4		0.07				93	2.71							0.07		- 2% - - -	- - Tr Tr - 10? Sp - Tr ? Mod Md	"			60% Mz + 50% Hf-qtzite. Mz irregularly intruding Hornfelsic silic. slt.st.
703.8	706.2	2.4		0.13				88	2.64							0.13		- <1% - - -	- - - - Sp - 1% 10% Tr	Biot Mz			Some what fresh appearing Biot. Mz. Numerous Biot. Books. CPY dissem. + along fracts. only Tr. Py.
706.2	717.5	11.3		0.11				80	2.64							0.11		- Tr - - -	- - - 4% - 30% - Tr - 30% Wk Mod	Aplite Hf 706.2-707.6 Mz 707.6-710.2 Slic Hf 710.2			Rk Types and alt. as above. Higher CPY content in Mz or along open fracts in Hf. Calcite as vns.
717.5	729.9	12.4		0.09				62	2.64							0.09		- 2% - - -	- - Sp Sp - 20% Wk - 1% 20% Wk				As Above. Rk is quite fine grained and dense. Generally unfavorable. CPY + Mo assoc. w/ qtz vns
729.9	738.4	8.5		0.07				69	2.80	Ag	Mo	Zn	Pb			0.07		- 2% - - -	- - Tr Sp - 10% Sp - 2% 60% Sp	Slic Hf - v.f.gr. Qtzite			Rk appears more and more like a v.f.gr. qtzite.
738.4	744.8	6.4		0.11				37	2.81	0.15	.0016	1.51	1.15			0.11		- 6% - - -	- - - St Mod - 5% -	Mz 738.4-744.8			Stly Mineralized + Altd Mz. Mod-st Py, Sp CPY, Mod Zns.
744.8	752.9	8.1		0.08				44	2.71							0.08		- <1% - - -	- - - Sp - 10% - 1% 60% Sp	v.f.gr. Qtzite - Hf.			Hornfelsic-quartzite as above. Thin Mz stringer cutting it.
752.9	760.3	7.4		0.12				95	2.74							0.12		- 1-2% - - -	- - - Tr Sp - 70% Sp - 5% 15% Wk 2%	Lt. Grn Diop Chlor Hf	Qtz 1/4" vns	∓60° and 90°	Lt Green Diop-Chlor Hf. Chlor developing along fracts. Gyp. vning appearing. Only Tr CPY + Sp Py.
760.3	770.0	9.7		0.12				97	2.67							0.12		- <1% - - -	- - - Tr - - Sp Tr 1% 4% Tr	Mz. P 760.3			Rather fresh appearing Mz w/ well dissem Sulfs. Some [illegible] present

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D-198E RE ENTRY
Page 2 of 2 Pages
Collar Elev 2820.59 Final Depth 908.8
Coords. N 38,102.17 E 15,751.91
Inclination VERTICAL
Logged by N.R.N. + R.E
Date: Start 4-1-68 Finish 4-29-68

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green		Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	Gypsum	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
770.0	776.3	6.3		.08				94	2.64							.08		-	1%	-	-	-	-	-	Tr	-	-	- Tr Sp	Tr	1%	4%	Tr		Mz Disp-Chlor Hf 776.3			Mz As Above
776.3	779.6	3.3		.15				87	2.46							.15		-	<1%	-	Tr	-	-	-	Sp	-	60% ?	Tr	?	Tr	?	Wk Mod	3%				D.y-Chlor Hf. As before. V.f.gr. dissem Sulfs. Gyp Vns to 3/4". Some Hem. along fracts.
779.6	783.7	4.1		.12				92	2.73							.12		-	1%	-	-	-	-	-	Sp	-	60%	Tr	Tr	Tr	—	Wk Mod	Tr				Hf as above
783.7	798.1	14.4		.13				95	2.71							.13		-	1-2%	-	-	-	-	-	Sp	Tr	-	- Wk	Wk	2%	4%	Wk Mod	Tr	Mz 783.7			Mz, Mod. alt. Biot. to Chlor - felds to Clay - ser. Numerous ser. sulf fracts
798.1	806.9	8.8		.12				88	2.66							.12		-	1-2%	-	-	-	-	-	Sp	Tr	-	- Sp	Wk	-	3%	Wk Mod	Tr				Mz As Above. Felds. altering to green "clay" possibly pyrophyllite
806.9	816.0	9.1		.15				95	2.63							.15		-	2%	-	-	-	-	-	Tr	-	-	- Sp	Mod	-	3%	Wk Mod	-				Mz As Above. All sulfs well dissem except for one 1/8" filled fract. (65°)
816.0	824.2	8.2		.10				93	2.64							.10		-	3%	-	-	-	-	-	-	-	-	- Wk	Mod St	3%	5%	Wk Mod					Mz, Alt of P. felds to Pyrophyllite except almost all grains. Increase in ser-Py Hal. fracts.
824.2	833.1	8.9		.08				94	2.62							.08		-	2%	-	-	-	-	-	Tr	-	-	- Sp	Wk Wk	-	3%	Wk Mod	Tr				Mz, wk-mod Alt as above. Biots + P. felds moderately altered.
833.1	842.5	9.4		.07				99	2.61							.07		-	2%	-	-	-	-	-	Sp	-	-	- Sp & Wk	Mod	-	3%	Wk Mod	Sp				Mz, Mod Alt. Most of sulfs well dissem
842.5	851.6	9.1		.09				97	2.52							.09		-	4%	-	-	-	-	-	Tr	-	-	- St	Mod	-	8% ?	Wk Mod	Sp				Mz, St Alt. St ser development in broad Halos assoc w/ Py
851.6	860.6	9.0		.10				98	2.62							.10		-	2%	-	-	-	-	-	Tr	Tr	-	- Sp	Wk	-	3%	Wk Mod	Sp				Mz, wk-mod Alt. Sulfs well dissem. Generally as above
860.6	870.0	9.4		.09				96	2.64							.09		-	1-2%	-	-	-	-	-	Tr	Tr	-	- Tr	Wk	1%	3%	Mod	Sp				Mz, Mod Alt. Occasional 25° ~~fr~~ - Py veinlets. Gyp vn. fracts
870.0	879.3	9.3		.12				96	2.62							.12		-	2%	-	-	-	-	-	Sp	Tr Sp	Sp	-	Sp	St-Mod	4%	8%	Mod St	Sp				Mz, St Alt. Py has been sheared and now healed. Sulfs not assoc w/ qtz vns
879.3	884.8	5.5		.11				89	2.68							.11		-	2%	-	-	-	-	-	Tr	Sp	Sp	-	Wk	Mod St	-	4%	Mod St	Sp				Mz, St Alt. Numerous ser-Sulf seams. Increase in calcite down
884.8	893.7	8.9		.16				99	2.64							.16		-	2%	-	-	-	-	-	Tr	?	Tr	-	Wk	St.	-	3%	Mod Mod	Sp				Mz, St Alt of felds to pyrophyllite and Biot to Chlor - Hydromica. Sulfs mainly dissem
893.7	902.6	8.9		.10				98	2.62							.10		-	4%	-	-	-	-	-	<1%	?	Tr	-	St	St	3%	6%	Mod	Tr Sp		qtz-sulf Vns 80°	Mz. St Alt As Above w/ St ser also developed. 1/2" qtz-Py vns present & well dissem sulfs in ser
902.6	908.8	6.2		.10				97	2.73							.10		-	2%	-	-	-	-	-	?	Sp Wk	Tr	-	St	St	12%	15%	Mod	Tr				Mz, St Alt. Thicker qtz-Py vns. bleed by St. ser w/ well dissem Bqz-Py
E.O.H.																																						

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. F-198
Page 1 of 1 Pages
Collar Elev 3001.43 Final Depth 306.2
Coords. N 28,360.87 E 29,225.54
Inclination vertical
Logged by J.C, RE
Date: Start 6-10-69 Finish 6-16-69

Depth From	Depth To	Depth Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Cu (1) Pitch	Cu (1) Black	Cu (1) Blue Green	Cu (1) N.S.	Cu (1) Cc.	Cu (1) Cpy.	Cu (1) Born	Fe (2) Lim.	Fe (2) Py	Fe (2) Mag.	Fe (2) Hem	Fe (2) Spec.	Other (2) Galena	Other (2) Sphal.	Other (2) Molyb	Other (2) Calcite	Other (2) Garnet	Other (2) Silicates	Other (2) Sericite	Other (2) Clay	Other (2) Vn. Qtz	Other (2) QUARTZ	Other (2) CHLORITE	(3) Rock Type	Structures (4) Depth	Structures (4) True Dip	Remarks
0	5.0	5.0																																			Rx o.t
5.0	8.2	3.2		.03				80										md	-		st								wk	md	-	5			Mz			st oxid. Mz, uniform st hem, md clay along small fracs.
8.2	18.2	10.0		.02				80										wk	-		tr								mg	st	3	15			12.9			st oxid & bleached, bx zone at 12.9 - gouge, wk-md limonite
18.2	28.0	9.8		.02				57										md	-		st								wk mg	md	2	10						st oxid, md in box work, lim on fracs, fld altd to clay
28.0	37.0	9.0		.02				84										md st	-		st								md	st	1	10						as above, local st sul box work, md live lim.
37.0	43.2	6.2		.02				87										st	-		st								md	st	1	15						as above, mg. st. live lim, md box work
43.2	51.0	7.8		.01				90										md	<		wk								md	st		20						st oxid & bleached, wk-md live lim, wk box work, more silicous & sul.
51.0	61.5	10.5		.06				86										md	<		md								mg	md		40						md oxid, st silic, wk ox, wk cc, hem along fracs. w/ md live lim.
61.5	73.5	12.0		.05				68										md	<		md								wk	md	-	40						as above, more sul box work along veins
73.5	83.0	9.5		.05				86										md	tr		md								wk	md wk	-	35						st silic, mod ox id, mo hem along fracs
83.0	92.5	9.5		.06				92										md	tr		md								wk	md	-	30						as above, less silic.
92.5	102.0	10.5		.05				79										md	tr		md								wk	md	1	25			Mz-?			as above, local st hm - 98'
103.0	113.8	10.8		.14				82							.14			md	<1		wk								md	md	2	20			106.2			st oxid & alteration, local st clay, mod bleaching, md py rec.
113.8	120.9	7.1		.01				75										md	<1		md								md	md st	<1	20						as above, local md box work, less sul.
120.9	133.3	12.4		.02				99										wk	2		wk								st	st	-	50			Sp			st oxid & bleaching, st silic. & altn, st ser & clay, obv. Sp px, wk cc
133.3	142.9	9.6		.05				92										-	2		—								st	st	-	40						as above, less silicification, wk cc
142.9	151.6	8.7		.05				100										-	2		—								st	st	<	40						as above, wk cc
151.6	161.2	9.6		.02				85										-	2		—								st	st	<1	40						as above, wk cc
161.2	169.6	8.4		.03				100										-	2		—								st	st	<1	30						st alter, silic, oxid, & bleached, fine dism. py wk cc.
169.6	179.0	9.4		.02				76										-	2		wk								st	st	1	25			Mz	172.2	25°	as above to 172.2, Mz dike - bleached to 176.5; as above
179.0	188.2	9.2		.04				96										-	4		wk								md	md	10	25						st silic stringers in mod altd Sp, disem. py, md bleaching
188.2	197.9	9.7		.22				94										-	<1		—								st	st	1	10			Sp			changes at 187.8 to st altd Sp, feldspars altd to clay, st bleach, wk cc
197.9	206.8	8.9		.07				99										wk	1		wk st								wk md	md	5	30						as above to 198.5 the alternate st hem & st alt to st silic & wk hm
206.8	215.9	9.1		.01				97										wk md	<1		md st								md	md	2	15						as above, becomes less silic & more clayey at 214.0 locally md live lim.
215.9	229.2	13.3		.01				58						.01				md	tr		tr								st	st	-	5				214.1		bx zone from 214.0 to 228.1 w/ much clay, st bleached, mod lim
229.2	238.4	9.2		.98	1.84 @ 0.73	Nil		97							.93	.05		wk	<1		wk								st	st	1	10						st altd, bleached w/ sulfides - py, cp, cc (mod)
238.4	247.6	9.2		.48		Nil		94							.46	.02		-	<1		-								st	st	3	20						as above, w/ more qz
247.6	255.9	8.3		.28				100							.26	.02		-	3		-								st	st	3	20						as above w/ more pyrite
255.9	265.5	9.6		.27				93							.25	.02		-	2		-								st	st	2	15			Sp			as above
265.5	274.9	9.4		.35				98							.33	.02		-	2		-								st	st	2	15						as above, locally w/ vugs
274.9	284.7	9.8		.44	1.85 @ 0.46	.01		93						.01	.43			-	2		-								st	st	2	15						as above
284.7	293.4	8.7		.48		.01		90						.01	.47			-	1		-								st md	st md	20	50				291.8	50°	becomes st silicified w/ein qz at 285.5; changes to Mz at 291.8
293.4	306.2	3.8		.18				100							.16	.02			1										st	st	5	10			Mz			mod altd Mz, st bleached qz-py veins
	EOH																																				EOH

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. 5-199
Page 1 of 1 Pages

Collar Elev 2820.32 Final Depth 265.8
Coords. N 28,980.42 E 29,803.47
Inclination Vertical
Logged by D.R. Rees
Date: Start 6-9-69 Finish 6-13-69

Depth From	Depth To	Depth Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green		Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem. Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0	10.0	10.0																																		Rock bit
10.0	19.0	9.0		.15					2.51									St	1		wk							md	md	7	15		Mz	Fracs	45°	Mod-c gr. Mz. St brn. lim wk silicification. md py & cc
19.0	28.6	9.6		.12					2.77									St			wk							St	md	3	15					Mdly altd bro altd to hydro mica w/ l.s. lated & vuggy
28.6	37.4	8.8		.26					2.64									St			wk							md	md		12					70% oxid. and st brn. lim. md cc in disseg & veinlets of py
37.4	47.2	9.8		.20					2.54									St	3		wk							md	md		10					30% " feldspar phenos alt to clay md cc
47.2	56.3	9.1		.19					2.53									Md	2		wk							St	Mt	3	12	wk		py veins	70°	wk chl. Several py veins w/ Qtz-ser borders md-st cc
56.3	66.0	9.7		.21					2.55									Md	2		—							md	wk		10	md				20% oxidized md chl alt wkly broken " " "
66.0	74.1	8.1		.32					2.61									St	3		—							Mt	wk	2	10	md				md chl alt several vuggy qtz veins wk-md disseg cc
74.1	84.3	10.2		.32					2.58									Md										md	wk	2	10	md				as above
84.3	94.0	9.7		.22					2.61									Md	2									Md	wk	2	10	wk				C gr Mz wk mdly altd brn lim on fracs cc as thin coatings on py
94.0	103.3	9.3		.19					2.66									Md	2									Md	wk	3	12	md		Qtz vns	70°	fine grained type above md chl vuggy stringers wk cc
103.3	113.0	9.7		.12					2.64									wk	3									md	wk	2	12	md	Mz			as above
113.0	121.8	8.8		.15					2.66									wk	2		—							md	wk	2	10	md	Sp?	113.5		from 113.5 f gr Sp? wk-mdly altd md chl on fracs wk cc
121.8	130.3	8.5		.13					2.74									Tr	3									md	wk	3	12	md SL				as above st py veinlets
130.3	143.5	13.2		.11					2.81									Tr	3									md	wk md	4	15	wk md	Sp.	136.5		as above 133.5 then c gr Mz wkly silicified ggat 136.5
143.5	152.9	9.4		.10					2.65									—	3									md	pK	3	15	5	Mz			c g Mz, 2nd K spar phenos little visible cc
152.9	162.2	9.3		.06					2.88									Tr	3									md	wk	2	10	5				As above.
162.2	172.1	9.9		.06					2.59									Tr	3									md	wk	2	10	5				" little visible cc. md alt. overall
172.1	181.7	9.6		.07					2.64									—	3									md	wk	2	15	5	Mz			mdly silicified, pale yellow altd f spars in glassy green G.M.
181.7	190.5	8.8		.11					2.66																			md	wk	1	10	20	f.g. dike	183.9 187.7		f.g. black pre-sulfide dike with abundant f.g. (2nd?) bi & chl
190.5	199.1	8.6		.05					2.39																			md	md	2	15	5	Mz			Mz as above altd f spars in glassy ground mass
199.1	207.6	8.5		.06					2.70									Tr						Tr				md	md	2	15	5				As above mdly in vuggy qtz vein @ 204.0 at an of some py.
207.6	216.9	9.3		.03					2.75									Tr										md	wk	3	15	3		PY veinlets	70-90	" " no visible cc
216.9	223.0	6.1		.08					2.58									—										md	wk	3	20	3				" " zones of st silicification
223.0	232.4	9.4		.05					2.63									—										md	wk	3	20	3				" " vein & disem. py lim along frac
232.4	241.8	9.4		.05					2.62									—										md	wk	2	25	2				" " stronger silic. ; no lim
241.8	251.6	9.8		.05					2.63									—										md	wk	2	20	2				" "
251.6	260.8	9.2		.03					2.72									—										md	md	-	10	-				st bleached ma ser & clay - locally strong less silica
260.8	265.8	5.0		.05					2.73																			md	md	-	10	-				as above, more vugs
	EOH																																			EOH

Average Recovery 94%

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO- SILVER BELL UNIT

W.E.S.
JUL 23 1968

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. 0200 E
Page 1 of ___ Pages
Collar Elev 2887.68 Final Depth 538.7
Coords. N 37,955.39 E 15,937.31
Inclination vertical
Logged by RE
Date: Start 6-6-68 Finish 6-7-68

J.H.C.
AUG 19 1968

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green		Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem.	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE		(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0	447.0	447.0																																				churn drilled (1956) approaching that of AK
447.0	450.0	3.0		.06				89	2.56							.06		-	1-2	-	-	-		Tr			md	ST	-	30	-			Da°				st clay-sericite alt, mod silicification, coarse grained - texture ∩
450.0	462.8	12.8		.16				95	2.56							.16		-	1-2	-	-	-		Tr				ST	ST	1	30	1		"				As above. Tr of moly in open veinlets
462.8	473.3	10.5		.10				88	2.55							.10		-	1-2	-	-	-		Tr				ST	ST	2	30	-		"	cpy veins	65°		st alt, as above; veins of spy, trace moly
473.3	482.8	9.5		.11				70	2.56							.11		-	1-2	-	-	-		-				ST	ST	-	35	-		AK				st alt, AK fine-grained than average, dis pyrite
482.8	489.5	6.7		.10				87	2.49							.10		-	1-2	-	-	-						ST	ST	-	50			}				stly altd & silicified, medium grained AK
489.5	538.7	49.2		—				0	—							—		-	1-2	-	-	-		Tr				ST	ST	-	50			AK				Breccia fragments and cave, stly altd AK.
	EOH																																					(Hole stopped due to bad hole conditions. Unable to cement or case hole. Bx casing was reamed down until casing bit were out, then cement was tried but ran out of hole before it set up.)

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO- SILVER BELL UNIT

Note (3)
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Note (4)
V - Vein
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C - Contact
Ig - Undif igneous

Hole No. Q 200 E
Page 1 of ___ Pages
Collar Elev 2887.68 Final Depth 538.7
Coords. N 37,955.39 E 15,937.31
Inclination vertical
Logged by RE
Date: Start 6-6-68 Finish 6-11-68

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green		Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz.	QUARTZ	CHLORITE		(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0	447.0	447.0																																			churn drilled (1956)
447.0	450.0	3.0		.06				89	2.56							.06		-	1-2	-	-	-		Tr				md	ST	-	30	-		Da?			st clay-sericite alt., and silicification, coarse grained - texture A approaching that of AK
450.0	462.8	12.8		.16				95	2.56							.16		-	1-2	-	-	-		Tr				ST	ST	f	30	/		"			As above. Trace mols in open veinlets.
462.8	473.3	10.5		.10				88	2.55							.10		-	1-2	-	-	-		Tr				ST	ST	2	30	-		"	cpy veins	65°	st alt, as above; veins of spy., trace mols
473.3	482.8	9.5		.11				70	2.56							.11		-	1-2	-	-	-		-				ST	ST	-	35	-		AK			st alt, AK fine grained than average, dis pyrite
482.8	489.5	6.7		.10				87	2.49							.10		-	1-2	-	-	-						ST	ST	-	50			ʃ			stly altd & silicified, medium grained AK
489.5	538.7	49.2		—			—	0	—							—		-	1-2	-	-	-		Tr				ST	ST	-	50			AK			Breccia Fragments and cave, stly altd AK.
	EOH																																				(Hole stopped due to bad hole conditions. Unable to cement or case hole. Bx casing was reamed down until casing bit were out, then cement was tried but ran out of hole before it set up.)

PRELIMINARY GEOLOGIC LOG
(Subject to Revised Logging)

ASARCO- SILVER BELL UNIT

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Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. F-200 x
Page 1 of 1 Pages
Collar Elev 2826.05 Final Depth 247.4
Coords. N 28,619.45 E 29,917.87
Inclination vertical
Logged by RS JC
Date: Start 2-14-69 Finish 5-19-69

Depth From	Depth To	Depth Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	N. S.	Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem.	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0	39.5	39.5																																			Rotbit, core though boulders, gravel
39.5	50.2	10.7		.06					2.49					↑				pxt			wk								md	st	3	15		SP			st alt 39.5-43.5 stly bleached, selt'd leached veinlets, upper work
50.2	62.2	12.0		.06					2.36									md			wk								md	st	2	7					stly broken f.g. bleached, stained w/ lim. from
62.7	72.5	9.8		.02					2.47									md			wk								mdst		2	7			Leached veinlets	40-50	Lucin in some leached veinlets most lim is brick red
72.5	82.0	9.5		.01					2.59									md			Wk								ma	st	2	10					as above open vugs, fine gr Sp
82.0	91.4	9.4		.01					2.60									md			md								md	st	1	10		Sp			as above st alt'd w/ brick red lim.
91.4	102.6	11.2		.01					2.57					↓				md			md								md	st	1	10			9	97.4	as above bx zone or gouge at 97.4 - 99.0
102.6	112.8	10.2		.06					2.57						✓			–			–								St	st	1	10		Sp			st alt'd + bleached, py + cc no fe Ox in Sul stringers
112.8	125.2	12.4		.15					2.35						✓			–			–								St	st	1	10					as above
125.2	134.1	8.9		.07					2.87						✓			–			–								md	st	3	30					as above stly silic zone 131' to 134'
134.1	143.0	8.9		.74		Nil			2.73						✓						–								md	st	1	10		Sp			st alt'd + bleached, py in stringers mod. sil cc - fine gr, biotite
143.0	151.2	8.2		.02					2.82					↑	✓			–			–								mdst		1	10			139.5 146		as above gouge zone 139.5 to 143 + 146' to 152'
151.2	158.0	6.8		.24					2.25									–		<1	–								Wk	st	-	7	1	latite			Post-min dike - latite w/ minor py. md. st alt'd + bleaching
158.0	167.1	9.1		.02					2.34									md		<1	wk								mdst		-	7	1	Post sulfide Latite			15% phynocrysts in tan gd mass, 92 phys. fel'd st alt'd to clay, bio to chlorite
167.1	176.1	9.0		.01					2.39									md		r	wk								mdst		-	7	51				20% " , as above, chlorite leached out, in places
176.1	184.9	8.8		.01					2.40									md		r	md								mdst		-	7	1				as above, alternating med. to coarse gr phenos uniform hem
184.9	194.2	9.3		.01					2.40									md		r	md								mdst		-	7	-				as above finer grained
194.2	209.7	15.5		.02					2.49									md		r	wk								mdst		-	7	1				as above, med-coarse grained, w less alt'd. of bio - feld.
209.7	218.3	8.6		.03					2.98									md			wk								wk	md	-	7	2				mod alt'd + bleaching, mod fresh bio fel'd mod alt'd to clay
218.3	227.0	8.7		.01					2.46									md			–								wk	ma	-	7	2				as above, random fractures filled scaly lm.
227.0	237.7	10.7		.02					2.47									md			–								wk	ma	-	7	2				as above
237.7	247.4	9.7		.01					2.48									md			–								wk	md		7	2	Post sulfide Latite			as above
	E-4																																				

Average Recovery 87%

(Trans. of rock on)

PRELIMINARY GEOLOGIC LOG
(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. F-201
Page 1 of 1 Pages

Collar Elev 2931.43 Final Depth 359.7
Coords. N 28,665.81 E 29,637.27
Inclination Vertical
Logged by RE, JW.C.
Date: Start 6-21-69 Finish 6-28-69

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Non Sulfide	Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0	5.9	5.9																																			
5.9	18.5	12.6		.02				81										md			Tr								md	wk	2	5?		SP				silicified SP some veinlets filled w/live lim., Jarosite on fracts.
18.5	27.5	9.0		.03				92										st			-								mdmd	2	20?			veinlets		30-70	Several leached veinlets w/live lim cut bleached SP
27.5	36.5	9.0		.01				95										st			-								mdmd	2	20?			"		45-80	ST Jarosite, md live lim., dis boxwork H 4.5
36.5	46.4	9.9		.01				86										st			-								mdmd	1	10						softer than above, numerous thin leached veinlets
46.4	55.5	9.1		.02				100										md											mdmd	1	10						disp. CC, oxidation mainly along veinlets & fractures
55.5	63.7	8.2		.01				93										st											mdmd	<1	10		SP	vein		35°	vein w/ st live lim in cinder like boxwork 61.5-63.0.
63.7	73.7	10.0		.01				87										st											mdmd	<1	10		SP 63.7-69.6				completely leached, Rk below 69.6 has numerous large qtz eyes
73.7	83.3	9.6		.04				91										md	1										mdmd	1	10		SP sulfide 75.8-85.3				sulfides 75.8-85.3 mostly py, wk c.c.
83.3	92.9	9.6		.04				94										st	½										mdmd	2	10						ST Jarosite, mostly leached w/some remnant sulfides
92.9	97.7	4.8		.01				88										md	½										mdmd	<1	10		SP				As above, dis py, c.c., oxidation of veinlets
97.7	107.2	9.5		.03				90										st	Tr										wkmd	4	15			leached veinlets		60-80	90% oxidized. md-st silicification st Jarosite
107.2	116.5	9.3		.02				95										wk	1										wkmd	4	12						15% " Brecciated & cemented by QTZ 108-110 disp. CC
116.5	125.7	9.2		.03				96										md	[illegible]										wkmd	3	12?						25% oxidized. Oxidation stronger below 123 recrystallized
125.7	135.1	9.4		.02				95										md	[illegible]										wkmd	4	12						60% " Angular fragments in QTZ vein 129-130
135.1	144.5	9.4		.02				96										wk	1										wkmd	2	15						10% " f.g. tac, silicified
144.5	153.4	8.9		.04				95										md	[illegible]										wkmd	10	20						30% " QTZ vein with st fragments 144.5-147.5
153.4	162.1	8.7		.06				96										wk	[illegible]										mdmd	5	15			veinlets		60-90	15% " st CC on dis-veined py
162.1	171.2	9.1		.16				100										Tr	3										wkwk	4	20?						<5 " silicified and/or recrystallized st CC on py veins
171.2	181.8	10.6		.12				81										Tr	2										wkwk	3	20?						<5 " Texture obliterated by alt & sil st dis CC.
181.8	190.4	8.6		.21				100										-	[illegible]										wkmd	2	10						clay sulfides less silicified than above
190.4	199.7	9.3		.26				94											[illegible]										mdst	2	10						softer than above, md-st alt. st dis CC, mdly broken
199.7	209.6	9.9		.30				89											[illegible]										mdst	2	10						As above, stly broken, 203.6-209.6
209.6	219.1	9.6		.27				100											[illegible]										mdmd	2	15?						f.g. mdly silicified, steep irregular fractures & veinlets
219.1	228.7	9.6		.26				95											[illegible]										mdmd st st	-	15						stly altd, broken 221-227
228.7	237.8	9.1		.20				95							✓✓	✓			2										mdst	<1	15			py veinlets		60-90	stly altd & bleached, fine grained, mdly silicified, py veins
237.8	247.2	9.4		.30				87							✓✓				2										mdst	2	20						as above, 336' to 342 more stly broken & silicified
247.2	255.7	8.5		1.76		Nil		99							✓✓				2										mdst	<1	15						as above, locally very st CC
255.7	264.9	9.2		.37		Nil		85							✓✓				2										mdst	1	15						as above
264.9	274.1	9.2		.23				90							✓✓				2										mdst	1	15		SP				as above
274.1	283.8	9.7		.22				93							✓				2										mdst	2	20		SP	275			as above, ster clay bx-silicified zone at 273 to 277
283.8	293.3	9.5		.19				96							✓				2										stst	<1	15		SP				stly altd & bleached, st ser along veinlets up to 1" wide w/py, cc
293.3	300.8	7.5		.15				82							✓				2										stst	<1	10						as above, less qz
300.8	310.7	9.9		.08				82							✓				[illegible]										mdst	<1	10						stly altd & bleached, weaker cc, stly fractured, vein py
310.7	319.7	9.0		.10				94							✓				[illegible]										mdst	<1	10						as above
319.7	328.3	8.6		.08				100							✓				2										mdst	<1	10						as above
328.3	336.9	8.6		.11				86							✓				2										mdst	<1	10						as above
336.9	350.3	13.4		.09				88							✓				[illegible]										mdst	1	15						fresher rx, more silicification
350.3	•359.7	9.4		.06				93											2										stst	-	10		Sp				stly altd & bleached, vein & disem py.
	Eolt																																				
				Average Recovery				92%																													

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. F-202
Page 1 of 1 Pages
Collar Elev 2830.31 Final Depth 2705
Coords. N 28,441.98 E 29,887.53
Inclination vertical
Logged by JC, RE
Date: Start 6-20-69 Finish 6-25-69

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	N.S.	Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem.	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0	28.0	28.0																																			Rx B.t
28.0	37.6	9.6		.14				87		✓			✓					md		wk									md	st	-	5		Mz	37.6		stly altd + bleached Mz, md lim, fldds replaced by clays, md Cu Ox
37.6	45.5	7.9		.12				81		✓			✓					md		wk									md	st	-	3			42.5		bx-gouge zone, mostly lim stained clay, Cu Ox
45.5	54.9	9.4		.13				82		✓			✓					md		wk									md	st	-	5		Mz?			st altd + bleached Mz? wk Cu Ox
54.9	64.2	9.3		.11				91					✓		✓			md	1	wk								wk	md	1	7					md-st altd, wk silicified, first sulfides, wk Cu Ox
64.2	75.8	11.6		.28				85		✓			✓		✓			md	1	wk								wk	md st.	1	7			75.8		as above, mod Cu Ox, mod Cc
75.8	86.0	10.2		1.85		.07		100						.07	1.78			wk	<1									md	st	-	3					st broken, brecciated, altd to clay, md to stcc, md Cu Ox
86.0	95.0	9.0		2.49		.10		100						.10	2.39			-		-								wk	st	-	3			95.0		as above, less Cu ox
95.0	100.0	5.0		1.82		.06		87						.06	1.76			-	2	-								wk	st	2	7		Mz?			st altd + bleached, stcc, wk Cu Ox.
100.0	108.6	8.6		1.27		.05		91						.05	1.22				2									wk	ST	-	3		SP?			F. m.gr., stly altered. st. CC on px
108.6	117.0	8.4		1.42		.05		88						.05	1.32	.05			2									wk	st	<1	3					F.gr. very soft (H=4), wkly broken, st CC cpy, cpy
117.0	125.3	8.3		.78		.02		92						.02	.71	.05			2									wk	ST	1	4			qtz veins 70-90		vuggy qtz veins both w/ secd sulf. As above
125.3	133.1	7.8		1.40	1.43 @ 1.12	.03	1.43 @ .004	100						.03	1.37				2									md	ST	-	3			shears 55-80		f.g., dk green, soft, stly altd, c sheared
133.1	140.5	7.4		.76		.03		100						.03	.73				1									md	ST	-	3					As above
140.5	148.5	8.0		1.37		.02		78						.02	1.30	.05			2									md	ST	-	3			148.5		" " stly broken 145.7-148.5 CC on px veins
148.5	157.3	8.8		.34		.01		94						.01	.23	.10			2									wk	ST	-	5		sp? or Mz?			slightly coarser grained, c lighter than above, stly broken
157.3	166.2	8.9		.29				100							.19	.10			2									wk	ST	-	5					stly broken, dis py, c cpy, less visible CC than above
166.2	172.5	6.3		.49		.01		77						.01	.33	.15			2									wk	ST	-	5					very stly broken, c gravel like
172.5	181.6	9.1		.58		Nil		93							.48	.10			2									wk	md	1	5		SP?			f-m.gr., light tan, fine dis. py w/ md st CC replacement
181.6	190.1	8.5		.87		.02		97						.02	.80	.05			2									md	md	1	5			vein 270°		Py-cpy-sc vein w/ partial ox of CC. takes lim 185.2-186.7
190.1	199.8	9.7		.28				95							.23	.05			2					Tr				wk	md	2	6					f.gr., light tan-green, harder, less altd than above
199.8	208.0	8.2		.30				95							.20	.10			2									wk	md	2	6	8?	Definite SP			Typical SP texture. Heavier, darker; chlorite ass. w/ sulfides
208.0	217.0	9.0		.29				93							.14	.15			2					Tr				wk	md	2-3	12?	8				Zones of st silicification. st chlorite. cpy on fractures
217.0	225.9	8.9		.24				90							.09	.15			3									wk	md	5	15?	8		qtz-py cpy 0	70°	mdly altd SP cut by qtz veins. c st sil.
225.9	233.0	7.1		.20				98							.05	.15			2					Tr				wk	md	5	12	8				As above, irregular white qtz veins w/ minor sulfides
233.0	240.0	7.0		.16				100							.04	.12			2									wk	wk	5	15	5				f.gr., light tan, silicified (H=5) dis py, c cpy, qtz veins and
240.0	248.8	8.8		.24				97							.09	.15			2									wk	wk	4	15	8				dk green, wkly altd SP with distinct texture, cut by silicified px veins
248.8	257.6	8.8		.14				100								.14			2									wk	wk	4	15	6				As above, small, elongate f spars, wkly altd where not silicified
257.6	270.5	12.9		.13				97								.13			2									wk	wk	5	15	8	definite SP			" " texture matches that of sp dikes found
	EOH																																				north of alteration zone; weakly altered.

Average Recovery: 93%

PRELIMINARY GEOLOGIC LOG
(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Notes:
(1) Est. % Cu represented by each mineral
(2) Est. mineral %, or, as follows: Trace (Tr); Sparce (Sp) < 5%; Moderate (Md) 5-50%; Strong (St) +50%

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. 2034 Re survey
Page 1 of ___ Pages
Collar Elev. 2,785.27 Final Depth 410.1
Coords. N 38,236.61 E 15,725.74
Inclination Vertical
Logged by N.R.N. + RB
Date: Start 8-23-67 Finish 8-29-67

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov	Sp. Gr.	Chrys.	Pitch	Black	Blue Green	Cc.	Cov.	Born	Lim.	Py	Mag.	Hem.	Spec.	Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz.	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	Structures (4) True Dip	Remarks
275.0	299.7			0.03																																Apparently all Core material. Some altd sed frags
299.7	306.2	6.5		0.03											0.03																		Apl/Sd			
306.2	310.3	4.1		0.05											0.06									Tr	Tr				Sp	Tr	Sp		Apl/Sd Contact	Hf		This N is the gland that gives tex to most of cu min developed on gtz-Cal contact, similar to coral glacier. This tex was seen 14.0-21.5 abv.
310.3	321.5	11.2		0.07											0.07														Sp	-	10%		Hf			As above
321.5	322.7	1.2		0.06										0.01	0.08				Sp									Sp	Sp	-	10%		Hf			altered, silicified Hf with partial obliteration of texture. Sp Pyrite in large blocks. Sp dis sulfides. Hf to st altd Hf (New drill hole mechanically started when bit bypassed cement at 321.) logging of angled hole begins at 322.7
322.7	326.5	3.8		0.03										0.02	0.01				Sp									Md	Sp		10%		Mz	Hf-Sd contact	@326.5	As above - st altd Hf
326.5	332.6	11.1		0.04											0.04									5%	50%	50%					Md		Hf			Grey-black, fg, Hf, Texture becomes andesitic, near end of interval hard rock, cleavage acid reactive.
332.6	345.8	13.2		0.04											0.04									2%	30%	30%					Md		Hf			Dark grey, fg, Hf, chlorite red and cuts in rp. Hf & qtz veins dipping 70° offset by 30° fractures and broken mixed mineral on end of pieces, intervals of Hf altd Da or Ar.
345.8	353.4	7.6		0.02											0.02									2%	30%	20%	Md	Md		5%	Md		Hf			Sp of Da (?) at end of interval (acid reactive)
353.4	364.2	11.8		0.04											0.04								Tr	5%	40%	30%				1%	Md		Hf			Greenish-grey Hf w/ st altd Ar. From 353.5 To 353.9
364.2	371.3	8.5		0.13											0.13								Tr	2%				Sp	-	5	20	St	Mz(?)			Dark porphyritic rock w/phenocrysts of Qtz and feldspar. Color may be due to fine grained biand chlor. weakly mineralized.
371.3	380.0	8.7		0.16											0.16									2%				Sp	-	2	20	St				As above, 2-20% bi and chlor
380.0	388.4	8.4		0.14											0.14				Tr					2%				Sp		-	15	St				As above, calcite along fracs, weak Sp in wisps
388.4	400.4	12.0		0.04											0.04									5%				-	St	-		St	Sed(?)			Highly fractured cohesionless rock over most of interval
400.4	410.1	10.3		0.03											0.03									5%					St			St	"			As above, high core loss, caving of hole. Gouge material
	EOH																																			

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO- SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. F-203
Page 1 of 1 Pages
Collar Elev 2751.59 Final Depth 271.5
Coords. N 27,847.78 E 31,185.46
Inclination Vertical
Logged by J.W.C.
Date: Start 6-27-69 Finish 7-2-69

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	N S	Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0	23.0	23.0																-													-			-	—		Rx B.T
23.0	30.2	7.2		.06				55										st			md								md	st	3			Sp			very stly altd + oxidized Sp?, brick red, argillaceous, friable
30.2	39.0	8.8		.05				91										st			md								md	st	3						as above ok CuOx in clay
39.0	49.0	10.0		.05				82										st			md								md	st	4						as above, becomes less broken + altd
49.0	59.5	10.5		.02				87										md			wk								md	st	7						less stly altd + oxidized, sugary qz, locally broken
59.5	63.5	4.0		.01				65										md			wk								md	st	7						as above; lim along fracs, otherwise rx is bleached mdly, wk CuOx
63.5	77.1	13.6		.01				59										md			wk								md	st	9						stly-mdly altd + bleached, lim in vein along fracs, rust colored
77.1	86.2	9.1		.01				91										md			wk								md	st	15						as above, more sugary qz
86.2	96.4	10.2		.01				92										md			wk								md st / wk md		15						mdly altd + bleached, feldspar strongest altd, sugary qz
96.4	106.0	9.6		.01				90										md			wk								wk	md	20			Sp			as above, locally rx is relatively fresh, sugary qz
106.0	111.5	5.5		.01				87										md			md								md	st	5	+		Sp / Mz	106' 109' 113'	90° 60°	bx zone, locally st lim + hem 106' to 111'; ser repl. bio in Mz?
111.5	123.2	11.7		.03				100										md			wk								wk	md	5	2					vertical to 60° contact between Sp + Mz; Mz - altd felds, md altd chlor
123.2	135.7	12.5		.12				74							✓			wk	<1										wk / md	md	5	4			sulfides		broken 113.5' to 118; beginning wker oxidation, md altd felds, wkly altd chlor
135.7	150.0	14.3		.12				82							✓			tr	1										md	md	5	4					as above feldspars fairly fresh - md altd, py + cc, bx at 148'
150.0	153.7	3.7		.29				100							✓	✓		-	2		-			Tr					wk	wk	10	4		Mz / Sp	150.1'	30°	150.1' - contact wet Mz + Sp.; fg., disem chl + py; dk gray; wk altd
153.7	162.5	8.9		.20				98								✓			1					Tr					wk wk		15	4					f.-m.gr. hard, siliceous, wkly altd, fine disp py + cp, no visible sp
162.5	171.0	8.4		.21				88								✓			1										wk wk		20	4					wkly altd, md-st silic. fractures
171.0	180.1	9.1		.15				93								✓			1										wk wk		20	2					as above; disem cp + py
180.1	193.0	12.9		.22				96								✓			1										wk wk		20	2					wkly altd, md silicification, cp locally med.-large grained.
193.0	201.6	8.6		.21				97								✓			1										wk wk		20	2			Jointing	45°	f.-m. gr, med-st silic., wkly altd, dis. py, wk (<1%) cp, tr cc
201.6	211.0	9.4		.22				91								✓			1										wk wk		20	2					as above, tr cp
211.0	220.7	9.7		.18				81								✓			1										wk wk / md md		20	2			Shear jointing	60°	as above, shear zone 214.2 - 218.9 w/ster altd - clay gouge
220.7	230.8	10.1		.24				79								✓			1										md / wk		20	2			226'		as above; bx 226 t. 231' w shear, locally st silic., <1% cp
230.8	244.5	13.7		.29				94								✓			1										md md		15	4			Jointing	45-90°	mdly altd, broken, ster chlor., wk cp, vugs
244.5	253.6	9.1		.19				95								✓	✓		1					Tr					wk wk		15	4					wk-md alta, lis py + p, jointing w. minor qz, tr moly
253.6	263.4	9.8		.12				93								✓			1					Tr					wk wk		15	4					as above, solution vugs
263.4	271.5	8.1		.13				90								✓			1										wk wk		15	4					as above
EOH																																					EOH
				Average Recovery:				87%																													

PRELIMINARY GEOLOGIC LOG
(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D 216E
Page 1 of 2 Pages
Collar Elev. 2722.42 Final Depth 903.9'
Coords. N 37,735.38 E 15,807.10
Inclination vertical
Logged by RE
Date: Start 5-1-68 Finish 5-15-68

Depth From	Depth To	Int'vl	Elev.	% Cu Total	Avg.	NS	Avg	% Core Recov	Sp. Gr.	Chrys.	Pitch	Black	Blue Green	Unknown N.S.	Cc.	Cpy.	Born
455.9	464.1	8.2		.16				94	2.56							.16	
464.1	472.7	8.6		.12				100	2.59							.12	
472.7	481.9	9.2		.10				88	2.56							.10	
481.9	490.8	8.9		.11				96	2.55							.11	
490.8	499.4	8.6		.26				98	2.58							.26	
499.4	509.8	10.4		.44		.01		95	2.65					.01		.43	
509.8	523.6	13.8		.30				96	2.71							.30	
523.6	534.3	10.7		.28				86	2.65							.28	
534.3	543.3	9.0		.24				94	2.66							.24	
543.3	552.6	9.3		.18		x		88	2.61							.18	
552.6	558.6	6.0		.26		x		85	2.57							.26	
558.6	568.0	9.4		.54		.03		93	2.80					.03		.51	
568.0	581.6	13.6		.44		.01		90	2.90					.01		.43	
581.6	590.4	8.8		.48	59.7 @ 0.47	.02	59.7 @ 0.01	89	2.70					.02		.46	
590.4	599.5	9.1		.39		.02		80	2.98					.02		.37	
599.5	608.2	8.7		.55		Nil		87	3.06					Nil		.55	
608.2	617.8	9.6		.44		Nil		90	2.76					Nil		.44	
617.8	625.9	8.1		.20				90	2.70							.20	
625.9	634.9	9.0		.28				78	3.07							.28	
634.9	644.2	9.3		.39				91	2.67							.39	
644.2	654.1	9.9		.35				87	2.62							.35	
654.1	663.2	9.1		.22				90	2.65							.22	
663.2	671.3	8.1		.08				97	2.68							.08	
671.3	680.5	9.2		.07				87	2.62							.07	
680.5	689.2	8.7		.22				96	2.87							.22	
689.2	698.7	9.5		.17				97	2.70							.17	
698.7	708.3	9.6		.15				97	2.74							.15	
708.3	716.6	8.3		.16				90	2.78							.16	
716.6	725.7	9.1		.14				98	2.74							.14	
725.7	735.4	9.7		.12				93	2.67							.12	
735.4	744.0	8.6		.20				97	2.83							[illegible]	
744.0	753.5	9.5		.26				88	2.79							.26	
753.5	761.3	7.8		.22				89	2.65							.2	
761.3	770.3	9.0		.16				100	2.61							[illegible]	
770.3	779.1	8.8		.15				98	2.61							.5	
779.1	786.1	7.0		.14				100	2.66							.4	
786.1	796.2	10.1		.15				90	2.68							.5	
796.2	808.5	12.3		.13				74	2.63							.3	
808.5	817.3	8.8		.11				97	2.65							.1	
817.3	827.0	9.7		.20				90	2.63							[illegible]	
827.0	835.1	8.1		.14				100	2.67							[illegible]	
835.1	844.7	9.0		.16				100	2.66							[illegible]	
844.7	853.6	8.9		.13				97	2.63							[illegible]	
853.6	862.6	9.0		.16				94	2.61							[illegible]	

Depth From	Lim.	Py	Mag.	Hem	Spec.	Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip
455.9		2										md	md ST	2	40	-	AK		
464.1		2										md	md ST	5	45	-	"	Qtz Sulf Veins	75°
472.7		2										md	ST	2	42	-	"	Fault 478.0'	65°
481.9		2						.0216				md	ST	2	42	-	"		
490.8	-	1-2	-	-	-	-	-	?+	11	-	10	md	ST	-	30	3%	AK	Shears 499.4	≈90°
499.4	-	<1	-	-	-	-	-	.0058	10	3	80	-	-	-	-	Tr	Hf		
509.8	-	≤1	-	-	-			.0048	10	3	80	-	-		-	Tr	Hf		
523.6	-	1	-	-	-			.0165	10	Tr	85	-	-	-	-	Tr	Hf		
534.3	-	1	-	-	-			.0016	5-10	Tr	85	-	-	-	-	Tr	Hf	543.3	
543.3	-	2	-	-	-	-	-	[illegible]	3	-	-	Tr	md	-	3	ST	SP?		
552.6	-	2	-	-	-	-	-	-	3	-	-	Tr	md	-	3	ST	SP? (Diop?)	558.6	
558.6	-	2	-	-	-	-	-	.0192	5	10	80	-	-	-	-	Tr	Hf		
568.0	-	2	-	-	-	-	-	.0108	5	20	70	-	-	-	-	Tr	"	¼" py vein	60°
581.6	-	2	-	-	-	-	-	.0010		10	75	-	-	2	2	?	"	590.4	
590.4	-	2	-	-	-	-	-	.008	8	40	40	-	-	2	2	?	Tr		
599.5	-	≈4	-	-	-	-	-	-	5	40	40	-	-	-	-	-		Sulfide veinlets	≈90°
608.2	-	≈4	-	-	-	-	-	-	3	10	70	-	-	-	-	-	Diop? Hf		
617.8	-	2	-	-	-	-	-	-	3	10	70	-	-	-	-	-	"		
625.9	-	1-2	-	-	-	-	-	-	5	10	70	-	-	-	-	-	"		
634.9	-	1	-	-	-	-	-	-	5	10	80	-	-	-	-	-	"		
644.2	-	1-2	-	-	-	-	-	-	5	10	80	-	-	-	-	?	"		
654.1	-	1	-	-	-	-	-	-	3	5	85	-	-	-	-	2?	"		
663.2	-	1	-	-	-	-	-	-	2	5	85	-	-	-	?	-	"		
671.3	-	1-2	-	-	-	-	-	Tr	2	10?	85	-	-	-	-	-	"	Bedding?	60°
680.5	-	<1	-	-	-	-	-	-	20	20	55	-	-	3	3	-	limey garnet Hf		
689.2	-	<1	-	-	-	-	-	Tr	10	30	50	-	-	-	-	-	garnet Hf		
698.7	-	<1	-	-	-	-	-	-	5	40	40	-	-	-	-	-	Tactite		
708.3	-	1	-	-	-	Tr	-	-	5	40	50	-	-	-	-	-	"	Gypsum veins	60°
716.6	-	<1	-	-	-	-	-	-	2	65	30	-	-	-	-	-	"	Tactite Hf "Contact"	55°
725.7	-	<1	-	-	-	-	-	-	7	25	70	-	-	-	-	-	Hf		
735.4	-	<1	-	-	-	-	-	Tr	2	30	60	-	-	2	2	-	Tr or Hf		
744.0	-	1	-	-	-	-	-	Tr	1	20	50	Tr	Tr	5	5	wk	TT c̄ MZ	py veins	90°
753.5	-	1	-	-	-	-	-	-	5	5	40	Tr	Tr	5	5	wk md	Hf / MZ	757.2	
761.3	-	1	-	-	-	-	-	Tr	Tr	-	-	wk	md	1	10	md	MZ		
770.3	-	1	-	-	-	-	-	Tr	-	-	-	md	md ST	-	10	ST	"		
779.1	-	1	-	-	-	-	-	-	-	-	-	md	md	-	20	ST	"		
786.1	-	2	-	-	-	-	-	Tr	-	-	-	md	md	Tr	10	md	"		
796.2	-	2	-	-	-	-	-	-	-	-	-	md	md	Tr	15	md	MZ / PM And / MZ	802.0-803.2	
808.5	-	1	-	-	-	-	-	-	-	-	-	md	md	?	20	md	"		
817.3	-	1-2	-	-	-	-	-	-	-	-	-	md	md	1	15	md	"		
827.0	-	1-2	-	-	-	-	-	-	-	-	-	md	md	1	15	md	"		
835.1	-	1-2	-	-	-	-	-	-	-	-	-	md	md	1	15	md	"	Qtz py vein	60°
844.7	-	2	-	-	-	-	-	Tr	-	-	-	md	md	5	20	md		"	65°
853.6	-	2	-	-	-	-	-	-	-	-	-	md	md	3	20	md			

Depth From	Remarks
455.9	md-ST Alt., No c.c., ST cpy, mineralized Sed. caving from above.
464.1	As Above, 3-4% Total (Hypogene) sulfides
472.7	Broken c̄ gougey, otherwise as above.
481.9	Numerous small holes in alt RK-like small solution cavities, md-ST Alt.
490.8	Xenoliths of min. Hf in AK. AK becomes finer grained along contacts.
499.4	Light green-tan, f.g., limey diop (?) Hf., Py : cpy : ½ : 1
509.8	light green-cream color, limey, c̄ py dis. and in stringers
523.6	dark green; numerous calcite veinlets; Abundant serpentine on fracts.
534.3	As above except for vertical shears filled with quartz-calcite veins and epidote
543.3	well mineralized dark porphyritic dike, wk sil. c̄ alt, contains
552.6	plagioclase laths in a sub-diabasic texture. gradational contacts
558.6	dark green, f.g., hornfels, strongly sheared, st cpy c̄ serpentine along shears
568.0	garnet increasing; serpentine decreasing; mineralization about the same
581.6	strongly broken. ST cpy along irregular calcite veins and fractures
590.4	ST cpy in QTZ and calcite veins, cpy veinlets up to ⅛" Thick
599.5	very hard, very strongly broken; 5-7% Total sulfides.
608.2	As above only less garnet, remains strongly broken with high sulfide content.
617.8	not as strongly broken, less py than above. Fracturing is proportional to mineralization.
625.9	RK as above, fewer sulfides, Typical f.g. dark green hornfels
634.9	f.g. dk green to tan Hf. strongly broken but weakly mineralized
644.2	mdly broken, serpentine c̄ calcite in fractures; About 3% dis py c̄ cpy
654.1	mottled texture, white to dk green; very hard, dense, f.g., wk sulfides
663.2	As above, rock is not acid reactive, except for calcite in fractures.
671.3	v.f.g., dense, green-tan Hf; stly Broken, wk mineralization, serp. on fracts.
680.5	coarse fabric due to aggregates of garnet, rock is more reactive less mineralized than above
689.2	Grading into tactite. Numerous veins of gypsum containing cpy.
698.7	most outstanding feature is large blebs of cpy in gypsum veins.
708.3	Thick (up to 2") gypsum vein continue; dis cpy and Tr of galena
716.6	Garnetiferous rk contains beads and xenolith like inclusions of green Hf
725.7	Garnet content decreasing; light green, f.g. Hf with aggregates of brown garnet
735.4	mineralization becomes strong where large patches of brown garnet are cut by Qtz veins, gypsum veins (secondary) cut and offset Qtz veins.
744.0	TT cut by thin dikes of MZ. Gradational contacts.
753.5	Hf to 757.2 followed by MZ porphyry with 10% pheno.s in a granular matrix
761.3	fine sugary texture persists 763.0 where there is a sharp irregular contact with a typical coarse monzonite
770.3	MZ has higher than average cpy content, 2nd Kspar, gypsum on fracts.
779.1	Gypsum: 779.1-780.0 md-st alt. c̄ silicification, 2nd Kspar
786.1	md-ST alt., occasionally st. moly
796.2	short interval of Post-mineral Andesite, MZ as above
808.5	md-st alt. c̄ silicification, sp secondary Kspar; py:cpy ≈ 1½:1
817.3	As above
827.0	As above, gypsum continues in fractures
835.1	As above
844.7	V. ST. silicification, cpy is uniformly disseminated
853.6	As above

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO- SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D 216 E
Page 2 of 2 Pages
Collar Elev 2722.42 Final Depth 903.9'
Coords. N 37,235.38 E 15,807.10
Inclination Vertical
Logged by RE
Date: Start 5-1-68 Finish 5-15-68

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green		Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem.	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE		(3) Rock Type	Structures (4) Depth	True Dip	Remarks
862.6	871.9	9.3		.12				96	2.66							.12		-	1	-	-	-		Tr	Tr			md	dk	-	20	Tr		MZ			md. ST silicification, dis py, cpy; molyb along fractures
871.9	881.0	9.1		.08				100	2.59							.08		-	2	-	-	-			Tr			ST	md	1	20	Tr					more py, sph., less silicification than above
881.0	890.1	9.1		.06				98	2.57							.06		-	2	-	-	-			Tr			ST	md md	1	20	Tr					As above
890.1	898.5	8.4		.04				96	2.71							.04		-	2	-	-	-			Tr			md	md md	1	20	Tr					As above
898.5	903.9	5.4						0	—																												(Core lost in hole.)
	EOH																																				(Note: see log for D138E for comparison of similar hornfels, monzonite sequence.)

JHC.

Final Depth 476.7'
Collar Elevation 3207.40
Coordinates 29,761.47 N; 24,901.65 E
Inclination Vertical

ASARCO
GEOLOGIC – ASSAY LOG

Property Silver Bell

HOLE NO. E-91
Sheet No. 1 of 2
Date Completed 7-15-65
Logged By JAB; CWH

Depth	Interval	Core Size	Sp Grav	Core Rec %	Core Assay - % Cu Total	Non-S	Average	Mineralization Oxides	Pyrite	Cpy	Cc	Other	Alteration Ser Clay	lim	Rock Type	Remarks
7.5	7.5	RB.	–	–	–	–	–	–	–	–	–	–	–	–	–	Rock bit
23.5	16.5	NXcl	2.51	39	.27			.27	–	–	–	gn Cu Ox	Mod ser	wk-mod lim	Mz	Sl silic, Alt, wk lim tr gra Cu Ox
39.2	15.7		2.50	48	.31	.26		.26	–	–	.05	)	)	)		as above
48.3	9.1		2.51	44	.58	.10		.10	wk	–	.48	–	)	sp-wk lim	Younger Sp @ 45.5	sl Alt mainly clay dark gray ground mass
58.9	10.6		2.41	75	1.01	.13		.13	tr	–	.88	gn Cu Ox	)	)	)	wk-mod Alt mainly clay in plag. wk cc as ex tr lim
67.1	8.2		2.31	100	1.09	.14		.14	tr	–	.95	)	)	wk lim		as above tr py cc very finely diss. sp spi wk-mod lim tr mag
75.1	8.6		2.37	100	.87	.14		.14	tr	–	.73	)	wk-mod	wk-mod lim sp jar	)	as above, sp py on vns & very finely diss. wk lim. rock dry prow
85.6	9.9		2.46	85	.98	.27		.27	–	–	.71	)	mod	)	)	as above, wk jar wk lim. tr gra Cu Ox
94.3	8.7		2.49	90	.69	.29		.29	–	–	.40	–	wk-mod	wk lim sp jar	)	as above tr py on fracts & disc wk lim, jar. wk silica on fracts
103.7	9.4		2.49	90	.55	.19		.19	tr	–	.36	gn Cu Ox	)	)	)	as above
111.3	1.6		2.52	97	.83	.21	1574	.21	Sp		.62		wk-mod ser & clay	)	)	wk-mod Alt wk lim on fracts, tr py notice off to tr ser
120.2	8.9		2.57	96	.82	.29	@	.29	)		.53		)	sp lim jar	)	as above, wk cup. on fracts, sp lim, jar.
129.3	9.1		2.58	94	.96	.29	18/16	.29	)		.67		)	)	Λ	as above, wk cup on fracts & diss. replacing cc? sp lim jar
141.4	12.1		2.59	68	.80	.28		.28	wk		.52	Tr MoS2	wk ser & clay	)	Sp @ 131.5	sl silic wk-mod py on fracts tr lim, jar
153.0	11.6		2.61	71	.69	.04		.04	)	.15	.50	)	)		)	sl silic wk py on fracts, spec, jar, chlor.
162.3	9.3		2.70	90	1.06	.06		Tr Cu Ox .06	)	.02	.98	)	Mod ser & clay	Tr lim	)	Mod-sl silic, mod pervasive gra chlor Alt wk-mod py on fracts wk
170.4	8.1		2.65	90	.69	.06		.06	sp-wk	.05	.58	–	)	wk lim wk-mod lim	)	As above mod Alt wk cc, patchy wk lim
179.0	8.6		2.65	96	.67	.03		.03	sp	–	.64	–	)	)	)	sl silic mod-sl pervasive gra chlor alt wk py along w/ sp, tr MoS2 sp lim
188.0	9.0		2.65	98	.38	.04		.04	tr-wk	–	.34	sp MoS2	)	)	)	as above tr sp py, wk lim
196.6	8.6		2.60	99	.65	.11		.11	wk(+)	tr	.54	sp MoS2	)	)	)	as above
205.5	8.9		2.63	95	.17			.01	mod(-)	.05	.11	–	wk-mod clay-ser	)	Silica rock Sp? @ 203.2	Sp as above to 203.2. Complete silic bleaches & destroys text of
214.2	8.7		2.62	92	.22			.01	)	.05	.16	–	mod ser clay	)	Grad. Sp Bx @ 212.4 Sp @ 224.7	Wk to pink color faint text suggests 2nd k sed
223.9	9.7		2.50	86	.16			.01	Sp	–	.15	–	)	)		bx is patchy w/ sil Sp. Frgx of silica in matrix of dk sediment Cal stgs @ about 75°
232.4	8.5		2.35	97	.15			.01	sp-wk	–	.15	sp bar	)	)	Sp @ 230	Ark appear. Sp to 230 then arg. sp. wk py, sp-wk cc.
241.4	9.0		2.67	89	.12			–	wk	.05	.07	Tr MoS2	wk ser	–	Grad. Sp Sp @ 238	Sl arg. sp to 238 then Ark. appear Sp wk-mod py, sp cc, sp
250.1	8.7		2.65	93	.01			–	tr-sp	–	.01	–	sp-wk ser clay	–	)	Ark appear Sp wk-mod py diss & in veins
258.7	8.6		2.66	95	.02			.01	tr	–	.01	–	)	Tr lim wk	)	As above but no visible cc, diss ? in veins. some leach on veins
267.6	8.9		2.47	92	.06			.02	tr	–	.04	–	)	)	)	Ark and appear Sp. Most ~~Spec~~ veins are leach. wk diss py.
276.7	9.1		2.58	84	.10			.06	tr	–	.04	sp-wk cup. on fracts	)	sp-wk lim	)	As above
285.9	9.2		2.61	96	.12			.04	tr	–	.08	–	)	)	)	" " veins mostly leached. Sulf are diss.
295.0	9.1		2.61	93	.13			.01	tr	.03	.09	–	sp ser clay	)	Sp @ 292	" " to 296.2 bx and appear Sp & f. gray per. dark dikelets cut also non m. Sp
303.5	8.5		2.69	95	.41	.01		.01	wk	.20	.20	Tr Sphl	)	wk lim	)	dk gy text wk fracts mod silic wk-mod cpy sp py cc
312.7	9.2		2.59	93	.27			.01	)	.20	.06		)	)	)	as above sp cpy tr py
321.9	9.2		2.59	96	.33			.01	)	.27	.05		sp-wk clay, ser	)	)	as above no cpy wk py, sp cc
330.9	9.0		2.68	93	.36			Tr	)	.36	Tr?	Tr MoS2	Sp ser-clay	Sp lim	)	dk gy to lk gray ground mass text wk Alt silic patchy w/ dk sp py
339.9	9.0		2.61	93	.55	.01		.01	)	.55	Tr?	)	)	)		lgt gy, mod w/ patchy sl silic sp py
349.0	9.1		2.57	96	.12				Sp	.12	Tr?		)	)	Sp @ 341.7	as above to cut. Cal brecciated w/ sp iatrixing wk-mod Alt w/ sil
358.5	9.5		2.56	97	.01			.01?	Sp-wk				)	wk lim		as above
367.6	9.1		2.67	97	.02				sp	.02?			)	)		dk gy to lk gray mod Alt wk disp sec? sp no discernable ex

Final Depth 476.7'
Collar Elevation 3207.40
Coordinates 29,761.47 N ; 24,901.65 E
Inclination Vertical

ASARCO

GEOLOGIC – ASSAY LOG

Property Silver Bell

HOLE NO. E-96
Sheet No. 2 of 2
Date Completed 7-15-65
Logged By JAB, CWH

Depth	Interval	Core Size	Sp Grav	Core Rec %	Core Assay - % Cu Total	Non-S	Average	Mineralization Oxides	Pyrite	Cpy	Cc	Other	Alteration Sericite	Chlor	Rock Type	Remarks
377.1	9.5	NX	2.53	95	0.10				sp	.08	.02	Tr MoS2 Tr MoS2	sp	sp Jar sp Sim	Alk @ 377.5	Sp st Alt & broken 3626 to cont. Alk wk-Mod Alt wk py
385.0	7.9		2.54	100	.29				sp-wk	.29		Tr MoS2 Tr Galena		sp Jar		Mod-st Silic. wk py cpy w/gtz Tr cov. Ne
393.9	8.9		2.51	97	.19					.19		Bot'n				as above wk chlor
423.0	7.1		2.54	100	.14					.14						as above sp-wk py, cpy
412.0	9.0		2.59	97	.28					.27	.01	tr MoS2				St silic in Alk w/patchy Mod Alt Ms. sp py tr cpy, MoS2
420.9	8.9		2.58	100	.31					.30	.01					as above
429.7	8.8		2.59	92	.15					.15	tr		tr			St Silic, patchy wk chlor Alt. sp py cpy, tr MoS2
438.9	9.2		2.58	96	.16					.16	tr	—	sp-wk			Mod Alt w/ser, chlor, Mod silic wk diss py + cpy
448.0	9.1		2.59	93	.16					.16	tr	tr MoS2				Mod Alt, as above, Mod-st silic wk py wk-mod cpy, tr MoS2
456.6	8.6		2.56	92	.14					.14	—	tr MoS2	sp			as above
465.8	9.2		2.56	97	.15					.15	tr	tr Galena w/ Jar	wk-mod			Alt & Silic as above wk gtz w/ ex-mod cpy on fracs wk py tr MoS2
476.7	10.9		2.55	87	.10					.10	-	tr MoS2 wk Jar	Mod (-)			Alk bxiated + recemented w/gtz Mod-st Alt Silic tr cpy wk py tr MoS2
E.O.H.		Avg. Rec'y =		88%												

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO- SILVER BELL UNIT

Notes:

(1) Est. % Cu represented by each mineral

(2) Est. mineral %; or, as follows: Trace (Tr); Sparce (Sp) < 5 %
Moderate (Md) 5 - 50 %
Stong (St) + 50 %

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. 2126 RA
Page 1 of 1 Pages
Collar Elev. 2728 71
Final Depth 660.0
Coords. N 37,872 92 E 15,669 16
Inclination VERTICAL
Logged by R.E. + W.R.N
Date: Start 8-15-67 Finish 8-22-67

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Wh NS	Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb.	Calcite	Garnet	Silicates	Sericite	Clay.	Vn. Qtz	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
384.0	393.6	9.6		0.41		Nil										0.41			2%				Tr		Tr	2%	6%	-	-	-	-	SP	Silic HF	min Veins	50-90	Green HF with brown garnets, calcite veinlets. Some CPY - smeatly in veins
393.6	400.9	7.3		0.43		"										0.43			1%						Tr	2%	5%	-	-	-	-	SP				As above, green alteration product may include serpentine. Light green-buff. Sparce QTZ veining and moderate silicification of rock
400.9	408.8	7.9		0.37		"										0.37			<1%						Tr	2%	5%	-	-	1	<10	SP				
408.8	417.9	9.1		0.46		"										0.46			<1						Tr	2%	5%	-	-	1	<10	SP				As above with very thin coatings of Native Cu along steep veins. Contains moderately siliceous. CPY and moly along QTZ-Calcite veinlets. Native (?) along steep veins, fractures. Native Cu (?) may be hem. after mag.
417.9	427.2	9.3		0.72		.02								.02		0.70			<1						Tr+	1%	4%	-	-	2	<10	SP				
427.2	436.1	8.9		0.34		.02								.02		0.32			<1						Tr	2%	4%	-	-	3	<10	SP		1/2" QTZ Vein 432	40°	
436.1	438.5	2.4		0.33												0.33			<1						Tr	5%	4%	-	-	-	SP	SP	Silic HF			As above. Prominent calcite veining.
438.5	442.6	4.1		0.03												0.03			-						-	3%	-	-	-	-	-	md	An			Less silicified than overlying HF. Dark green unmineralized andesite. Sharp contact with HF. Small white feldspar phenocrysts. Acid reactive.
442.6	453.0	10.4		0.58		NIL										0.58			<1						Tr	6%	4%	-	-	1%	SP	SP	Silic HF	Few min 8" Vein 447	70°	Green - brown HF with large no. of thin calcite veins and thicker pre-calcite QTZ veins carrying CPY, moly. Acid reaction.
453.0	461.5	8.5		0.38		NIL										0.38			1%						Tr	10%	6%	-	-	<1%	SP	md				Increased chloritization, garnetization. 3/8" calcite veins, stearinregular, bordered by thin zone of mineralized QTZ
461.5	470.0	8.5		0.23												0.23			1%						-	7%	6%	-	-	<1	SP	SP				weakly silicified, acid reactive. Steeply dipping QTZ-calcite veinlets with SP mineralization
470.0	478.1	8.1		0.27												0.27			<1%		Tr				-	5%	5%	-	-	<1	SP	SP				As above
478.1	486.6	8.5		0.10												0.10			<1%		Tr					5%	5%	-	-	<1	SP	md				As above, SP mineralization along thin veins
486.6	496.1	9.5		0.31												0.31			1%							3%	7%	-	-	1%	SP	SP				Increased silicification, increased sulfides along veins. Faint mineral banding - relict bedding - Dips 40°
496.1	504.7	8.5		0.21												0.21			<1%	Tr						2%	7%			2%	10	SP		min Veins	70°	Barely reactive. large blebs of CPY in QTZ veins
504.7	513.8	9.1		0.27												0.27			<1%	Tr						2%	5%			1-2	>10	SP				Fine grained, silicified. Rest appears to have originally been siliceous
513.8	523.0	9.2		0.16												0.16			2%							2%	8%			2%	>10	SP				Unreactive except for thin calcite veins. Hard, green-brown
523.0	531.4	8.4		0.26												0.26			2%							2%	8%			1%	>10	SP				Strong Moly From 528' to 529'
531.4	539.9	8.5		0.24												0.24			1-2%							2%	8%			1%	>10	SP				Fine grained, unreactive. Only Trace of visible moly.
539.9	547.8	7.9		0.27												0.27			1%							2%	8%			3%	>10	SP				Strong moly and CPY in vertical vein at 542'
547.8	556.4	9.6		0.36												0.36			-	1%	-	-	-	-	-	0.03%	3%	20%	-	-	1%	50%	Tr				This Pk is and has been a hornfelsic fine-grained gneiss or silt St. - It is dense, hard v. pale grn.-tan. Chlorite is as blebbs. Calcite occurs in tns. Sp PY + Tr SPY & Tr moly. In fract. v. lgn. gar + pale Silicates intergrained w/ v.l.gr. glc. - CPY so PY Ratio approaches 1:1
556.4	564.3	7.9		0.32												0.32			2%	Tr	Tr	-	-	-	-	Tr	5p	15%	35%	-	-	1%	40%	Sp				
564.3	573.1	8.8		0.24												0.24			<1%	-	-	-	-	-	-	Tr	Tr	5p	1%	50%	-	-	1%	40%	Sp				There apparently is a unknown intergrowth of v.l.g. glc + Trem (??) in the grnd mass. Gnr. is blocky & frosty. Contains A.S. Gnr. Zone occurs in the interval 578-581.5 CPY to PY Ratio > 1
573.1	582.0	8.9		0.16												0.16			-	1%	Tr	-	-	-	-	Tr	Sp	1%	50%	-	-	-	40%	Tr	Bxd. Fr. 578.8 to 581.5	45°-60°	
582.0	590.9	8.9		0.12												0.12			-	0.5%	-	-	-	-	-	Tr	0.02%	1%	5%	50%	-	-	2%	20%	Tr	Possible Bxd. Formation 2" 583.2	55°	Lt. Grn + Tan, v. dense + Silic (?) Hf. Carb. Some gnrd along fracts + possible beds. Tr-Sp PY, Tr CPY.
590.9	599.0	8.1		0.18												0.18			-	1%	-	Tr	-	-	-	Tr	0.02	1%	5%	60%	-	-	1%	20%	Tr			Rk. Some what more limy - more upon spec. - Local disem of v.l.gr. Silic
599.0	607.6	8.6		0.23												0.23			-	0.5%	-	-	-	-	-	Tr	0.02	2%	5%	60%	-	-	1%	20%				Densely grown v.l.gr. lt. grn + Tan Hf. Relict sk. v. hard. As Above
607.6	614.0	6.4		0.12												0.12			-	0.5%	-	Sp	-	-	-	Tr	Tr	1%	4%	60%	-	-	3%	20%				As Above
614.0	622.0	8.0		0.27												0.27			-	0.5%	-	Sp	-	-	-	-	0.02	Sp	2%	70%	-	-	1%	20%				As Above. - Sp Sulfs on fracts. - Tr of MnCO3 -
622.0	631.0	9.0		0.19												0.19			-	0.5%	-	-	-	-	-	Tr	Tr	Sp	2%	70%	-	-	-	20%				As Above - Gnr. occurs as small pods and v. sparsely along some fracts
631.0	636.3	5.3		0.03												0.03			-	0.2%	-	-	-	-	-	-	-	Sp	45%	40%	-	-	0.5%	10%		Car-well-Tr 633 634	635	Car development becomes stronger. starts as v.l.g. and v. becomes medium sr. well-Trem occurs from 633-634
636.3	644.3	8.0		0.02												0.02			-	0.3%	Sp	-	-	Tr	Sp	40%	35%	45%	-	-	Tr	?	?	Car + Trem Tr 634 Tr To 641 - Trem limy Tr 641 - 644			Gnr. intermixed w/ Lt. gra. Silic Hf to 641. Thin rk becomes med green - limy - med hard Hf probably somewhat calcar.
644.3	652.5	8.2		0.18												0.18			-	0.2%	-	Sp	-	-	-	Sp	1%	25%	30%	-	-	Tr	?	5%	Car. Trem 644 to 652.5		Rk contains to be more limy, softer + contain slightly more CPY.
652.5	658.0	5.5		0.15												0.15			-	0.2%	-	Sp	-	-	-	Tr	Sp	<1%	60%	-	-	1%	15%	?	Car. Trem 652.5 to 658.0 Trem Sp to gra. Hf Tan. bands		Less gnr. more well. Trem back into lgr. Silic Hf.
658.0	660.0	2.0		0.50		0.01					0.01					0.49			-	0.5%	-	Wk	-	-	-	Tr	Tr	Sp	<1%	80%	-	-	<1%	5%	?		Bxd ? 70°	Rk shows what appears to be v. Tan bedding (1/4") and is steeply dipping increase in CPY content. Rock looks like abrigo
E.O.H.																																					

RE-ENTRY OF OLD CHEN DRILL HOLE

Final Depth 215.3'
Collar Elevation 2,791.83
Coordinates 35,818.68 N; 18,256.46 E
Inclination VERTICAL

ASARCO
GEOLOGIC – ASSAY LOG

Property SILVER BELL

HOLE NO. D-220
Sheet No. 1
Date Completed 5-3-67
Logged By N.R.N.

Depth	Interval	Core Size	Sp Grav	Core Rec %	Core Assay - % Cu Total	Non-S	Average	Mineralization Oxides	Pyrite	Cpy	Cc	Other	Alteration		Rock Type	Remarks
0.0-10.5	10.5				.06			.06				wk MnO	Sp Chl, Sp epidote, wk Mag		QTZITE	Med grained Qtzite, wk Mag; Wk Alt'n of a tr calcareous biotite mineral occasional veinlets + surrounding grains. Sp limo in fracs.
19.2	8.7				.05			.05				wk MnO Mod MnO				As Above w/ wk-Mod MnO Assay w/a yellow-brown clay like mineral.
27.9	8.7				.41	.16		.16	<1%	.15	.10	wk Mn-Sulf		Sulf @ 23'	Recrystallized Qtz to 19.2 50° dip in Ht zone 19.6-20.6	There is also more of the salmon-brown mineral. Sp limo. Recrystallized med grained Qtz of 19.2; Fine grained at brown Qtzite 50° dipping Ht zone 19.6-20.6. The Recrystallized Qtz is cut by Mn-Sulf veins up to 1/8" wide, which carry wk Mn assay w/ magnetite
38.2	10.3				.19			.05	Tr	.10	.04	Mod-st Mn, some Mn Ox, wk Chl	St Gray in Ht, wk Chl		20.6 w/ Green Ht 28.5 Tr Sulf 33.7-35.7 35.7-38.2 Contact Ht	Remarks Recrystallized Qtz has st chloritic w/ Chl + Mag; The Ht Green Ht is v fine grained but is wk mag + is wkly dis trumble. The Tr is at the dark brown. This is somewhat intermixed w/a Chl, some Qtzite, intermixed from 35.7 on Ht is fine grained and has which non-garnet mineral. This is bra wkly by St MnO + appears as a pale mineral which may be Rhodochrosite
47.6	9.4				.04			.02		.02		Mod MnO	St Gray, Mod wkly Calc Silicate		Bedding at 30° intermixed Ht + Qtzite 46 to Tr 47.6	Garnetized Ht to 44.1' then Hornfels qtzite. The garnetized Ht has intermixed zones of tan V finely calcareous cream colored mineral at 44.1' There is a 50° contact followed by intermixed Qtzite + Ht moderate Rhodochrosite.
54.4	6.8				.38			.15	>1% Sp	.20	.03	wk MnO Mod Mag	Mod Gry + wkly Calc Silicate		Rx is in 46.6-54.3	Mod Stained Qtzite to 47.8' The St Mag + Mn Ox Tr. To 49.6 where has 70% of w/ Hornfels rock which grades into a fine-med grained recrystallized Quartzite which is cut by irregular wk Sulf veinlets which have Cpy associated. @ 54.3' w/ a 50° dip a cream colored Hornfels which is moderately stained by CuOx.
56.4	2.0				.30			.15		.15			St white Calc Silicate wk Chlor		54.3 Hornfels w/ Tr Sulf 54.3-56.4	
65.9	9.5				.03			.03	>1%			Sp Mag, Sp wk MnO wk Mag	St Gray w/ Sp Mag As Above w			Rx Composed of intermixed Brown Qtz + fine grained white Ht, Rx is Magnetite as a reactive Bubbles of by w/ wk magnetite at end of run; Sp cpy
75.4	9.5				.11			.02	5%	.09	—	Sp MnO	Wk Garnet	Mod Wk	Tr @ 72.5	which Ht v fine grained w/ wk chlor on fracs, wk Py + Sp Magnetite green Tr. There is an increase in epidote till mod Py + mag also Mod; At 72.5' a brown garnetic w/ mod Py; The Ht is wkly Recrystallized + Tr is a
84.2	8.8				.02			Tr	20%	.02	—	40% Mag	Trem, gar	Sp Chl	Magnetite Py Cpy Tr @ 75.5	Rx is composed of 30% Rind of magnetite ale, 15% Py. The remainder of the Rx being Qtz, Tremolite + other calc. silicates
92.5	8.3				.16			Tr	30%	.16	—	40% Mag 5% Cpy	St Gr Gar, Trem	St Gr wk	Trem-Gar Ht 92.5-96.3	Mag 20% Py 30%, Tr Galena, St Gr, mod Tremolite
100.9	8.4				.11			Tr	40%	.11		Mod Mag 20% Mag	Gr Trem	Lim wk-Mod	Massive Py w/ Mag Gar to 96.3	Tremolite Ht w/ Massive Py to 92.5 Then Rx is almost wholly replaced w/ Py and lesser Magnetite
109.7	8.8				.06			Tr	65%	.06		2% to 3%	Trem	Lim		Rx is 70-80% Coarse Py w/ 15-20% Magnetite veinlets; mod Chlor + Sp Silicates.
118.8	9.1				.07			Tr	85%	.07			Trem	Lim Sp wk		Massive fine to coarsely crystalline Py associated w/ 10-15% Mag (magnetite?) Ht. In general there is a moderate amt of open space
127.8	9.0				.05			Tr	15%	.05		80% Mag	Trem	Wk Lim	Massive Mag w/ Py @ 127.7	Mass of Py w/ 5% Mag to 127.7 Then Transition Zone to 132.7 where Magnetite begins to make up about 70% of the volume; Sp Cpy is associated w/ the mag; within the Mag the Sulf becomes high yellow + may be a Cpy bearing sphalerite Py at disc just a trace.
137.1	9.3				.04			Tr	10%	.04		75% Mag	Trem	Wk Lim	Mag Decreasing Py Increasing Dolomite Magnetite	60% Mag, 20% Py; 20% Chlor-Tremolite; Mag + Py f.g.
145.3	8.2				.04			Tr	20%	.04		60% Mag	Trem-Garnet	/	Tr Sulf at 140.5' 143.2'	mod alone + intermixed as blebs. Py increases to about 60% at 143.5' Then Py drops off to about 5% and the rock becomes 50% fine grained Amber brown garnet w/ 30% Mag occurring as clusters of Radiating Acicular xls. Py Then is Mag w/ lesser Py assoc w/ wk alt'n Trem Ht
154.5	9.2				.06			Tr	40%	.06		40% Mag	Tr Gar	Wk-Mod Lim		Continuing variations as above. Py-Mag 60-80% of Rx.
163.3	8.8				.02			Tr	40%	.02		40% Mag 3% Sph 35% Mag	Sp Gar Sp Trem	Wk Lim		As Above. Mag intermixed w/ Py as masses of small grains and in radiating acicular xls. Py contains Sphalerite Trace mag
172.2	8.9				.02			Tr	50%	.02		Sp Mag	Trem-Epidote Mod Gray-Sw-Clay	/ Lim		Radiating magnetite in Garnet w/ Py varying from 15%-60% of Rx
177.3	5.1				.01			.01	Sp							Py + mag intermixed w/ minor gar + Tremolite
180.7	3.4				.02			.02	Sp				/	/	Rx @ 177.6'	Med grained Plagio fels are altered to point of hornfels w/ hazy borders, but is wkly altered to Chlor, Rx contains wk mag + Py as disseminations. There is also a lim on fracs.
183.3	8.6				.05			Tr	Sp	.05			St Alt, Chl, Mn Qtz	Wk Lim		Mod St Alt, Mod Sil'n; mod-st epidote 183'-186', Sp Sulfs, mod lim
197.9	8.6				.09			Tr	Sp	.06		Covellite .03	/	/		Mod Alt, wk Sil'n Mod flooding, wk Sil'n, Mod Alt to Chlor, Tr Py, Sp Mag
209.2	11.3				.09			Tr	2%	.09			/	/		Apparently wk Alt; plagio fels only wkly altered. The bio is only wkly alt to chlor; wk flooding of silica + some K-spar; Sp Py + Mg
215.3	6.1				.10			Tr	1%	.10			/	/		As Above w/ the additional development of metamorphosis is some of the plagio. fels.
E.O.H.																

E.O.H.

Final Depth 1065.0
Collar Elevation 2736.56
Coordinates 37,704.65 N, 15,382.87 E
Inclination Vertical

ASARCO
GEOLOGIC – ASSAY LOG

Property Silver Bell

HOLE NO. D-219
Sheet No. 1 of 4
Date Completed 5-4-67
Logged By JAB

Depth	Interval	Core Size	Sp Grav	Core Rec %	Core Assay - % Cu Total	Non-S	Average	Mineralization Oxides	Pyrite	Cpy	Cc	Other	Alteration clay sericite	limi hem	Rock Type	Remarks
0.0-5.0	5.	NC	–	–				–	–	–	–	–	–	–	–	NC Starting B.H
13.5	8.5	NXWL			.19			tr grn Cu ox .19					sp clay-ser	wk Mod lim wk hem stain	AK	Sp-wk Alt, consisting of clay Alt of plag. wk hem sp lim sp llm tr fer Mots tr grn Cu ox in plag
23.4	9.9				.21			.21					wk clay ser	Mod lim sp-wk hem wk [illegible]		Wk Alt, Clay Alt of plag sp-wk chlor con in one area tr grn Cu ox in clay
33.6	10.2				.08			.08						lim		Mod Alt, still mainly clay RK crumbly 1st 2' tr cu ox in clay wk lim, hem
42.8	9.2				.02			.02						wk Mod lim wk hem wk [illegible]		As above, both felds Alt tr grn Cu ox, tr? cc wk-Mod lim, hem, tr llm
51.7	8.9				.03			.03				sp Alunite		wk lim wk hem sp [illegible]		As above, No cc wk lim wk-Mod hem tr llm
60.3	8.6				.02			.02						tr lim		Mod Alt, Sp-wk lim, wk-Mod hem stain on Alt felds
68.8	8.5				.04			.04				–		wk lim, hem, jar		As above, tr cc tr grn Cu ox tr llm
77.6	8.8				.05			.05	tr		tr				Suls @ 76.0'	As above in Ox zone Sul zone – Mod Alt, wk py sp cc wk lim on fracs
90.9	13.3				.50			.01	wk(?)	.10	.31	tr MoS2	wk clay	sp lim		Mod Alt of both felds, wk-Mod py diss ON wk lets Mod cc, wk(?) cpy tr Cu ox
96.9	6.0				.36			tr		.10	.26					Alt as above, wk py wk cc, sp cpy some aplite, sp chlor [illegible] w/ some py wins
105.4	8.5				.23					.08	.07	.08 Native Cu tr MoS2		tr lim		Alt as above, decreasing @ end run sp-wk py sp cpy tr MoS2 sp cc, sp native Cu ppt on chlor & [illegible]
113.6	8.2				.18				wk	.10	.08	tr MoS2				wk Alt. of plag, K spar fresh, suls as above
122.3	8.7				.20					.10	.10			tr lim		Alt as above, wk cpy, py, sp cc, tr MoS2
134.8	12.5				.18				wk-Mod	.15	.03					Alt increases to Mod last ½ run, sp-wk py, wk cpy, sp cc tr MoS2, All felds AH
144.9	10.1				.18					.15	.03					wk-Mod Alt; sp-wk Sil'n + Qtz-veining; wk Py, sp cpy, tr cc + MoS2
153.9	9.0				.16					.13	.03					wk Alt, sp Sil'n + Qtz veining; wk Py, sp cpy + cc, tr-sp MoS2; suls prefer plag felds
163.1	9.2				.18					.15	.03		wk clay-ser			wk + local'l Mod Alt; wk-Mod Sil'n; wk-Mod Py, sp-wk cpy, sp cc
173.9	10.8				.16				wk-Mod Sil	.15	.01					Alt As Above; Sil'n as; wk-Mod Py, sp cpy, tr-sp cc + MoS2; tr chlor
183.8	9.9				.15					.14	.01					Alt + Sil'n As Above; wk-Mod Py, sp-wk cpy, sp cc + MoS2
192.5	8.7				.22					.18	.04			tr lim		Alt As Above; Sil'n sp; wk Py, sp cpy, tr-sp cc, sp chlor, Sul'n felds + Qtz vns
201.1	8.6				.19					.16	.03					Alt As Above, wk-Mod Sil'n + Qtz veining; wk Py sp-wk cpy, tr-sp MoS2; Suls prefer plag felds. as host. usually suls right by chlor in plagio. felds.
211.0	9.9				.18					.16	.02					As Above, wkd Qtz-Sul veing is present in high angled, vns are to ¼ wide
219.6	8.6				.17				wk	.16	.01		sp clay-ser			As above, wk Alt increases toward end run wk py sp cpy, tr cc
230.3	12.7				.19				Mod	.18	.01	sp-wk MoS2	wk clay			Mod Silic Alt w/ patches of wk Alt RK, wk-Mod py, sp-wk cpy tr cc, MoS2
237.1	8.8				.24				wk Mod	.13	.06	(T) wk MoS2	wk Mod clay-ser			Alt RK Mod silic, Alt, MIN As above, ST shearing 235.1 - 236.1' with increased MoS2
247.3	8.2				.25					.20	.05	sp-wk MoS2	wk clay-ser			Alt as above wk py sp cpy tr MoS2
255.8	8.5				.15				Mod	.15		sp MoS2				Sulfide also tr MoS2, cc
264.2	8.4				.18				wk-Mod	.18						As above
272.3	8.1				.14					.14		tr-sp MoS2	sp clay ser			ST silic Alt wk-Mod py, sp cpy, tr MoS2
280.4	8.1				.10				Mod	.10		sp MoS2	sp wk clay			As above, tr cc
289.7	9.0				.21					.21		sp-wk MoS2				Mod silic Alt, Min as above, silica is derived from Qtz py, wk veins & felds sul RK
297.9	8.2				.14					.14		tr-sp MoS2				As above wk-Mod py sp cpy tr MoS2
307.0	9.1				.13					.13						Wk-Mod Alt, silic wkd almost not Qtz py-cpy veins & Qtz flooding along walls wk-Mod py, sp cpy tr cc
315.0	8.0				.12				wk-Mod	.12		tr MoS2				As above tr carbonate along fracts
323.7	8.7				.17					.17						As above
332.5	8.8				.38				wk Mod	.38			wk clay			As above
341.5	9.0				.20					.20						As above
350.4					.15				sp-wk	.15						wk Alt; wk Sil'n Qtz vns; sp Py + MoS2, tr cc; Qtz + Sul veins are v thin and high angle
359.4					.14					.14						wk-Mod Alt, Mod Sil'n + Qtz veins: wk Py sp MoS2 + cc; veins to ¼" of Sul & Qtz.

Final Depth 1065.0
Collar Elevation 2,736.56
Coordinates 37,704.65N 15,382.87E
Inclination Vertical

ASARCO
GEOLOGIC – ASSAY LOG

Property Silver Belt

HOLE NO. D-219
Sheet No. 2 of 4
Date Completed 5-4-67
Logged By JAB + NRN

Depth	Interval	Core Size	Sp Grav	Core Rec %	Core Assay - % Cu Total	Non-S	Average	Mineralization Oxides	Pyrite	Cpy	Cc	Other	Alteration Clay, Ser, Chlor	Calc. Sil.	Rock Type	Remarks
368.1	8.7				.12				wk	.12		tr MoS2	wk-Mod clay		Ak	wk-Mod Alt; Mod-st sil'n + Qtz veing; Mix as above; sil'n frac. Controlled. up to 1½" wide b.n.
377.3	9.2				.28				\	.28		\	\			wk Alt, wk sil'n; Sp-wk Py, Tr-sp CPy + MoS2; occasional carbonate seams
386.2	8.9				.39	Nil		N.I	\	.39		\	\			wk Alt; wk-Mod sil'n; sp CPy + Py, Tr-sp MoS2; Vn's to 50°-70°; Sp Biot 383'-384'; sp Py
395.1	8.9				.69	Nil		\	\	.69		\	trser			wk Alt; Mod sil'n + veing; wk CPy + Py, Tr-sp MoS2; occ-sub seams 50°-70° have sp site assay. Carbonate present
405.4	10.3				.26	Nil		\	wk-Mod	.26		\	wk clay			wk Alt; Mod sil'n + veing; sp CPy, sp-wk Py, sp MoS2; sp Carbonate
414.5	9.1				.32				\	.32		\	wk clay -Ser			wk Alt; sp-wk sil'n; sp(+) CPy, sp Py; Tr Biot, sp Chlor; salt in fracs & replacing fe
423.2	8.7				.35				\	.35		\	\		Apatite @ 423' Ak @ 424.8	wk Alt; sp-wk sil'n; sp-wk CPy, sp Py; Tr Carbonate, Tr-sp MoS2
431.5	8.3				.36				\	.36		\	\			wk Alt; Mod sil'n + veing; wk CPy, sp-wk MoS2, sp Py; veing to 70°; some Carbonate
440.2	8.7				.27				\	.27		\	\			wk-Mod Alt, wk Qtz veing + sil'n; sp-wk CPy, wk Py, sp-wk MoS2
449.0	8.8				.28				wk	.28		tr MoS2	\			wk-Mod Alt; Mod sil'n + Qtz veing; wk CPy, MoS2 + Py, wk(+) Carbonate on frac
458.7	9.7				.32				\	.32		\	\			wk-Mod Alt; wk sil'n, sp-wk CPy, sp MoS2, wk Py; Carbonate on frac
467.1	8.4				.17				\	.17		\	sp clay			wk-Mod Alt; wk-Mod Qtz veing; sp-wk CPy, sp MoS2; sp-wk Py; Carbonate on frac
475.8	8.7				.18				\	.18		\	tr ser			Alt same; wk-Mod sil'; Sp Py, Sp MoS2, Tr-sp CPy; Carbonate on fracs
484.7	8.9				.23				\	.23		tr MoS2	tr-sp clay-Ser			Mod Alt; Mod sil'n + veing; wk CPy, sp-wk MoS2, sp-wk Py; sp Chlor
495.3	10.6				.44	Nil			wk-Mod	.44		\	wk clay -Ser			Mod Alt; Mod-st sil'n + veing; wk Qtz, CPy, sp-wk MoS2; sp wk Py; Mod Carbonate
504.1	8.8				.35	Nil			\	.35		\	\			Mod Alt; st sil'n + veing; wk-Mod CPy + Py, sp-wk MoS2; Mod Carbonate
512.9	8.8				.20				sp-wk	.20		\	sp-tr clay(Ser?)		Apatite 511' Sil	wk-Mod Alt; Mod sil'n; sp CPy, Py, sp-wk MoS2; Tr Chlor; Salts in fracs
521.9	9.0				.11				wk(-)	.11		\	sp clay Ser			wk-Mod Alt; Mod sil'n; sp CPy, Py + MoS2; Carbonate on fracs; assoc. w/ Qtz. vns
530.5	8.6				.12				\	.12		\	\			wk-Mod Alt; Mod sil'n + Qtz veing; sp-wk CPy, wk Py, sp MoS2; Shale walled Qtz vns are rare
544.2	13.7				.26				wk	.26		\	\			wk Mod Alt; Mod sil'n veing; wk CPy, wk-Mod Py, sp(+) MoS2; Rk Cut by numerous
550.2	6.0				.44	Nil		Nil	wk-Mod	.44		—	—	Mass Gar	Tr Biot A 544', occasional pieces of Ak	sulfide seams. Quite Brec. Light orange-brn garnet, interspersed by green chlorite silicate; Mod Py, wk CPy sp MoS2. Salt occurs in seams, occasionally w/ sil'n; and disseminated. wk effervescence. Local occurrences of Ak first 4'. Cr indistinct
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
559.4	9.2				.50	Nil		Nil	\	.50		tr Mag	Spellar	sp epidote	Tr-Hf.	Gar decreasing and green chlorite increasing; Sp CPy, sp-wk Py, sp MoS2 Tr Actinolite. Rk weakly reactive w/ HCl. Sign of 3rd gen.
567.7	8.3				.54				\	.54		tr MoS2	tr chlor	Mass Gar		Mixture interlayering of br. brn. Gar and by green-green chlorite; relative proportions of each varies. Mod Py, wk CPy, wk MoS2. Salts occur in vns up to ½" thick.
572.0	4.3				1.23				wk(+)	1.23		wk MoS2	—	—		some associated w/ Qtz others not; some disseminations of v.f. gr. grains.
576.6	4.6				.64				wk-Mod	.64		tr MoS2		Mass Gar	Qtz ON @ 567.7-572.0 Trd 572.0	Qtz vn(s) to 2-3" Cpy 4% Cpy 1-2% MoS2. Moly in thick qtz vns
585.6	9.0				1.08				sp-wk	1.08		—	—	tr-sp epidote		Mass br. gar w/ patchy lt grn Hf. Rk is wkly limy wk-Mod Cpy w/ tr MoS2 along vnlets
594.5	8.9				1.19				wk-Mod	1.19		tr MoS2	—	\		Garnet as above, only tr chlor. wk-Mod Cpy, Cpy sp MoS2 on vnlets
603.0	8.5				1.26				\	1.26		\	\	\		As above
611.8	8.8				.86				wk	.86		\	wk-Mod chlor	wk-Mod Gar, tr epi	Chlor Hf @ 594'	hard lt grn chlor Hf, splime. wk Py, Cpy tr MoS2 on vns
611.8					.86				wk	.86		\	\	wk-Mod Gar, tr epi		As above
618.5	6.7				.96				sp-wk	.96		—	ST chlor	sp-wk Gar		limy st'y chlorite Hf, Mod finely diss. sulf. wk Py wk-Mod Cpy
621.5	3.0				2.77				\	2.77		sp MoS2	—	—	Qtz vn @ 618.5-621.5	St Cpy sp-wk MoS2 sp Py intergrown w/ white qtz.
630.9	9.4				1.60				sp	1.60		tr MoS2	sp chlor	sp Gar		chlor Hf as above Qtz vn
637.8	6.9				4.11				tr-sp	4.11		\	\	\		Rk as above, a 4" mod-st Mag. 631' wk Py Mod-st Cpy in crumbly pods
639.6	1.8				.56										Post Min Vn @ 637.8	Angle ST appears to be low angle but acc. quite broken up.
648.7	9.1				.92				\	.92		tr MoS2	sp chlor	sp Gar	Silty chlor Hf @ 639	Hf br to salmon colored s.f. st cut by web-work of chlor which at Magnetite limy
660.5	11.8				1.05				sp	1.05		\	Mod chlor	tr Gar	Qtz vn circa 661.9	wk Cpy Hf grn sil silty Hf to 655.9 wk chlor along irreg. fracs sp-wk Py, Cpy in Qtz vns wk Cpy for Avg of run

Final Depth 1065.0
Collar Elevation 2,736.56
Coordinates 37,704.65N 15,382.8TE
Inclination Vertical

ASARCO

GEOLOGIC – ASSAY LOG

Property Silver Bear

HOLE NO. D-219
Sheet No. 2 of 4
Date Completed 5-4-67
Logged By JAB + NRN

Depth	Interval	Core Size	Sp Grav	Core Rec %	Core Assay – % Cu: Total	Non-S	Average	Mineralization: Oxides	Pyrite	Cpy	Cc	Other	Alteration: Clay, Ser Chlor	Calc. Sil.	Rock Type	Remarks
368.1	8.7				.12				wk	12		tr MoS2 x	wk-Mod clay		Ax	wk-Mod Ax; Mod-st Si'a + Qtz vnlg, Ax as above; Si'a frac. Consolid. up to 1½" wide b.n.
377.3	9.2				.28				1	.28		1 x	1			wk Ax; wk Si'a; sp-wk Py, Tr-sp CPy + MoS2; occasional Carbonate seams
386.2	8.9				.39	Nil		N.I	1	.39		1 x	1			wk Ax; wk-Mod Si'a; sp CPy + Py, Tr-sp MoS2; Vn's la 50°-70°; sp Biot 383'-384'; sp PO's
395.1	8.9				.69	Nil		1	1	.69		1 x	tr ser			wk Ax; Mod Si'a + vnlg; wk CPy + Py, tr-sp MoS2; Qtz Sulf Seams 85°-90° low Sp-Cu assay. Carbonate present
405.4	10.3				.26	Nil		1	wk-Mod	.26		1 x	wk clay			wk Ax; Mod Si'a + vnlg; sp CPy, sp-wk Py, sp MoS2; sp Carbonate
414.5	9.1				.32				1	.32		1 x	wk clay -Ser			wk Ax; sp-wk Si'a; sp(+) CPy, sp Py; Tr Biot, sp Chlor; Sulf in fracs + Rel'ing fr
423.2	8.7				.35				1	.35		1 x	1		Apatite B 423' Ax B 422.8	wk Ax; sp wk Si'a; sp-wk CPy, sp Py; Tr Carbonate; Tr-sp MoS2
431.5	8.3				.36				1	.36		1 x	1			wk Ax; Mod Si'a + vnlg; wk CPy, sp-wk MoS2, sp Py; vnlg 70-70°; some Calcite
440.2	8.7				.27				1	.27		1 x	1			wk-Mod Ax, wk Qtz vnlg + Si'a; sp-wk CPy, wk Py, sp-wk MoS2
449.0	8.8				.28				wk	.28		tr MoS2 x	1			wk-Mod Ax; Mod Si'a + Qtz vnlg; wk CPy, MoS2 + Py; wk(c) Carbonate in frac
458.7	9.7				.32				1	.32		1 x	1			wk-Mod Ax; wk Si'a, sp-wk CPy, sp MoS2, wk Py; Carbonate on frac
467.1	8.4				.17				1	.17		1 x	sp clay			wk-Mod Ax; wk-Mod Qtz vnlg; sp-wk CPy, sp MoS2; sp-wk Py; Carbonate on frac
475.8	8.7				.18				1	.18		1 x	tr ser			Ax same; wk-Mod Si'a; sp Py, sp MoS2, Tr-sp CPy; Carbonate on fracs
484.7	8.9				.23				1	.23		tr MoS2 x	tr-sp clay-Ser			Mod Ax; Mod Si'a + vnlg; wk CPy, sp-wk MoS2, sp-wk Py; sp Chlor
495.3	10.6				.44	Nil			wk-Mod	.44		1 x	wk clay -Ser			Mod Ax; Mod-st Si'a + vnlg; wk(+) CPy, sp-wk MoS2; sp-wk Py; Mod Carbonate
504.1	8.8				.35	Nil			1	.35		1 x	1			Mod Ax; st Si'a + vnlg; wk-Mod CPy + Py, sp-wk MoS2; Mod Carbonate
512.9	8.8				.20				sp-wk	.20		1 x	sp-tr clay (Ser-?)		Apatite 507' 5%	wk-Mod Ax; Mod Si'a; sp CPy, Py; sp-wk MoS2; Tr Chlor; Salts in Seams as assoc. w. Qtz vns
521.9	9.0				.11				wk(-)	.11		1 x	sp clay Ser			wk-Mod Ax; Mod Si'a; sp CPy, Py + MoS2; Carbonate on fracs
530.5	8.6				.12				1	.12		1 x	1			wk-Mod Ax; Mod Si'a + Qtz vnlg; sp-wk CPy, wk Py, sp MoS2; Sharp walled Qtz vnlt are rare
544.2	13.7				.26				wk	.26		1 x	1			wk Mod Ax; Mod Si'a + vnlg; wk CPy, wk(+) Py, sp(+) MoS2; Rk Cut by numerous Quartz veins. Quite Brec
550.2	6.0				.44	Nil		Nil	wk-Mod	.44		— x	—	Mass Gar	Tr Qtz 544, occasional patches of Ax	wht orange-brn garnet interspersed by green & pale silicates; Mod Py, wk CPy sp MoS2. Salt & Quartz seams, occasionally w/ Si'a, and disseminated. wk effervescence. Local occurrences of Ax that A. Cr indistinct
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—		
559.4	9.2				.50	Nil		Nil	1	.50		tr Mag x	spotted	spotted mass Gar	Tr-HF	Gar decreasing and green pale silicates increasing; sp CPy, sp-wk Py, sp MoS2 Tr. disseminated Re weakly reactive w/ acid signal 1.5 ppm Re.
567.7	8.3				.54				1	.54		tr, MoS2 wk-Mod	tr chlor			Rocks interlayering of lt. brn Gar and lt. green-green pale silicates & relative proportions each vary. Mod Py, wk CPy, wk MoS2. Salts occur in vns up to ½" in diam.
572.0	4.3				1.23				wk(+)	1.23		—	—	—		some associated w/ Qtz & Sulf. Sulf disseminated of v.f.-m. grains.
576.6	4.6				.64				wk-Mod	.64		tr MoS2 x		Mass Gar	Qtz vn @ 567.7-572.0 Tr @ 512.0	Qtz vn w/ 2-3% cpy, 4% cpy, 1-2% MoS2. Moly in disk up to ¼"
585.6	9.0				1.08				sp-wk	1.08		— x	—	tr-sp epid		Mass br. Gar w/ patchy lt grn HF, Re is only lightly wk + y wk-Mod cpy w/ f.g.n. along contacts
594.6	8.9				1.19				wk-Mod	1.19		tr MoS2 x	—			Garnet as above, only tr chlor wk-Mod py, cpy sp MoS2 on vnlets
603.0	8.5				1.26				1	1.26		1 x				As above
611.8	8.8				.86				wk	.86		1 x	wk-Mod chlor	wk-Mod Gar, tr epi wk-Mod	Chlor HF @ 594'	hard lt grn chlor HF, splime, wk py, cpy tr MoS2 on vns
611.8					.86				wk	.86		1 x	ST chlor	tr epi sp-wk Gar		As above
618.5	6.7				.96				sp-wk	.96		— x			Qtz vn @ 618.5-621.5	limy st chlorite HF, Mod finely diss. sulf. wk py wk-Mod cpy
621.5	3.0				2.77				1	2.77		sp MoS2 x	—	—		st cpy sp-wk MoS2 sp py, intergrown w/ white Qtz.
630.9	9.4				1.60				sp	1.60		tr MoS2 x	sp chlor	sp Gar		chlor HF as above Qtz vn
637.8	6.9				4.11				tr-sp	4.11		1 x	1	1		Rk as above, a 4" mod st Mag 631'. wk py Mod-st cpy in crumbly pods
639.6	1.8				.56										Post MIN Vns @ 639.8	And st appears to be low angle but area quite broken up.
648.7	9.1				.92				1	.92		tr MoS2 x	sp chlor	sp Gar	Silty chlor HF, Cpy 651' Qtz vn 651.9	Hbr to salmon colored s/f st cut by web-work of chlor which w/ f.l.my Mag + wk cpy
660.5	11.8				1.05				sp	1.05		1 x	Mod chlor	tr Gar		lt grn s/f silty HF @ 659.8 wk chlor along num. fracs sp-wk sp py, cpy in qtzite wk cpy for Avg of run

Final Depth 1065.0
Collar Elevation 2,736.56
Coordinates 37,704.65 N, 15,382.87 E
Inclination Vertical

ASARCO
GEOLOGIC – ASSAY LOG

Property Silver Bell

HOLE NO. D-219
Sheet No. 3 of 4
Date Completed 5-4-67
Logged By JAB

Depth	Interval	Core Size	Sp Grav	Core Rec %	Core Assay - % Cu Total	Non-S	Average	Mineralization Oxides	Pyrite	Cpy	Cc	Other	Alteration Clay, sec chlor	Carbnat calc silicates	Rock Type	Remarks
671.5	11.0	NX WI			0.88	0.01		—	<1%	0.8	—	Mod gyp?	Mod chlor Hf sec?		Aplite circa 660'	Aplite has distinct text. but appears to cut limy chlor. seds, core is very broken last 2' of run contains chlor gg material wk py, sp-wk cpy in small veinlets
687.0	15.5	BxWI			0.16				1	0.16		?	tr chlor frags		Very poor recovery	to 673.1 - 2 frag of chlor Hf. To 682.3 small frags Ak & Apl. 684.3 Ak bx. All Ak is stly sericitized, wk py sp cpy
689.5	2.5				0.55	0.01			<1%?	0.55	—	to MoS2	wk sec chlor?			about 0.5' core recovered. 1 strong chlor Hf. rest - stly Alt Ak wk py
702.7	13.2				1.01	Nil			1-2%	0.55	—	Wk Mag	Wk chlor Mod clay	Mod? Act?	Hf Ak circa 701	Core stg broken w/poor recy & stand of run pyx, mainly Hf Mod wk mag py wk to 685 & 694-700' St appears to be strong, brown seds rak MoS2 seds ak Ak py, cpy, To MoS2 Ak sp py, cpy, To MoS2 wk Mod chlor Alt and carbonate Ak stly Alt shows porosity to seds by possible wk Mod chlor Alt and carbonate
710.4	7.7				0.77	Nil			<1%	0.77		tr MoS2	sec			Pyrite occurs out in vns - wk py, cpy, tr MoS2
718.5	8.1				23				1-2%	0.23			wk sec chlor			Ak is stly Alt, silic, wk py, cpy, tr MoS2. one 1" qtz, cpy, MoS2 bx sp chlor & lime in Ak. Core gouge broke
726.7	8.2				.24				1%	0.24		Wk gyp		sp calc silicates		Ak is stly chlor, core is solid (Frag 721) Ak is broken but cemented by num. gyp (Post or late Mineral) vns up to 1/2" tr Ak St Alt. - wk to mod pervasive grn clay-chlor Alt. wk py wk(?) cpy, tr MoS2 wk-mod gyp veining
735.3	8.6				.15				1	0.15		5-10% gyp	Mod St clay sec? wk chlor			
744.4	9.1				0.66				<1%	0.66				Mod? calc silic?	< Hlor Hf @ 744.4	Rk is strongly sheared to 741.8' Rk is stg grn clay-chlor, mostly of chlo. + Ser. Ak has been strongly sheared and fractured and was subsequently cemented by gyp, cpy veins & stringers now comprised from 20-85% of the rk. Ak contains mod-st py + mod cpy as vns and pods. Rk is Non Reactive, sp. MoS2
754.3	9.9				1.30	Nil			46%	1.30	—	10% gyp	Wk-Mod chlor			Mod dark green chlor Hf locally limey. Cut by numerous High ang. gyp vns of 2 or 3 different ages, wk grn 753.8-754.3 Mod py, wk-mod cpy, tr MoS2. Most of gyp seems to be post Min.
759.2	4.9				0.64	0.02		0.02	<1%	0.62	—	5-10% gyp	Wk chlor	Wk-Mod Ser Mod calc sil		Mixture of lt green sil + lt brown mond. Text is softer than gen Rk. Contains wk py + cpy - sp Moly. Trip non assay. Also sp Hf. Contains a larger amount than brown mineral to qtz, 765' Than predominately the brown mineral. The chlor is in several forms a brilliant green. The Mon Chlorite zone contains substantial cpy according to assay results and Ni mod bright Hem associated with Chlorite. Rk is about 60% gyp & by intense fracturing, cpy, St occurring in massive blebs and as fine grained disseminations. Mod Hem is associated w/ the cpy. Mod well disseminated Magnet to also present
774.6	6.9				1.03	Nil		Nil	<1%	1.03		20-25% gyp Mod St Mag			Gra Hem Ak Mag Silica bx	
783.5	8.9				1.71	Nil		Nil	1	1.71	—	5-10% gyp St Mag	— ?	Mod St? calc sil?		St Magnetite. Mod cpy & py & wk Hem & a lt green Hf. Cut by innumerable gyp vns. Trematis occurs as veinlet fills
792.2	8.7				1.18	Nil		Nil	1	1.18		1	1	1		St Mag., Mod cpy, py & Hem as well fine grained disseminations associated w/ the magnetite.
800.0	7.8				2.08	Nil		Nil	1	2.08		1	1	1		St Mag wk Hem & St cpy, wk py associated w/ wk-mod chlor mod calc-silicates + sericite. High gyp content as usual
809.1	9.1				2.24	0.02		Nil	1	2.22		5% gyp Mod Mag	1	1		As above, cpy vns up to 1/2" post Min + 10-20% gyp Mag Mags tends to follow a thin lt band? Sericite contorted bx has Aerigs Fa-like asp
818.0	9.1				0.95	0.01		0.01	<1%	0.94		5-10% gyp Wk-Mod Mag 10-15% gyp St	1	1		As above, core stly magnetic, wk-mod silic zone w/ diss cpy. No lime, sp-wk
827.6	9.6				2.54	0.01		0.01	<1%	2.53		St Mag 25-30% gyp				As above + 20% gyp. Sp py stly contorted ? bedding? No lime
836.3	8.7				0.81	0.01		0.01	<1%	0.81		Mod Mag 20% gyp	wk chlor	—		As above, This Rk (above Ak) is a bx cemented by gyp. bx prob post Min + Minor pre Min
845.7	9.4				0.63	0.02		0.02	<1%	0.63		St Mag 45% gyp	1		bx @ 839.4	Altered as above. Post Min bx (very str 838.4' to) cemented by gyp. Gyp is 50% core bx
855.8	10.1				0.62	0.01		0.01	1	0.62		Wk Mag 30-40% gyp				As above - gyp 50% to 50+ of core from bx frags. 847'
859.8	4.0				1.00	0.01		0.01	2%	0.99		Wk-Mod Mag 20-25% gyp	Mod chlor		Wk bx @ 859.8	As above core is about 50% gyp
865.8	10.0				0.94	0.01		0.01	<1%	0.93		Mod St Mag	Wk-Mod chlor			St Mag. Mag finely diss Cpy assoc. w/ Mag. Rk broken & stly veined w/ 20-30% gyp
875.1	8.3				0.58	0.01		0.01	<1%	0.57						As above wk cpy & 25-30% gyp as a web-work of veinlets. Core is very broken & mainly in North, Sp wk chlor. Mag Hf 10-15% Mag 5% hem wk-Mod Cpy diss w/ Mag + or vns 15-20% gyp.
884.0	8.9				2.81	0.02		0.02	<1%	2.79			Mod chlor?			
893.1	9.1				.73	0.03		0.03	<1%	.73		Wk-Mod Mag	Wk chlor			As above, 120% Mag. 3% hem wk-Mod Cpy in blebs + assoc w/ Mag
899.1	6.0				.64	0.02		0.02	<1%	.64		Mod Mag	—			As above, 125% Mag. + 8% Hem Cpy diss w/ Mag Rk is stly broken and cemented by gyp as in the case above. This increase to be noted in the next run

Final Depth 1065.0
Collar Elevation 2,736 56
Coordinates 37,704 65 N ; 15,382 87 E
Inclination VERTICAL

ASARCO
GEOLOGIC – ASSAY LOG

Property Silver Bell

HOLE NO. 0-219
Sheet No. 4 of 4
Date Completed 5-4-67
Logged By J.A.B + N.R.N

Depth	Interval	Core Size	Sp Grav	Core Rec %	Core Assay - % Cu: Total	Non-S	Average	Mineralization: Oxides	Pyrite	Cpy	Cc	Other	Alteration: Clay, Ser Chlor	Bar. Calc Silic	Rock Type	Remarks
908.7	9.6	BXxl			0.36	0.01		0.01	< 1%	0.35	—	50-75% gyp + wk Mag 5% gyp &			Bx circa 919.(to 908.7 Mag Hf	RK is small angular frags of chlor-Mag Hf cem by 50-75% gyp. Alt + Min of frags. As above
918.9	10.2				2.76	0.01		0.01	< 1%	2.75	—	ST Mag.				RK still broken + cem by gyp. but frags not rotated.
923.8	4.9				0.29			—	< 1%	0.29		—	ST clay		Flt 99 Talc? gyp-clay? Flt 99	@ 25% fine disc Mag. 2% cpy along vns + ST fine disc of Mag. 30-50% Talc? gyp-clay? Flt 99 w/ also fr. cpy also frag. of
926.0	2.2				0.04				0.5%	0.04		Wk Mag	ST clay?		918.9-923.8 Sx Min Alt. 923.8-926.0	Pyrite: Pyrolusite Quartz @ 918.1 (see below) Porphyritic pre mineral pyrox? Andesite RK is strongly mineralized. Gyp. Mag & Alt to 50% Mag are limited to Alt complex to here. Tr to 5% Py. no cpy. Numerous Un-Min Cal vns. And - Mz CT - 75°
—	—	—	—	—				—	—	—	—	—	—			
937.8	11.8				0.12				1%	0.12		tr Mag	Mod grn clay?		926 @ 922.0' CTs - 75°	Mod - ST Alt. 99% Feld Alt to tt grn clay or chlor, bio Alt to chlor + hydromica. 1% to 5% 1% cpy tr MoS2 diss w/bio and along vns. Mz is porph. w/ ≤ 5% bio. Sp and K spar along 2° Nstrowns w/ slight pos. increase in Cu. To Colonia
—	—	—	—	—				—	—	—	—	—	—			
946.5	8.7				0.09				1%	0.09		tr gyp + wk Mag & Mt Kspar	Mod clay grn?			As above
954.9	8.4				0.09				≤1%	0.09		"	Mod grn clay?			As above, but grn Alt of pla drops off + 2nd K spar increases
963.9	9.0				0.13				≥1%	0.13		"	"			Some K spar porphoroblasts w/ remnants of grn Alt pla within xyl. As above, still more 2nd K spar & the cpy is 1.5 to 2% pl. Countless tr MoS2 on & in vns. 2nd K spar assoc. w/ Qtz owing wk gyp
973.0	9.1				0.12				1"	0.12		"	"			As above, Mod Amt of 2nd K spar in ground mass & as porphoblasts
981.2	8.2				0.14				2%	0.14		"	"			As above
990.0	8.8				0.09				≥1%	0.09		"	"			As above, increasing amount of gyp owing (Pan-mineralized)
999.0	9.0				0.08				1%	0.08		"	"			As above, decreased cpy, some increase in grn Alt of pla
1008.1	9.1				0.07				"	0.07		Sx 2nd K spar wk 2nd K spar	"			As above, both Alt types present w/ 2nd K spar most recent
1017.3	9.2				0.05				"	0.05		" wk-Mod "	"			wk-Mod gyp vns. As above
1024.7	7.4				0.03				≥1%	0.03		Tr Mag Tr MoS2	"			As above. some development of chlor-hydromicas? along qtz stw. vn.
1033.9	9.2				0.05				6%	0.05		1% MoS2 wk grn 2nd K Tr-sp MoS2	Mod grn Mica Mod grn - Mod grn Mica			As above
1042.7	8.8				0.06				1%	0.06		wk 2nd K spar	wk grn			As above. gyp vns still comen
1051.8	9.1				0.03				≥1%	0.03		Tr sp MoS2 Sp Mag	/			As above 1% py 0.5% cpy tr MoS2
1060.0	8.2				0.07				2%	0.07		tr MoS2 Tr Zn Mag sp Mag	Mod grn Mica Sp chlor		Andes @ 1051.6 1052.8	CTs 55° and lower 50°. 0.3' Alt @ 1055.8 CTs // to above Mz @ 50°
1065.0	5.0				0.09				4%	0.09		Mod 2nd K sp	/			Mz as above
E.O.H.																

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Notes:

(1) Est. % Cu represented by each mineral

(2) Est. mineral %; or, as follows: Trace (Tr); Sparce (Sp) < 5 %; Moderate (Md) 5-50 %; Stong (St) +50 %

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

HAMMER

Hole No. D 249
Page 1 of 1 Pages
Collar Elev. 2,667.69
Final Depth 242.3'
Coords. N 36,186.22 E 15,332.41
Inclination VERTICAL
Logged by RE
Date: Start 8-16-67 Finish 10-3-67

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	wk N.S.	Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0	22	22		--																																	
22	27	5		0.04									.04					md	Tr		md										35			AK			oxidized AK, except for px in QTZ
27	32			0.01									.01					md	<1		md				Tr						35			AK			
32	37			0.22									.13	.04	.18			wk	<1		sp										35				sulfide contact		sulfides - oxides intermixed
37	42			0.41		0.07								.07	.34			sp	<1		-										35						dis. cc
42	47			0.26										.02	.24			sp	1%		-							sp	md		35						md. alt
47	52			0.38										.02	.36			-	1%		-							md	md		35						
52	57			0.23										.02	.21			-	1%		-							md	md		40						
57	62			0.30										.02	.28			-	1%		-							md	md		40						
62	67			0.50		0.02							.02		.48				2%									md	md	st	60						cc. in clay and quartz, appears to be a fault zone
67	72			0.39	0.33		0.41						.02		.37				2%									md st	md		45						increase in sericite
72	77			0.38									.02		.36				1%									md	md		40						AK remains typical coarse grained, md altd AK
77	82			0.46		0.01							.01+		.45				1%									md	md		40						Appears to contain 0.10% blue-green Cu minerals
82	87			0.22									.01		.20	.01			2%									md st	md		40						
87	92			0.26											.26(?)														V ST		30						sample mostly mud and clay
92	97			0.28									.03		.23	.02			3%									md	md		40			AK			blue-green minerals on cc. on cpy.
97	102			0.27									.04		.23				<1%									sp	md st		10	sp		MZ			MZ w/large bndr. of biotite dominates sample, large amount of clay
102	107			0.32									.06		.26				<1%									sp	md st		10	sp		MZ			10% biotite - mostly unaltered
107	112			0.36									.03		.33				1%									sp	md st		30			MZ AK			mixed MZ and AK fragments
112	117			0.20											.20				<1									sp	md st		40			AK			wk-md altd AK frags coated with clay
117	122			0.29									.01		.27	.01			1									sp	st		30			AK			some MZ chips
122	127			0.50		0.01							.01		.45	.05			1-2									md	st		60			AK?			appears to be mostly vein QTZ w/sulfides
127	132			0.33		Nil									.30	.03			2									md	md		20			MZ			
132	137			0.60		0.02							.02		.50	.08			1-2					Tr			md	md	st(?)	40	md		AK-MZ			80% AK, 15% MZ, 35% vein QTZ
137	142			0.97		0.03							.03		.84				2					Tr			md	st	to 50	st			MZ(?)			strongly altered rk w/apparent QTZ veining
142	147			0.56	55' @ 0.60	0.02	55' @ 0.02						.02		.56				1									md	st ?	20	md		MZ			noticeable lack of cpy
147	152			0.74		0.02							.02		.70	.02			2									md	st	15	md		MZ			md - st altd MZ, dis. c.c.
152	157			0.51		0.02							.02		.49				1-2									md	md	2 15	md st		MZ			overall green color, some vein QTZ
157	162			0.49		0.05							.05		.44				2									md	md	20 30	md		MZ			
162	167			1.10		0.01							.01		1.00	.09			5									st	st	40 60	-		MZ			mostly sulfides in vein QTZ, st alt. of rk. High QTZ content may be due to nearly complete destruction of feldspars
167	172			0.84		0.02							.02		.80	.02			3									st	st	20 60	-		MZ			
172	177	5		0.80		0.02							.02		.80				5									st	st	20 60			MZ			st. QTZ, clay, sulfides. few feldspars
179.3	188.1	8.8		0.34											.34				5									sp	sp	5 60			AK			st. silicification, px in steep stringers w/c.c.
188.1	196.5	8.4		0.40		Nil									.40				3					SP				sp	sp	3 55				QTZ sulf vein 45° QTZ sulf veins 60°		silicification obscures texture down to 191.0' md at 45° parallel to walls at 45°
196.5	205.0	8.5		0.23											.20	.03			5									sp	sp	5 60						silicified Bx from 199.0-199.3. small angular fragments aligned w.c.c.
205.0	213.1	7.6		0.10											.09	.01			2					Tr				md	sp	3 50						sharp decrease beyond 207.0'. wk-md alt.
213.1	222.7	9.6		0.03											.03				2									md	sp	2 45						steep px stringers with little or no c.c., wk alt
222.7	230.6	7.9		0.09											.03	.06			2									md	sp	1 45						2% Bi, md alt., wk sil., no significant c.c.
230.6	242.3	11.7		0.18											.12	.02	.04		2					Tr				md	sp	<1 45			AK			wk alt., sil., wk cpy in steep veins w/mols
E.O.H.																																					

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO- SILVER BELL UNIT

Notes:

(1) Est. % Cu represented by each mineral

(2) Est. mineral %; or, as follows: Trace (Tr); Sparce (Sp) < 5 %; Moderate (Md) 5-50 %; Stong (St) +50 %

Note (3): Tt - Tactite; Hf - Hornfels; Mb - Marble; Qt - Quartzite; Bx - Breccia; Da - Dacite; Mz - Monzonite; An - Andesite

Note (4): V - Vein; F - Fault; D - Dike; C - Contact; Ig - Undif igneous

Hole No. D-250

Page 1 of 1 Pages

Collar Elev. 2,668 [24] Final Depth 305.2

Coords. N 26,298 [28] E 15,465 [10]

Inclination VERTICAL

Logged by N.R.N.

Date: Start 8-18-67 Finish 9-30-67

	Depth From	To	Int'vl	Elev.	% Cu Total	Avg.	NS	Avg	% Core Recov.	Sp. Gr.
FILL	0.0	22.0	22.0							
	22.0	27.0	5		0.28					
	27.0	32.0			0.28					
	32.0	37.0			0.21					
	37.0	42.0			0.18					
	42.0	47.0			0.18					
	47.0	52.0			0.24					
	52.0	57.0			0.24					
	57.0	62.0			0.13					
	62.0	67.0			0.13					
	67.0	72.0			0.13					
	72.0	77.0			0.71		0.02			
	77.0	82.0			0.66		0.01			
	82.0	87.0			0.56		0.01			
	87.0	92.0			0.42	45' @ 0.52	0.01	45' @ 0.01		
	92.0	97.0			0.52		0.01			
	97.0	102.0			0.40		0.01			
	102.0	107.0			0.48		0.01			
	107.0	112.0			0.56		0.01			
	112.0	117.0			0.45		0.01			
	117.0	122.0			0.32					
	122.0	127.0			0.37					
	127.0	132.0			0.37					
	132.0	137.0			0.34					
	137.0	142.0			0.51		0.01			
	142.0	147.0			0.73		0.02			
	147.0	152.0			0.48		0.01			
	152.0	157.0			0.50		0.01			
	157.0	162.0	5		0.46		0.03			
BEGIN DIAMOND DRILLING →	162.0 (161.0)	170.0	9.0		0.33					
	170.0	174.6	4.6		0.64	100.8 @ 0.45	.04	100.8 @ 0.02		
	174.6	187.5	12.9		0.64		.04			
	187.5	196.3	8.8		0.25					
	196.3	211.2	14.9		0.26					
	211.2	217.0	5.8		0.53		.04			
	217.0	220.4	3.4		0.32		.01			
	220.4	227.3	6.9		0.55		.02			
	227.3	236.8	9.5		0.41		.02			
	236.8	244.5	7.7		0.26					
	244.5	250.7	6.2		0.34					
	250.7	257.2	6.5		0.16					
	257.2	267.8	10.6		0.18					
	267.8	276.8	9.0		0.15					
	276.8	285.3	8.5		0.17					
	285.3	295.2	9.9		0.19					
	295.2	305.2	10.0		0.15					

From	Cu (1) Chrys.	Pitch	Black	Blue Green	Unknown Non-Sulf	Cc.	Cpy.	Born. & Covellite
22.0						0.26	0.02	
27.0					0.01	0.25	0.02	
32.0					0.01	0.18	0.02	
37.0					0.02	0.16		
42.0	0.01				0.02	0.15		
47.0	0.01			Tr	0.02	0.20	0.01	
52.0						0.23	0.01	
57.0	Tr			Tr		0.13		
62.0	0.01			Tr	0.01	0.11		
67.0					0.01	0.12		
72.0					0.02	0.68	0.09	
77.0					0.01	0.60	0.05	
82.0					0.01	0.52	0.03	
87.0					0.01	0.38	0.03	
92.0					0.01	0.48	0.03	
97.0					0.01	0.37	0.02	
102.0					0.01	0.44	0.03	
107.0					0.01	0.49	0.06	
112.0					0.01	0.40	0.04	
117.0					0.01	0.29	0.02	
122.0					0.01	0.34	0.02	
127.0					0.01	0.32	0.04	
132.0					0.01	0.31	0.02	
137.0					0.01	0.47	0.03	
142.0					0.02	0.56	0.15	
147.0					0.01	0.43	0.04	
152.0					0.01	0.43	0.06	
157.0					0.03	0.28	0.15	
162.0					0.03	0.23	0.07	
170.0					0.04	0.50	0.10	
174.6					0.04	0.50	0.10	
187.5					0.02	0.13	0.10	Tr
196.3					0.02	0.14	0.10	Tr
211.2					0.04	0.20	0.10	0.19
217.0					0.01	?	0.10	0.21
220.4					0.02		0.15	0.38
227.3					0.02		0.15	0.24
236.8					0.01		0.12	0.13
244.5					.01		0.13	0.20
250.7					.01		0.09	0.06
257.2						0.05	0.10	0.03
267.8						0.03	0.10	0.02
276.8						0.04	0.10	0.03
285.3						0.06	0.12	0.01
295.2						[illegible]	0.13	[illegible]

From	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	Pinite (?)
22.0	Tr	1%	-	-	-	-	-	Sp	-	-	-	Mod St	Sp	?	30%		
27.0	-	1-2%	-	-	-	-	-	Sp	-	-	-	Mod	Wk	?	40%	Sp	Sp
32.0	-	1-2%	-	-	-	-	-	Sp	-	-	-	Mod	Wk Mod	?	40%	Sp	
37.0	Sp	1-2%	-	-	-	-	-	-	-	-	-	Wk	Wk	?	35%	Tr Sp	
42.0	Sp-Wk	2%	-	-	-	-	-	Tr	-	-	-	Sp	Wk Mod	?	40%	Tr Sp	
47.0	Tr Sp	2%	-	-	-	-	-	-	-	-	-	Sp	Wk	?	35%	Tr Sp	
52.0	-	1-2%	-	-	-	-	-	Tr	-	-	-	Sp	Wk Mod	?	35%		
57.0	Tr	1%	-	-	-	-	-	Tr	-	-	-	Sp Wk	Wk	?	35%		
62.0	Wk	2%	-	-	-	-	-	-	-	-	-	Tr Sp	Wk Mod	?	35%	Tr	Tr
67.0	Tr	2%	-	-	-	-	-	Tr	-	-	-	Sp	Mod	?	30%	Tr	Tr
72.0	Tr	2%	-	-	-	-	-	-	-	-	-	Mod ST	Mod	?	35%		
77.0	-	3-4%	-	-	-	-	-	?	-	-	-	Mod St	Wk Mod	?	40%		
82.0	Tr	5%	-	-	-	-	-	?	-	-	-	Mod	Mod	?	50%		
87.0	-	2-3%	-	-	-	-	-	?	-	-	-	Wk Mod	Wk Mod	?	45%		
92.0	-	2-3%	-	-	-	-	-	Sp	-	-	-	Mod	Wk Mod	?	40%		
97.0	-	2%	-	-	-	-	-	?	-	-	-	Wk Mod	Wk Mod	?	38%		
102.0	-	2-3%	-	-	-	-	-	?	-	-	-	Mod St	Wk	?	40%		
107.0	-	4%	-	-	-	-	-	?	-	-	-	Mod	Wk Mod	?	50%		
112.0	-	4%	-	-	-	-	-	?	-	-	-	Mod ST	Wk	?	63%		
117.0	-	3-4%	-	-	-	-	-	0.1%	-	-	-	Mod	Mod	?	40%		
122.0	-	3%	-	-	-	-	-	0.04%	-	-	-	Wk	Wk Mod	?	45%		
127.0	-	1-2%	-	-	-	-	-	?	-	-	-	Wk	Wk Mod	?	45%		
132.0	-	2%	-	-	-	-	-	?	-	-	-	Wk	Wk Mod	?	40%		
137.0	-	2-3%	-	-	-	-	-	?	-	-	-	Mod	Wk Mod	?	45%		
142.0	-	4-5%	-	-	-	-	-	?	-	-	-	ST	Mod	?	45%		
147.0	-	4-5%	-	-	-	-	-	?	-	-	-	Mod ST	Wk	?	55%		
152.0	-	3%	-	-	-	-	-	?	-	-	-	Mod	Wk	?	45%		
157.0	-	3-4%	-	-	-	-	-	?	-	-	-	Mod	Sp Wk	?	50%		
162.0	-	1-2%	-	-	-	-	-	Tr	-	-	-	Tr Sp	Wk	1%	40%		
170.0	-	4%	-	-	-	-	-	Tr	-	-	-	Sp	Wk	3%	48%		
174.6	-	4%	Tr	.02	Tr	-	-	Tr	-	-	-	Wk Mod	Md	4%	7%	Sp	
187.5	-	1%	-	-	-	-	-	-	-	-	-	Tr Sp	Wk	2%	45%		
196.3	-	4%	-	-	-	-	-	-	-	-	-	Sp	Wk Mod	2%	40%		
211.2	-	4%	-	Tr	-	-	-	-	-	-	-	Sp Wk	Mod	7%	12%	Tr	
217.0	-	4%	-	-	-	-	-	-	-	-	-	Wk Mod	Wk	5%	40%		
220.4	-	1-2%	-	Tr	Tr	-	-	-	-	-	-	Tr	Wk	2%	3%		
227.3	-	1-2%	-	-	-	-	-	-	-	-	-	Tr	Wk	<1%	40%		
236.8	-	2%	-	-	-	-	-	-	-	-	-	Tr	Wk	<1%			
244.5	-	6%	-	-	-	-	-	-	-	-	-	Wk	Wk	7%	10%		
250.7	-	8%	-	-	-	-	-	Tr	-	-	-	Wk Md	Wk	20	20		
257.2	-	<1	-	-	-	-	-	-	-	-	-	Wk	Md	!	45%		
267.8	-	<1	-	-	-	-	-	.05	-	-	-	Wk	Md	2%	45%		
276.8	-	<1%	-	-	-	-	-	Tr	-	-	-	Wk	Wk	1%	45%		
285.3	-	1%	-	-	-	-	-	-	-	-	-	Wk	Wk	1%	45%		
295.2	-	1%	-	-	-	-	-	Tr	-	-	-	Wk	Wk	3%	45		

From	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
22.0	Ak + Ap			Strly altd to ser. Wk total sulfs. High MoS2 occurrence.
27.0	Ak			Increase in Sulfs and increase in pinite-chlor. Over all alt mod.
32.0				Not all py coated by c.c.
37.0				Sudden appearance of leaching
42.0				Alt. has decreased to wk-mod
47.0				Occurrence of the fushia green iron sulfate and gr. Cu minerals
52.0				Most of sulfs assoc w/ qtz-ser vns.
57.0				
62.0				Renewed increase in Lim + Total sulfs
67.0				wk-mod Alt.
72.0				St-Inten Alt, St C.C. development - Py cont remains about same.
77.0				As Above except Py content is high. Felds primarily altering to ser. not clay
82.0				Alt. Decreased - Evidence of qtz-ser-sulf veining
87.0				Alt + Min. still decreasing
92.0				Increase in alt + Min
97.0				
102.0				Py content little change C.C. seems to coat non sulf grains + cracks also
107.0				St qtz-ser-sulf veining
112.0				St qtz-ser veining + alt. only thin coating of C.C. on py
117.0				Thick MoS2 seams, less C.C.
122.0				
127.0				Rk becoming a little fresher. Py content down.
132.0				
137.0				alt + Min increasing - more ser. Color of K-spars gone
142.0				Py in thick concentrations + coated w/ C.C.
147.0				
152.0				Most of Min is assoc w/ qtz-ser vns
157.0				Qtz-ser alt St.
162.0		Sulf-Qtz-Ser. Seams	≈ 80°	wk-med alt, Most sulfs assoc w/ fracts. rest well dissem. Thin C.C. on Sp Py + Tr Cpy.
170.0		3" C.C. + Sulf zone @ 173.6'	≈ 65°	Med alt. + wk-med Min. Good C.C. development on Py + Cpy.
174.6	Biot Mz @ 174.6-187.5'	Qtz-Sulf Vns 1/8"-1" 1' spacing	70°	Variably altd. wk-St. Sub hedral Med sized Pl felds + 6% Book Biot. 6% v.f. dissem biot. Sulf closely assoc w/ fracts + vns. C.C. well developed on Tr-Sp Cpy. Contacts indistinct
187.5	Ak @ 187.5	Sp Sulf-Silica Seams	60°	Wkly altd., Tr-sparsely Mineralized w/ v.f. gr. well dissem py + cpy. Sp CC on cpy. - Sulf assoc w/ [illegible]
196.3		For Contact of Mz @ 211.2	70°	Some wkd Bika + locally Mod altd. Cpy + Py Ratio ≈ 1. Cpy about ½ replaced by CC.
211.2	Biot Mz 211.2-217.0	Qtz-Sulf Vn 1"	80°	Mod-St Alt., Mod qtz veining, sil'n + ser. alt. Sulfs assoc. wk-Mod Py, Sp Cpy, Tr-Sp C[illegible]
217.0	Ak 217.0-220.4	Mz Dike "A"	60	Upper Cont. Strly silicified + sericitized Mod Min assoc.
220.4	Biot Mz 220.4-227.3			Rk is Mod-Strly altd near contacts w/ Ak. Sp Total sulfs, but C.C. still present. Sulf primarily fract controll[ed] Rk shows a 85° lineation of the f. biot in grnd mass.
227.3	Ak 227.3-			Typical Ak.
236.8	Ak 236.8			As Above. Ak becomes aplitic towards end of run
244.5	Biot Mz 244.5	½ Qtz Sulf Vn	85°	Med Alt'd. Mz. Med min. Sp CC - Biot still showing lineation + flowage
250.7	Bi MZ	QTZ Py Veins	85°	As above, 2nd. Bi increases near contact, steep qtz veins occur @ 250.7-25[illegible]
257.2	AK 257.2			md altd, vertical fracturing, wk cc on cpy (Bornite)
267.8		QTZ Sulf Veins	70°	vertical fracturing, wk cpy stringers; good moly in QTZ veins about 274'
276.8		Sulf veins	70°	md alt., c.c. on cpy, plag altd to pinite (?) - yellow waxy
285.3				As above
295.2				[illegible]

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

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Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D 251
Page 1 of 1 Pages
Collar Elev 2,750.09
Final Depth 164
Coords. N 37,111.89 E 14,816.45
Inclination Vertical
Logged by R.E.
Date: Start 10/12/67 Finish 10/16/67

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Un Known	Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0	43.0																																				Dump
43.0	52.4	9.4		0.06										0.06				ST		md									SP	SP	Tr	SQ		AK			md. alt'd. AK, st limonite on fractures, no boxwork
52.4	61.6	9.2		0.04										0.04				ST		md									SP	md		- 50					highly fractured, decomposed from 52.4 - 61.6
61.6	71.0	9.4		0.02										0.02				ST		md									SP	md		- 45					md alt'd, strong leaching effects
71.0	79.8	8.8		0.01										0.01				md		wk									SP	SP		- 45					decrease in alteration, fracturing, leaching
79.8	88.7	8.9		0.03										0.03				md		wk									SP	SP		- 45			sulfides @ 88.7		md alt, hematite staining of altered fspars. Pyrite within coating of C.C
88.7	98.0	9.3		0.07										0.03	0.04			md	1%	wk									SP	Tr		- 45					oxidation from 91.8 to 96.2 followed by sulfides
98.0	106.3	8.3		0.24										0.02	0.22			Tr	1%	-									SP	md		- 45					Apatite 101.8-102.0 C.C on py. Green xtals on fractures - may be Torbernite, strongly fractured
106.3	115.1	8.8		0.26										0.02	0.24			Tr	1%	-									SP	md		- 45					wk-md alt, broken w/ some gouge
115.1	124.0	8.9		0.24											0.18	0.06		Tr	1%	-									SP	md		- 45					As above, gouge from 121.5-121.8, C.C on py
124.0	132.8	8.8		0.36											0.26	0.10		Tr	1%	-									SP	md		245			Qtz-sulf 50° @ 130.4	75°	md alt, dis py, cc, Gouge: 127.0-127.3.
132.8	140.7	7.9		0.19											0.11	0.08		Tr	1%	-									SP	SP		- 45					As above
140.7	148.4	7.7		0.16											0.09	0.07		Tr	3%	-									SP	Tr		3% 45°			Qtz-sulf veins	60-80°	Increased py in veinlets cutting weak, silicification near veins
148.4	155.1	6.7		0.05											0.03	0.02		—	5%										md			- 5% 60°					As above py dis and in steep veins w/ little or no cc, st silicification
155.1	164.0	8.9		0.12											0.07	0.05		-	4%										md			- 5% 55°					As above, slightly better C.C on py near end of interval
E.O.H.																																					

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

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Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D252
Page 1 of 1 Pages
Collar Elev 2798.03 Final Depth 229.7
Coords. N 36,972.00 E 14,906.47
Inclination VERT. CAL
Logged by RE
Date: Start 10-5-67 Finish 10-9-67

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu N S	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Carbonate N.S	Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem.	Spec.	Other (2) Galena	Sphal.	Molyb.	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz.	QUARTZ	CHLORITE	Pyrite %	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0	90.6	90.6																																				Dump Material
90.6	98.5	7.7		0.04										0.04				ST		md									sp	md	-	40			AK			Stp. altd. AK, Lim, r'Hem stained fspars.
98.5	107.4	9.1		0.06										0.06				ST		md									sp	md	-	45				Joints	80°	Gouge from 99.2-100.5.. overall highly fractured
107.4	115.2	7.8		0.04									0.04					ST		wk									sp	md ST	-	45						S.T. alt, plag completely altd to clay, Gouge from 110.0-112.9.
115.2	122.8	7.6		0.05										0.05				ST		wk									sp	md ST	-	45						As above
122.8	130.7	7.9		0.03									0.04	0.05				ST		wk									sp	ST	-	45						Gouge from 128.3-130.9
130.7	138.8	8.1		0.14									0.04	0.05	0.05			ST	Tr	wk									sp	VST.	-	35(?)						Tr of py, CC. and clay Core from 134.0 to end of interval consists of gravel sized quartz fragments
138.8	145.9	7.1		0.82			.11						0.03	0.02	0.71			wk	Tr	-									sp	VST.	-	35(?)						Mostly gouge with some C.C.
145.9	153.9	8.0		1.25			.07						0.07		1.08	0.10		wk	sp	-									sp	ST	-	45				Surface Stringers	70°	ST. alt, highly fractured, good C.C. on py, cpy
153.9	161.6	7.7		0.56	55' @ 0.59		.04						0.04		0.46	0.06		wk	1%	-									sp	ST	-	45						As above
161.6	169.5	7.9		0.39			.05						0.05		0.28	0.06		Tr	Tr	-									sp	md ST	-	45				Approx 68.5-68.8		Decrease in alt. and sulfides
169.5	178.1	8.6		0.17									0.05		0.10	0.02		Tr	1%	-	Tr	-	-	-	-	-	-	Tr	wk. Mod.	Ab.	?	10%						Rk is not str. altd except for P feld. which are very altd to med grey soft min. possibly. Rare
178.1	184.9	8.8		0.57			.05						0.05		0.47	0.05		wk	2%	-	Tr	-	-	-	-	-	-	Tr	Mod. Ss	Ab. 4%	?	37%				2° Qtz-Sulf Vns	70°	Py is str. altd & mineralized from 178.1 to 183.5. Very decreased wk mod Py w/ tri-OC. noting
184.9	194.5	7.6		0.38									0.04		0.30	0.07		wk	1%	-	-	-	-	-	-	-	-	Tr	wk 4%	Ab.	?	57%				Ap Vn @ 190.6		Total sulf content low, & all coated w/ O.O. Lots of Ss clasts - may be part back dump
194.5	202.6	8.		0.19									0.03		0.16			Sp	0.5%	-	Tr	-	-	-	-	-	-	-	Sp.	Ab					Ap @ 194.5 Ap @ 202.6	Contact	50°	Fg grnish, wkly alt'd Ap. Sulfs scarce - not disem. Some Sp Sulfides on fracts.
202.6	211.9	9.3		0.16									0.02		0.12	0.02		-	0.2%	-	-	-	-	-	-	-	-	-	Wk Sp	35	2%					Contact	35°	The P feldsp are moderately altd, but now changing to a yellow-grey product. P.O. becoming pale. The
211.9	220.7	8.8		0.10											0.06	0.04		Tr	0.2%	-	-	-	-	-	-	-	-	-	wk	35	3%	wk						Py decreasing, wkly altd O.O. showing up. Main alt is pinite after P feldsp
220.7	229.7	9.0		0.07											0.04	0.03													wk.	3B	3%	wk.						Wkly altd w/ Tr-Sp. py, Tr CPY + Tr C.O.
E.O.H.																																						

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO- SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D-253
Page 1 of ___ Pages
Collar Elev 2,798 ±5 Final Depth 196.5
Coords. N 34,799 ±3 E 14,733 ±3
Inclination VERTICAL
Logged by Y.R.N.
Date Start 9-23-67 Finish 9-26-67 / 10-9-67 / 10-11-67

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Wk Blue Stain	Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	Pyrite	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0.0	105.1	105.1																																DUMP	MATERIAL		
105.1	113.5	8.4		0.07										0.07				Sp Wk		-	0.2%	-	-	-	-	-	-	Tr	Wk	Tr	35%	3%		Au			wkly Alto, Sp-wk. Lt Orange Lim. Original Bor content 3% (-6%) iron alld to Chlor. Hem is after magnetite
113.5	122.7	9.2		0.12										0.08	0.04			Sp		-	0.5%	-	-	-	-	-	-	Tr	Wk	Tr	35%	3%					As Above. P. felds are largely alld to Pale (?) Hem occurs as solid pseudomorphs of Bo replacing Py
122.7	131.7	9.0		0.07										0.07				Sp Wk		-	Sp	-	-	-	-	-	-	Tr	Wk	-	35%	3%	Wk		Fr 60.5' 126.5'	55°	The hem is also seen occurring as a stain on felds. Hem Pseudomorphs may be after magnet. ie
131.7	138.7	7.0		0.13										0.10	0.03			Wk		Tr	Sp	Tr							Sp	-	35%	4%	Wk					As Above. Tr Sp. empty hem-Lim breccia or occasional fractures.
138.7	151.3	12.6		0.18										0.08	0.10			Sp Wk	2-4%	-	Tr		-	-	-	-	-	Tr	Tr Wk	-	35%	4%			Suff Rock Lost Area 138.7 Fault = Fr 136	85°	Lim persist as stain of fracts, but good mass is unstained. Sulfs are Py w/n.n. coating. Occasionally Pyrite
151.3	161.4	10.1		0.32										0.06	0.26			Sp Wk	2-4%	-	Tr	-	-	-	-	-	-	-	Sp Wk	-	35%	3%	Sp Wk					Seem well alld + more str alld locally. Total sulfs sp.
161.4	169.5	8.1		0.11										0.05	0.06			Tr	3%	-	0.2%	-	-	-	-	-	-	-	Tr Sp	-	35%	3%	Tr					Py stains only in sp. alt. Sulfs are along microfracts + assoc w/ quart + P. felds. Hem Pseudomorphs of Mag still present.
169.5	178.2	8.7		0.20										0.02	0.18			-	2-4%	-	0.2%	-	-	-	-	-	-	-	Tr Sp	-	35%	4%						Py is quite fresh only alt. indicated by Hem after Mag, slight alteration of P. felds + Chlor (wk) after Bio
178.2	188.2	10.0		0.11										0.01	0.10			Tr	Tr	-	0.8%	-	-	-	-	-	-	-	Tr Sp	-	35%	2%						Less alld. Biotites are still quite dark. Original magnetite content was higher.
188.2	196.5	8.3		0.15										0.01	0.11	0.03		Tr	3%	-	0.5%	-	-	-	-	-	-	-	Tr Sp	-	35%	1%						As Above. Increase in total sulfs. Still some Cu present in amts of 0.01%
E.O.H.																																					

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Note (4)
V - Vein
F - Foult
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D-254
Page 1 of 1 Pages
Collar Elev 2,832 LP
Final Depth 406.2
Coords. N 36,618 LP
E 14,913 LP
Inclination VERTICAL
Logged by RG
Date: Start 9-14-67 Finish 9-20-67

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Unk. Non Sulf.	Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem.	Spec.	Other (2) Galena	Sphal.	Molyb.	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	Tourmaline	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0	28.0	28.0																																				Dump Material
28.0	37.8	9.8		0.12											0.12			md			SP								SP	SP	-	45	5		AK			Stly altd. AK w/chlorite and other green alt. products. Hem after mag. Fault Bxd. Most of interval has abundant gouge resulting from
37.8	50.2	12.4		0.15											0.15			md			SP								md	30	3	40	10			QTZ vein 39.0-39.3	?	complete destruction of topaz. Near vertical fracturing / veining
50.2	60.6	10.4		0.05											0.05	Tr		md			SP								SP	SP	25	40	5			Topaz in vein leached	55°	
60.6	74.3	13.7		0.05											0.05	Tr		md			Tr								SP	SP	-	40	7					md-st alt. 25% green alt products including chlorite, Pyrite (?)
74.3	84.8	10.5		0.08											0.08			ST			SP								md	40	2	35	10(?)			QTZ vein 84.0-84.8	80°	Footwall from 75.0-77.0 only small fragments of rock - mostly limonite stained gouge. Rest of interval is gouge but recognizable as AK
84.8	93.9	9.1		0.02											0.02			md			md								md	10	4	45	5			QTZ veins 87.8 to 87.8	70°	QTZ veins 77 and from 84.8 to 87.8 than non staining or altd. topaz to 93.0
93.9	103.1	9.2		0.04											0.04			md	Tr		md								md	25	3	40	5(?)			QTZ vein 98.6	65°	QTZ vein @ 98.6 w/ lim. limonite, large sulfide cavities, trace unoxidized py. From 98.8 to 103.1 highly broken altd, gouge - fault zone
103.1	112.1	9.0		0.09											0.02	0.07		Sp Wk	-	Tr	Sp wk	-	-	-	-	-	-	-	Tr Sp	Mod	-	35	3%					Rk wk-mod AxO, wkly Hem-lim stained. - Sp Gra. Calc. spots of ppt folds - Rk mod-stly. Bxd
112.1	121.7	9.6		0.08											0.02	0.06		wk	Tr	-	Mod	-	-	-	-	-	-	-	Sp	Mod	Tr	35	3%			Remnant Gossan - Sec. zone Pyrite mtx 120.0	≈ 60°	Rk more strongly Hem-lim. Stained, wk Bx work. Remnant Sulfs 120.0 - 121.6. Py only
121.7	129.2	7.5		0.02											0.02			wk	Tr		wk		-	-	-	-	-	-	Tr Sp	Mod	-	40	2%			Sulfs Cilla 129.2	122.8-129 Fracts	85-90	Rk is fin. gg for most part. Remainder shows micro stockwork - some barite present
129.2	139.3	10.1		0.32											0.02	0.30	Tr	Tr	2%	-	Tr	-	-	-	-	-	-	-	Tr Sp	wk Mod	-	45	1%	Tr					RxB wk-Mod. AxO. Primary sulfs are v.f. gr. + well dissem. Primarily Py. Thin QC coating on folds + on some fracts.
139.3	148.7	9.4		0.16											0.02	0.24	Tr	—	2%	-	-	-	-	-	-	-	-	-	Ti	wk Mod	-	45	1%	Tr					P folds are fill to bottom of open white and Coarse barite filled K-Spars are only slightly lighter red. Sheets of leach solutions from above are seen as coy on fracts + stain along
148.7	158.0	9.3		0.25											0.01	0.22	0.02	—	1%	-	-	-	-	-	-	-	-	-	Tr	wk	-	45	1%					wk alt. Bxd is only slightly altd. Primary sulfs are wide spaced + QC is v. thin
158.0	166.9	8.9		0.24											0.01	0.21	0.02	—	1/2	-	-	-	-	-	-	-	-	-	Tr	wk Mod	-	40	Tr	Tr				As Above
166.9	178.9	12.0		0.19											0.01	0.17	0.01	—	1.5%	-	Tr	-	-	-	-	-	-	-	Tr	wk Mod	-	40	Tr	Tr Sp	AP @ 178.4	NOT	30°	As Above.
178.9	191.2	12.3		1.05		0.03									0.02	0.83	0.20	—	1%	-	-	-	-	-	-	-	-	-	Mod	Mod	?	60%	-			AxO 191.2		Ap is mod-stly altd, Mod. min + bxn. Locally Ak Tr is seen. Tr is graphite
191.2	202.7	11.5		0.33											0.01	0.27	0.05	—	1/2%	-	-	Tr	-	-	-	-	-	-	Tr	Mod wk	1%	30%	Tr	Tr Sp				wkly alt. Ak. Tr wide spaced stalls still Tr. B.S. on Py.
202.7	211.8	9.1		0.18											0.01	0.09	0.08	—	1%	-	-	-	-	-	-	-	-	-	Tr	wk	-	40%	Tr	0.3%				As Above. Increasing Tourmaline content.
211.8	219.6	7.8		0.17											0.01	0.08	0.08	—	1%	-	-	-	-	-	-	-	-	-	Tr	Sp	-	45	Tr	-				wkly altd + wkly mineralized. No Tourmaline
219.6	228.5	8.9		0.29											0.01	0.18	0.10	—	1%	-	-	-	-	-	-	-	-	-	Md	Sp	2	60	Tr	-		2 QTZ-Sulf. vein @ 223.6	≈ 60°	Zone of strong silicification surrounding QTZ vein, from 222.8 - 227.4. Decalcified rock appears as above.
228.5	237.2	8.7		0.76		0.02									0.02	0.64	0.10	—	2%	-	-	Tr	-	-	-	-	-	-	Md	wk	2	60	Tr	-				w/ sericite. st. silicification w/ wk min over most of interval
237.2	246.1	8.9		0.35	63.3 @ 0.52		63.3 @ 0.01									0.30	0.05	—	2%	-	-	-	-	-	-	-	-	-	Md	wk	2	60	Tr	-		QTZ sulf vein @ 240.8	≈ 70°	Silicification ends about 241.5' ends in wkly altd AK
246.1	254.1	8.6		0.33												0.28	0.05	—	2%	-	-	-	-	-	-	-	-	-	Md	wk	?	60	Tr	SP				Tourmaline in fractures from 246-248
254.1	268.9	14.2		0.45												0.35	0.10	—	2%	-	-	-	-	-	-	-	-	-	Md	wk	?	65	Tr	-				Silicified from 249-252. Near vertical sulfide veining.
268.9	277.0	8.1		0.82		0.03									0.03	0.79	0.10	—	2%	-	-	-	-	-	-	-	-	-	Md St	wk	-	60	Tr	-				mostly silicified w/ vertical sulfide veinlets, C.C., Px, Spy
277.0	291.8	14.8		0.50		0.01									0.01	0.39	0.10	—	1%	-	-	-	-	-	-	-	-	-	Md	Md	1	55	SP	Tr				St. sil., as above w/ C.C. on Px. Silicification ends about 282.0'. Rock becomes md. altd w/ c.c. on py.
291.8	300.6	8.8		0.30												0.15	0.15	—	4%	-	-	-	-	-	-	-	-	-	St	wk	1	60	-	—				Steep, Thin QTZ veining. gouge at 288.8
300.6	310.1	9.5		0.34												0.24	0.10	—	3%	-	-	-	-	-	-	-	-	-	ST	ST	-	30	SP	-				st. alt & sil, massive px from 293.2-293.9,
310.1	320.1	10.0		0.26												0.20	0.06	—	2%	-	-	-	-	-	-	-	-	-	ST	Md ST	-	30	SP	-				Interval begins sil. but becomes gouge @ 303.6 (-312.5).
320.1	329.1	9.0		0.27												0.14	0.13	—	2%	-	-	-	-	-	-	-	-	-	ST	ST	-	35	SP					Gouge to 312.5, strong sil. to 316.5, st. alt. to end of interval
329.1	339.0	9.9		0.15												0.08	0.07	—	3	-	-	-	-	-	-	-	-	-	ST	ST	1	25(?)	SP			QTZ vein @ 337.0	80° (?)	st. alt. w/ gouge zones to 328.0. Intense alt. and/or gouge dominates core from 328.0 to 347.0. Cpy & C.C. in
339.0	348.0	9.0		0.07												0.02	0.05	—	1	-	-	-	-	-	-	-	-	-	ST	ST	-	25(?)	SP					QTZ vein at 337.0.
348.0	355.5	7.5		0.03												0.01	0.02	—	1	-	-	-	-	-	-	-	-	-	Md	ST	-	40	SP					Md alt becomes intense from 353.0-354.2. wk C.C. on Px
355.5	364.1	8.6		0.05												0.03	0.02	—	1%	-	-	-	-	-	-	-	-	-	SP	SP	1	45	SP					Md. alt. Throughout, aplite from 359.3-361.3.
364.1	372.1	8.0		0.12												0.08	0.04	—	1%	-	-	-	-	-	-	-	-	-	SP	SP	1%	45	SP			QTZ vein 368-372	80°	Md alt., alt. of plag to clay minerals, fresh K-spar, texture unaltered
372.1	381.0	8.9		0.06												0.02	0.04	—	1%	-	-	-	-	-	-	-	-	-	SP	SP	-	45	SP					as above
381.0	392.0	11.0		0.04												0.02	0.02	—	2%	-	-	-	-	-	-	-	-	-	SP	SP	5	45	SP			QTZ vein 380.0-380.3	55°	wk - md alt.
392.0	406.2	14.2		0.14												0.02	0.12	—	2%	-	-	-	-	-	-	-	-	-	SP	SP	7	45	SP			Veins	70°	QTZ veins from 395.7-396.7 & 404.4-406.2, md alt, some cpy in first vein.
E.O.H.																																						

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D 255
Page 1 of 1 Pages
Collar Elev 2,826.77
Final Depth 309.0
Coords. N 36,635.93 E 19,726.5
Inclination VERTICAL
Logged by R.C.
Date: Start 10/16/67 Finish 10/19/67

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu N.S	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Wet Dry Stain	Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn Qtz	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0	63.0	63.0																																			Ramp
63.0	71.3	8.3		0.02										0.02				md			Tr								T+SP	-	45	Tr					Green alt. product (mostly malachite) stained, fined from plag. limonite mainly on fractures
71.3	81.1	9.8		0.03										0.03				ST			SP								Tr	SP	Tr	45	Tr		located 8' to vein 71.5	35°	1" at gauge at 72.1. Vertical jointing
81.1	90.2	9.1		0.04										0.04				ST			SP								Tr	SP		45	Tr				plag. sections to be strongly alt., limonite on fractures may be enhanced by leach pods.
90.2	99.2	9.0		0.04										0.04				ST			SP								Tr	SP	Tr	45	Tr		Veins thin veins	50° & 90°	As above
99.2	108.1	8.9		0.03										0.03				ST			md								SP	SP	Tr	45	Tr				steep, thin limonite filled cracks with pr. cavities
108.1	118.0	9.9		0.06										0.06				ST			md								SP	md	Tr	45	Tr				fault zone 108.5-118.0, salpaids cavities as above, moderate alt.
118.0	126.3	8.3		0.04										0.04				md			–								SP	md	Tr	45	Tr				limonite filled fractures, trace pr. cavities
126.3	135.1	8.8		0.07										0.07				md			–								SP	md	Tr	45	Tr		8'8 vein 128.5	80°	As above
135.1	144.0	8.9		0.07										0.06	0.01			md			Tr								SP	md	Tr	45	Tr				Dis. hem after magnetite. Plag altd to clay minerals
144.0	152.5	8.5		0.20									0.10	0.10				md			–								SP	md	Tr	45	Tr				light green Cu staining on fractures, addition to brown limonite
152.5	161.6	9.1		0.08										0.08				md			–								SP	md	Tr	45	Tr				Rossolite, epi. bowlder in thin steep veinlets
161.6	170.2	8.6		0.25									0.10	0.15				md			–								SP	md	SP	45	Tr				Cu - (?) staining on fractures, green alt. minerals (Cuentamarillanite?)
170.2	179.6	9.4		1.02			0.78						0.78	0.22				md			–								SP	md	ST	Tr	45	Tr			Dark, bright green staining from 173.6-177.6, gauge 173.6-173.8
179.6	189.0	9.4		0.44			0.25						0.25	0.19				md			–								SP	md	ST	Tr	45	Tr			strong. 15% light green alt. minerals, light Cu staining
189.0	198.8	9.8		0.18			0.04						0.02	0.02	0.14			wk	SP		Tr								SP	ST	Tr	45	Tr		8'8 dot vein 189.5, leached veins	90°	20% green alt. min after plag, hem after mag., wk. c.c. near end of interval
198.8	208.4	9.6		0.49			0.09						0.09	0.03	0.35	0.02		md	<1%		–								SP	ST	1%	45	Tr		leached veins		leached veins with yellow brown limonite, some dis. c.c. on pyr. remains
208.4	217.5	9.1		0.37			0.10						0.07	0.03	0.25	0.02		ST	<1%										SP	ST	Tr	45	Tr				ST at b., stilbite from 215.0 to 217.5, wk. mod. c.c. on pyr
217.5	226.0	8.5		0.43			0.11						0.11		0.32	0.02		wk	<1%										SP	md	Tr	45	Tr				wk. c.c. on dis. and pyr. 15-20% green alteration minerals
226.0	235.0	9.0		0.35									0.03		0.26	0.07		Tr	<1%										SP	md	Tr	45	Tr				Gouge 227.5-227.9. alt. products becoming yellow (vs green)
235.0	243.9	8.9		0.36									0.03		0.30	0.03		Tr	<1%										SP	ST	Tr	45	Tr				light green gouge on all fractures, strong gouge since 241.0'
243.9	253.2	9.3		0.39									0.04		0.32	0.03		–	<1%										SP	md	Tr	45	Tr				broken, gouges, alog. altd. to yellow green clays, wk-mod c.c.
253.2	262.3	9.1		0.38									0.02		0.34	0.02		Tr	1%										SP	md	Tr	45	SP		calt stringers	70°	As above
262.3	270.9	8.6		0.27									0.02		0.22	0.03		SP	1%										SP	md	Tr	45	SP				Highly broken & gouger from 265.0-267.6.
270.9	280.0	9.1		0.34									0.01		0.30	0.03		SP	≤1%										SP	SP md	Tr	45	SP	Aplite 275.0-277.5		Aplite makes sharp contact dipping 10°
280.0	290.0	10.0		0.31									0.01		0.27	0.03		SP	≤1%										SP	md	Tr	45	SP				Aplite fingers in Rk from 281.7-283.0. Rk remains mdly altd, wk tr min.
290.0	309.0	19.0		0.18									0.01		0.14	0.03		SP	≤1%										SP	md	Tr	45	SP		Px vein	70°	1" aplite 295.9 dips 50°; Px vein @ 296.1 dips 10° in opposite direction. wk c.c. coatings
	EOH																																				

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO- SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D 256
Page 1 of 1 Pages
Collar Elev 2,821 34 Final Depth 320.2
Coords. N 26,791 55 E 14,636 90
Inclination VERTICAL
Logged by RE
Date: Start 9-21-67 Finish 9-25-67

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Mis C. N.S.	Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb.	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0	139.9	139.9																																			Dump Material, (leach dump)
139.9	148.3	8.4		0.05									0.05					ST			md							Tr	SP	- 45	Tr		AK				md alt., green alt products - Pinite (?), aplite from 146-149
148.3	156.8	8.5		0.28									0.28					ST			SP							Tr	md	- 45	Tr						ST limonite (not "live") along fractures, malachite also on fractures
156.8	165.9	9.1		0.09									0.09					ST			SP							Tr	SP	- 45	1%						Plag altd light yellow, bi altd to chlor., mod-st. alt.
165.9	175.5	9.6		0.26									0.26					md			-							Tr	SP	- 40	5%						decrease in limonite, mal. persists on fracts - up to 1/8"
175.5	184.8	9.3		0.45		0.12							0.12		0.33			md ST	1%		-							Tr	SP	- 40	3%			sulfide veinlets	60°		c.c. on px along thin seams, 1% pinite
184.8	194.0	9.2		0.39		0.16							0.16		0.23			md ST	1%		-							Tr	SP	- 40	1%						As above
194.0	203.1	9.1		0.54		0.09							0.09		0.35	.10		ST	1%		SP							Tr	SP	- 40	1%						As above. Hem along steep fractures - related to leach ponds (?)
203.1	212.4	9.3		0.50		0.06							0.06		0.34	.10		md	1%		-							Tr	SP	- 40	1%						Limonite decreases throughout interval, c.c. on px, Tr of cpy
212.4	221.2	8.8		0.47	53.8 ?	0.05	53.8 ?						0.05		0.29	.08		md	1%		-							Tr	SP	1	45	1%			QTZ veins	70°	Persistance of limonite into sulfide zone probably due to leach ponds.
221.2	230.3	9.1		0.54	0.55	0.05	0.065						0.05		0.39	.10		md	1%		-							Tr	md	1	45	1%			vein	80-90°	Vertical fractures and Quartz-sulfide veining from 223.0-227.0
230.3	238.9	8.6		0.83		0.04								0.04	0.69(?)	.10		md	2%		-							SP	md	3	45	1%			QTZ vein 233.9 236.2	≈85°	c.c., cpy - will probably have good assay. Vertical fracturing from 232.6-233.9, QTZ-sulfide vein has med ^
238.9	247.8	8.9		0.48		0.10								0.10	0.28	.10		md	1%		wk							Tr	SP	- 45	Tr						md alt., rust colored limonite and flat red hematite on fractures.
247.8	257.8	10.0		0.29										0.10	0.14	0.5		md	1%		-							Tr	SP	- 45	Tr						Vertical fracturing. c.c. on px. limonite unchanged in color or text.
257.8	265.5	8.7		0.13										0.03	0.10	-		wk md	1%		-							Tr	SP	1	45	Tr			QTZ-sulf 260-1 min fract	70°	decrease in limonite, 20% Pinite (?)
265.5	275.2	8.7		0.21										0.12	0.21	-		md	1%		-							Tr	SP	- 45	Tr					85°	Fracture @ 271.0' lined with natural, red brown limonite and small stale stc. cuprite and Tr of native
275.2	283.6	8.4		0.38										0.10	0.28	-		md	2%		-							Tr	SP	- 45	Tr						as dark cuprite
283.6	293.2	9.6		0.32										0.10	0.22			md	1-2%		-							Tr	SP	- 45	Tr						md alt., dis. py w/ c.c. coating. rust brown limonite continues ^
293.2	302.8	9.6		0.40	0.45	0.03	0.04							0.03	0.30	.07		md	1-2%									Tr	SP	- 45	Tr			Py - c.c. stringers	65°	As above. cuprite ends near end of interval
302.8	311.2	8.4		0.50		0.06								0.03	0.37	.07		md	1%									Tr	SP	- 45	Tr						As above
311.2	320.6	9.4		0.04											0.03	.01		SP	1%									Tr	SP	- 45	Tr						As above
320.6	330.4	9.8		0.02												.02		-	1%									SP	md	- 45	Tr						limonite ends at ≈ 315: - md alt., decrease in c.c., Tr of sp. along fracts.
330.4	339.8	9.4		0.02												.02		-	1%									Tr	SP	- 45	SP						Fracturing and intense alt. from 330.0-326.6
339.8	350.6	10.8		0.02												.02		-	1%									Tr	md	- 45	SP						mod-st alt., 10% green alt. products, 2nd Kspar (?)
350.6	360.4	9.8		0.02												.02		-	1%									Tr	wk Mod	- 40	Tr Sp.						increasing alt. to 349.0 where it becomes aplitic, cpx, c.c.
360.4	369.5	9.1		0.01												.01		-	1%									Tr	wk Mod	- Tr 40	Tr Sp						Some what fresh appearing - P. feldS. altering to green (Pinite ?) Tr. c.c.
369.5	380.2	10.7		0.03												.03		-	1%									Tr	Mod	Tr 40	Tr Sp.						As above - K. feldS still pink
E.O.H.																																					The pinite (?) development is moderate

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO- SILVER BELL UNIT

Notes:

(1) Est. % Cu represented by each mineral

(2) Est. mineral %; or, as follows: Trace (Tr); Sparce (Sp) < 5% Moderate (Md) 5-50% Stong (St) +50%

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D257
Page 1 of 1 Pages
Collar Elev 2825 45 Final Depth 410.7
Coords. N 38,082 62 E 16,352 34
Inclination VERTICAL
Logged by RE + N.R.N
Date: Start 8-30-67 Finish 9-7-67

From	To	Int'vl	Elev.	% Cu Total	Avg.	NS	Avg	% Core Recov	Sp. Gr.	Chrys.	Pitch	Black	Blue Green	[illegible]	Cc.	Cpy.	Born
0.0 / 4.0	4.0 / 12.9	8.9		0.23						0.10				0.13			
12.9	21.1	8.2		0.18										0.18			
21.1	30.2	9.1		0.06										0.06			
30.2	38.9	8.7		0.06										0.06			
38.9	47.2	8.3		0.11										0.11			
47.2	57.9	10.7		.08										0.08			
57.9	66.9	9.0		.12						0.08				0.04			
66.9	76.0	9.1		.26						0.04			0.10	0.12			
76.0	85.1	9.1		.10									0.10				
85.1	93.8	8.7		.23									0.23				
93.8	104.7	10.9		.22									0.22				
104.7	116.6	11.9		.15									0.15				
116.6	127.2	10.6		.20									0.20				
127.2	132.8	5.6		.60		.09							0.09		.30	.21	
132.8	142.2	9.4		.87	48.2	.11	48.2						0.11		.45	.30	.01
142.2	150.2	8.0		1.14	0.90	.08	0.06						0.08		.80	.32	.02
150.2	158.4	8.2		.91		.06							0.06		.54	.30	.01
158.4	166.4	8.0		1.09		.02							0.02		.70	.35	.02
166.4	175.4	9.0		.71		.01							0.01		.35	.35	
175.4	183.2	7.8		.25											.15	.10	
183.2	191.8	8.6		.30											.15	.15	
191.8	200.0	8.2		.50											.25	.25	
200.0	212.9	12.9		.23											.13	.20	
212.9	221.4	8.5		.59		.01								.01	.30	.28	
221.4	230.2	8.8		.45		.01								.01	.25	.19	
230.2	239.1	8.9		0.27											.11	.15	.01
239.1	247.3	8.2		0.25											.06	.18	.01
247.3	255.4	8.1		0.27											.07	.19	.01
255.4	262.8	7.4		0.22											.04	.18	
262.8	274.3	11.5		0.21											.03	.18	
274.3	287.0	12.7		0.22											.04	.18	
287.0	291.7	4.7		0.33											Tr	.33	
291.7	300.4	8.7		0.33												.33	
300.4	316.3	15.9		0.21												.21	
316.3	323.1	6.8		0.63												.63	
323.1	332.4	9.3		0.25												.25	
332.4	341.6	9.2		0.18												.18	
341.6	350.5	8.9		0.13												.13	
350.5	359.0	8.5		0.18												.18	
359.0	367.2	8.2		0.21												.21	
367.2	375.9	8.7		0.36												.36	
375.9	384.8	8.9		0.22												.22	
384.8	393.0	8.2		0.23												.23	
393.0	401.7	8.7		0.23												.23	
401.7	410.7	9.0		0.35												.35	
E.O.H.																	

From	Lim.	Py	Mag.	Hem.	Spec.	Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	Bi.	2nd K-Spar
4.0	md ST	-		SP								SP	SP	-	15	md		
12.9	md ST	-		SP								SP	SP	-	15	md		
21.1	md	Tr		Tr								SP	md	1	15	md		
30.2	md	Tr		Tr								md	SP	-	15	md		
38.9	md	Tr		Tr								md	SP	-	15	md		
47.2	md	-		Tr								md	SP	-	15	md		
57.9	md	-	Tr	Tr								md	SP	-	15	md	5%	
66.9	md	-	Tr	Tr								md	SP	-	15	10%	20%	
76.0	SP	-		-								md	SP	-	15	5%	5%	
85.1	SP	-		-								md	SP	-	15	5%	3%	
93.8	SP	-		-								md	SP	2	15	5%	5%	
104.7	SP	-		-								md	SP	2	15	5%	5%	
116.6	ST	-		-								md	ST	-	15?	md ST	?	
127.2	SP	<1%		-								SP	SP	-	15%	5%	10%	
132.8	Tr	4%		-								—	—		15%	5%	10%	
142.2	-	1%		-				tr				Mod	-	tr.	20%	4%	2%	
150.2	-	1%		-				tr				St	-	-	20%	3%	4%	
158.4	-	1%		-				tr				Mod	-	-	20%	2%	3%	
166.4	-	4%		-				tr				Sp	-	tr	20%	6%	4%	
175.4	-	<1%		-				tr				Mod	-	tr	15%	4%	<1%	
183.2	-	2%		-				tr				Mod	-	tr	20%	2%	3%	
191.8	-	1.2%	-	-				tr-sp				Sp	-	1%	15%	2%	4%	
200.0	-	1%		-				tr				tr-sp	-	-	20%	1%	4%	
212.9	-	<1%		-				-				tr	-	-	15%	3%	3%	
221.4	-	tr-sp		-				-				Sp	-	tr	15-20%	4%	1%	
230.2		4%						Tr				Tr	-	4%	10%	2%	3%	
239.1		2%						.01				Tr	-	2	10	3	2%	
247.3		1-2%						Tr				SP		3%	10%	3%	2%	
255.4		2%						Tr				Tr		2%	10%	5%	2%	
262.8		2%						Tr				SP		2%	10%	5%	2%	
274.3		1-2%						Tr				SP		2%	10%	5%	2%	
287.0		3%						.054				SP		3%	10%	5%	3%	
291.7	-	<1%	-	-	-	-	-	0.03	-	-	-	Tr-Sp	-	1%	15% ?	1-2%	5%	4%
300.4	-	1-2%	-	-	-	-	-	Tr	-	-	-	Tr-Sp	Tr sp	<1%	10% ?	2%	6%	2%
316.3	-	1-2%	-	-	-	-	-	0.02-0.03	-	-	-	Tr	Sp	<1%	10% ?	1%	3%	5%
323.1	-	1%	2%	-	-	-	-	Tr	-	-	-	-	Sp	Tr	10% ?	1%	4%	3%
332.4	-	2%	Tr	-	-	-	-	Tr	-	-	-	Sp	Sp	<1%	15% ?	1%	3-4%	2%
341.6	-	<1%	-	-	-	-	-	-	-	-	-	Tr	Tr Sp	-	15% ?	3%	6%	1%
350.5	-	2%	Tr	-	-	-	-	Tr Sp	Tr-Sp	-	Tr	Tr	Tr Sp	1%	10% ?	3%	5%	1%
359.0	-	<1%	Tr	-	-	-	-	Tr	Tr- Sp	-	-	Tr Sp	Tr sp	<1%	10% ?	3%	5%	1%
367.2	-	<1%	Tr	-	-	-	-	Tr	Tr Sp	-	-	Tr Sp	Tr Sp	Tr	10% ?	1%	4%	1%
375.9	-	<1%	Tr	-	-	-	-	Sp	Tr	-	-	Tr Sp	Sp	-	10% ?	3%	4%	1%
384.8	-	<1%	Tr	-	-	-	-	Tr	Tr	-	-	Sp	Tr Sp	-	10% ?	3%	4%	2%
393.0	-	<1%	Tr	-	-	.	-	Tr	Tr Sp	-	-	Tr- Sp	Tr- Sp	-	10% ?	2%	4%	1%
401.7	-	2%	Tr Sp	-	-	-	-	0.03	Sp	-	-	Sp	Sp wk	-	10%	4%	4%	4%

From	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
4.0	Dp ?			Texture vague. Partial alt. of bi → chlor, 2nd Bi.
12.9	Inter. mixed Mz + Dp			Texture more distinct. md-st alt. most bi completely altd. To chlor, however some bi is nearly unaltered. Alt. of F plag.
21.1				As above 5% bi in various stages of alt., minute py xtals.
30.2				chlorite appears to be altering to sericite
38.9	Biot Mz A1.2			more, fresh looking, secondary bi, otherwise as above
47.2				As above
57.9				As above Joint spacing: 2"
66.9				As above except from 71.0-75.0 where groundmass is darker due to increased fine grained bi.
76.0				less limonite, beginning of visible malachite
85.1				As above Altered inclusion (sediment?) @ 92.0
93.8				As above weak-md alt, no sulfides, SP limonite
104.7				As above with bi in various stages of alt to chlor.
116.6				Fault zone with intermittent yellow-green gouge between intervals of broken rock limonite restricted to fractures. less alteration of bi → chlor.
127.2		Sulfide zone @130'		Dis. f.g. pyrite in rock. Tr of cpy, c.c.
132.8				Nearly fresh Mz w/ c.c on cpy and py, highly broken 135-139
142.2				Biotite has altered to chl. & sericite. Good Cc coating on sulfides.
150.2				Along fracture breaks there is some alt. to sericite, & generally an aphanitic texture.
158.4				As Above
166.4				Most biot. altered to chl-ser. Some feldspars show secondary growth. Some alteration of Plag. to pinite(?)
175.4				As Above
183.2				As Above Both green & yellow forms of pinite(?) present.
191.8				Texture has more silicic appearance (vague)
200.0				Secondary ortho. appears in sulfide concentrations.
212.9				Highly altered area w/ grn appearance due to almost total alt. of plag. to pinite. Secondary ortho. w/ sulfides. Zone is highly broken.
221.4				Like above only grading into less altered condition in last two feet of interval.
230.2		QTZ-Py Vein @237'	60°	Alteration as above, 2-1" qtz-sulfide veins near and w/some cpy
239.1				Random thin vuggy qtz veins; some w/moly. Secondary Kspar. Generally subhedral-anhedral minerals except for large 2nd Bi. Dis. cpy. 2nd Kspar
247.3				
255.4				As above.
262.8				Texture partially destroyed, md. silicified, dis sulfides
274.3				md. alt. & silicification, sp. cpy
287.0		QTZ-Sulfide veins	65°	md. alt. & sil. w/ veins of 25% sulfide-75% qtz., plus dis. moly. affected
291.7				Rk has mod fresh appearance - Felds. phenos obscured by sil'n. CPY to PY > 1. Sulfs well dissem.
300.4				Much Core loss. - Rk appears wkly altd. Higher total sulf. cont. - 2nd k-spar in veinlets + flooding.
316.3		1" G.G. zone @323.1	20°	There is an assoc. between 2nd k-spar + CPY. - More alt. showing up. Felds becoming visible local thick concentrations of CPY.
323.1				High mag. content 323.1 - 323.6 gives rk a black appearance - k-spar along fracts
332.4				Rk is more dense appearing, less 2nd k-spar, less vuggy + less total sulfs.
341.6				As Above
350.5				Generally As Above - Rk. Continues to be occasionally vuggy - open spaces may represent early brecciation
359.0				As Above. - Qtz content is + has been questionable. It occurs as a pervasive amorphous invasion of grnd mass.
367.2				Numerous open spaces. CPY to PY > 1. Sulfs occur in voids, veins + dissem.
375.9				No significant changes
384.8				"
393.0				"
401.7				Rk is more stly brkn, altd, and mineralized. + shows more Calcite - Hole Terminated because of Depth but should be deepened to check on sediments at depth

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO – SILVER BELL UNIT

Notes:
(1) Est. % Cu represented by each mineral
(2) Est. mineral %; or, as follows: Trace (Tr); Sparce (Sp) < 5 %; Moderate (Md) 5–50 %; Stong (St) +50 %

Note (3): Tt – Toctite; Hf – Hornfels; Mb – Marble; Qt – Quartzite; Bx – Breccia; Dc – Dacite; Mz – Monzonite; An – Andesite

Note (4): V – Vein; F – Fault; D – Dike; C – Contact; Ig – Undif igneous

Hole No. D-258
Page 1 of 3 Pages
Collar Elev. 2,786.20 Final Depth 1011.0
Coords. N 38,007.71 E 15,394.33
Inclination VERTICAL
Logged by RE; RRC; N.R.N.
Date: Start 9-7-67 Finish 10-6-67

Depth From	Depth To	Intvl	Elev.	% Cu Total	Avg.	N.S.	Avg.	% Core Recov	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Non Sulf (?)	Cc.	Cpy.	Born.	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb.	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE			(3) Rock Type	Structures (4) Depth	True Dip	Remarks
4.0	12.1	8.1		0.01										0.01				ST	-	?	md/ST								SP	SP	1	50				AK	qtz veins	60°	md-st altd, hem stained AK w/ pinite,(?) cock in qtz veins.
12.1	21.9	9.2		0.02										0.02				ST			md/ST								SP	SP	3	55							As above
21.9	30.9	8.4		0.02										0.02				ST			md								SP	SR	3	55							abundant boxwork along fractures, veins; some cpy, cc coats, mostly py fracts
30.9	37.5	6.6		0.02										0.02				ST			md								SP	SP	2	55				AK	Ak contact @ 37.5		As above Veins dip at all angles
37.5	42.3	4.6		0.07										0.07				SP			wk								SP	60%	-	-	Tr			An			Bleached, highly altd An. Near contact altd to 80% clay, light yellow-gray to tan
42.3	49.2	6.9		0.02										0.02				ST			wk								SP	20%	1/2	50	Tr			AK	AK contact @ 42.3		st. altd AK localized complete destruction of feldspars.
49.2	58.8	9.6		0.02										0.02				st			mod								sp	mod/st	-	40	-						Feldspars are somewhat bleached. Plag. has hem-lim staining but in places is altered to light green min.
58.8	67.4	8.6		0.03										0.03				mod			st								tr	mod/st	1/2	35	-						Boxwork from previous sulfide mineralization present. Sp occurrence of light green supergene min. which occurs in veining as well as separate chunks. Tr occurrence of pinite.
67.4	76.1	8.7		0.02										0.02				wk/mod			st								tr	mod/st	-	30	-						Like above
76.1	88.4	12.3		0.10										0.10				st	tr		mod								sp	st	-	30	-						Like above until 81.2' where it becomes highly altered & broken (probably fault zone). The Ak has a granular appearance from 81.2 to end of interval.
88.4	94.3	5.9		1.25		1.02							1.02	0.23				wk	=									?	-	st	-	-	?			An	Contact 88.4		First ? broken w/ lim staining. Plag phenocrysts altered to pinite. Dark green phenocrysts of mafic(?) present. Presence of exotic malachite & devrite(?) throughout. Rk is very soft as a whole.
94.3	103.6	9.3		1.91		1.85							1.85	0.06				wk			-							?	-	wk	-	-	?				Contact w/ Ap 103.6		Small interval of Ak in An (99.4–100.8). Otherwise like above (except rk is not soft)
103.6	112.6	9.0		0.04										0.04				wk	-		wk								-	-	18	35	-			Ap			Qtz veining has oolitic appearance w/ boxwork from sulf. in the center. Ak appears out of place in rock.
111.6	122.2	9.6		0.02 (circled; Assay Hi Lim(?))										0.02	[illegible]	0.01		wk	tr/ck		wk								wk	mod	-	30	-			Ak			Some plag to pinite; other plag bleached white. Some boxwork present w/ some pyrite w/ cc coating. Ak has more normal appearance towards end of interval. – Mid JAR (Lim)
122.2	130.9	8.7		0.02											0.02			sp	-	Tr	wk	-	-	-	-	-	-			wk									Sp like Al
130.9	140.2	9.3		0.02											0.02			Tr/Sp	0.1%	-	sp	-	-	-	-	-	-	-	Tr	Sp	0.1%	30%	-		Tr	Ak ? 137.8–140.2	Cr. 70°; Fractures	70°; 30°	Rk is wk oxd. bleached: K felds white, but not soft. K-felds ?, Sp Hem-Lim stain – Tr Sulfs.
140.7	145.4	5.2		0.27									0.24	0.02	0.01			sp	2%	-	-	-	-	-	-	-	-	-	Tr	Sp	-	45%			mod	Ak @ 140.7(?)			Sp. diss – Sp Hem-Lim on fracts – Only sp-tr indications of former sulfs.
145.4	158.3	12.9		0.18									0.18					sp	0.2%	Tr	-	-	-	-	-	-	-	-	Tr	-	-	30%				Bx ... 158.3(?)	Bx Cr; Cr 70°(?)	70°(?)	Rk appears somewhat silicious – has been brxd & rehealed – Lim is brn & malachite on some fracts. Cu ? is apparent
158.3	167.0	8.7		0.75		0.08								0.08	0.	0.67		Sp	3%	?	sp	-	-	-	-	Md	15%	15%	-	?	60%	?	30%			Dike w/ ... 163.5(?)	161.4(?)		Med-dk gray grn Bx composed of 1–3 mm feld phenos, 20% chlor phenos 1 mm in f. matrix. V.f.gr. Py uniformly dissem. May be syngenetic – Sp Mal + Azur assoc. – Lower F.z. contact is post brxn.
167.0	173.3	6.3		1.93		0.02								0.02		1.91		Tr	8%	-	2%	-	-	-	-	Md	30%	15%	?	-	-	1%	15%				(?) 170	70°	Rk is Bx ... Rk is f.gr. med-dk grn & composed of ... chlor-silicates-Gar and is mineralized by v.f.gr.
173.3	175.8	2.5		0.21	1.26 (?)		1.86 (?)									0.21		-	2%	-	-	-	-	-	Sp	-	-	Tr	Sp	-	13	37				@ 173.3(?)			Interbedded chl. Hf & Gar. Tr. Pebble Bx @ 169.5 has qtzite pebbles. Sulfs become St. from 178.1. Cpy content shows st increase also – Assoc. of Hem + Cpy.
175.8	181.1	5.3		0.06											0.01 (?)	0.04		-	2%	-	-	-	-	-	Sp	-	-	Tr	Sp	Tr	27	37				181.1(?)			This is the same Hf seen in D-230, D-234 & D-231 – Tr has a ? developed and ? ... 1% f.gr. Py is uniformly dissem & Tr biotite(?) to chlor. Approx 1% qtz eyes.
181.1	183.6	2.5		1.60	1.16 (?)	0.01	N.I.							0.01		1.57		-	1%	-	.05%	-	-	-	-	Wk	70%	20%	-	-	0.1%	?	-			Ls Gar(?) 181.1	Lower Contact 181.1	70°	Med grained Gar. of lt brn & lt grn color. Variable amts of open space. Cpy higher in brn Gar. Tr.
183.6	191.4	7.8		0.16		0.01								0.01		0.15		-	2%	-	-	-	-	-	-	Sp	-	-	Tr	Sp	-	3%	4%			Hf @ 183.6(?)			No – As described above. Py is now quite ? Chlor occurs along fracts as well as alteration of biot.
191.4	200.8	9.4		2.25		N.I.								0.1 (?)		2.25		-	6%	37%	4%	-	-	-	-	Wk	60%	30%	-	-	?	Tr					200.8(?)	70°	Rk changes from gar Tr to a gar-tremol(?) Hf. St Cpy ... w/ Mag & the first Tr ... There is a St assoc. of Cpy + Mag. The Mag is altering to Hem in places.
200.8	209.8	9.0		1.20		0.01								0.01		1.19		-	14%	14%	Sp	-	-	-	Sp	Wk	60%	4%			?	Tr					Contact(?)	70°	Gar Tr ... f.gr. varied Cpy throughout. Hf is ... No sulf – Remaining ...
209.8	217.8	8.0		0.02												0.02		-	-	1%	Tr						1%			Tr			30%				Low contact(?)	70°	Tr is fractured & grained w/ much open space, but little sulfs. Post Min Rxbn(?) Tr 70°
217.8	223.8	5.0		0.04												0.04		-	Tr	1%	Tr								Sp				20%					70°	Ague(?) as Breccia, Bx: Feld phenos are ... vague ... throughout ... Calcite vns.
222.8	226.9	4.1		4.77												4.77		-	4%	37%	4%	-	-	-	Sp	Mod	30%	30%		?	?						Poss. vein(?)	75°; 60°	As above: slightly more altd. altd Feld phenos more prominent.
226.9	232.7	5.8		0.29												0.29		-	Tr	Tr	Tr	-	-	-	Sp	Wk	15%	30%	-	-	5%	5%	15%	4%	Bx				Appears to be quite sheared ... occurs as thin wedge which contains mod-st Mag and ... The brn Gar Tr is ... grained and is sp'ly mineralized w/ Cpy & ... Mag.
232.7	233.8	1.1		0.06												0.06			2%	Sp						3%				Sp	-	30%							The Hf is sp'ly brxd – rehealed w/ calcite, qtz, + ... Bx possibly w/ structural intensity ... sulfs. Cpy & tr mag ... as above.
233.8	240.0	6.2		0.04												0.04			1%	Sp	6%					2%				Sp		30%					10% Cal(?)	75°	Ague(?) is as above. K felds stand out and are surrounded by Hem – ... irregular calcite veins
240.0	261.3	21.3		0.88		0.03								0.03		0.85		-	3%	Md		-	-	-	Tr	Md	70%	15%	-	-	?								As Above
261.3	266.7	5.4		1.11	0.76 (?)	0.01	0.015 (?)							0.01		1.10		-	3%	Tr	Md	3%	-	-	Tr	Md	60%				?						Possible bed(?)	33°	Tr is f grained granular brn gar. Hem stain throughout. F. grained sulfs throughout & locally massive. Tr is f. grained & Hem stained Gar. Decreases ... Hem & Cpy increase downward. Calcite also increases.
266.7	271.9	5.2		0.88		0.02								0.02		0.86		-	1%	-	Sp	Tr			Tr	Sp	Sp	30%	60%		?	Tr					Possible Bed	50°	Hem appears to be after specularite and possibly some from alt. of py. Possible bedding is indicated by parallel bands of coarser grained garnet in one small section of the core.
271.9	281.8	9.9		0.43	0.18	0.01								0.01		0.42		-	1%	-	Sp	Tr			Tr	Sp	80%	5%			1								Interbedded thin zones of Gar. Tr and dense non-reactive grn silicate Hf. Probably reflects original interbedded ls & shale – Cpy dissem. in Tr & only along a few fracts in silicate
281.8	288.2	6.4		0.31		0.01	0.015							0.01		0.30		-	2%	-	Tr				Tr	Sp	85%	2%			?								Lt yellow-brn Gar. Med Gr. possibly intergrown – Cpy & Py Sp, but occurs in porous zones(?).
288.2	294.9	6.7		1.48		0.01								0.01		1.47		-	2%	4%	Sp				Sp	Tr	90%				?	4%					Bedding	60°	Tr is now porous to 286.6 then porous to 288.6(?)
294.9	299.0	4.7		0.43		N.I.										0.43		-	1%	2%	-	-	-	-	Sp	Sp	80%				?	2%				299.6(?)			Dark white Hf of med hardness & no reaction. Sp'ly mineralized w/ Cpy & Tr Py. Mag locally st. Chlor assoc. w/ mag + Cpy.
299.0	312.3	12.7		0.19												0.19		-	1%	-	-	-	-	Tr	Sp	Sp	60%	25%	-	-	1%	?				Mottled Tr(?) & Hf	Qtz vn(?) 30°	70°	As Above
312.3	321.3	9.0		0.15												0.15			1%							SR	SP	60%	30%			1%					Qtz sulf vein 31.8(?)	60°	Rk has a mottled appearance of lt brn dense Gar and tassel in grey-green dense silicate Hf.
321.3	330.7	9.4		0.24												0.24			<1%	-	-	-	-	-	Tr	3%	60%	35%	-	-	Tr	-							mottled garnet-diopside horn fels, sp. mineralization
330.7	336.5	5.8		0.23												0.23			13%	Tr	-	-	-	-	Sp	Tr	Wk	80%	20%	-	-	?	Tr				Mottled Tex(?) 336–336.5		First one foot fine grained light green, slaty texture, otherwise light brown-green mottled texture
336.5	343.4	6.9		0.60		0.01								0.01		0.59			2%	-	-	-	-	-	Tr	Wk	Mod	15%	80%	-	Tr	Tr	?	Sp		Gar Silicate(?)			slightly mottled brn gar. Tr. w/ small patches of grey-green silicate Hf. Tr-sp dissem sulfs – one Cpy vn.
343.4	356.6	13.2		0.54												0.54			<1%	Sp				Tr	Tr	Sp	10%	85%	-		?	Tr					Contact(?)	15°	Rk: Gar silicate Hf is v.f.gr. ... locally may have been silicified, st. Tr sulfs. The Gar-Tr ... Hf is med. grained and contains sp. of Cpy
356.6	365.0	8.4		0.38												0.38			<1%					0.03 (?)	Tr	50	45		2								Qtz-sulf veins	70°	Gar. – ... has shotgunned appearance of Gar in wollastonite grd mass. Cpy assoc. w/ Gar. 45% ...

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Note (3)
Tt - Toctite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D-238
Page 2 of 3 Pages

Collar Elev 2,786 ±20 — Final Depth 1010.0
Coords. N 38,007 ±7 — E 15,394 ±3
Inclination VERTICAL
Logged by KE, HRN
Date: Start 9-16-67 Finish 10-6-67

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Wax, Nav. Sulf	Cc.	Cpy.	Born	Fe (2) Lim.	Mag.	Hem.	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
365.0	375.5	8.5		0.18												0.18																					
375.5	386.1	12.4		0.25												0.25																					
386.1	395.0	8.9		1.39		0.01								0.01		1.38																	HF				
395.0	403.9	8.9		0.67		0.01								0.01		0.67																					
403.9	412.7	8.8		0.60		0.01								0.01		0.59																					
412.7	419.5	6.8		1.59		0.02								0.02		1.57																					
419.5	428.3	8.8		0.16		0.01								0.01		0.15																					
428.3	437.7	9.4		0.26		0.01								0.01		0.25																					
437.7	446.2	8.5		0.54		0.01								0.01		0.53																					
446.2	455.1	8.9		0.45		0.01								0.01		0.44																					
455.1	465.9	10.8		0.40		0.01								0.01		0.40																					
465.9	474.3	8.4		0.77		N.I								N.I		0.77																					
474.3	488.6	14.3		0.90		N.I								N.I		0.90																					
488.6	498.8	10.2		0.07												0.07																					
498.8	513.5	14.7		1.58		0.01								0.01		0.25	1.32																				
513.5	518.7	5.2		2.40		0.01								0.01		2.19	0.20																				
518.7	539.7			0.83		0.01								0.01		0.52	0.20																				
539.7	550.4			0.82		0.01								0.01		0.76	0.05																				
550.4	559.2	8.8		0.70		0.01								0.01		0.69																					
559.2	567.6	8.4		1.01		0.01								0.01		1.00																					
567.6	576.2	8.6		1.95		0.01								0.01		1.94																					
576.2	585.2	9.0		0.50		0.01								0.01		0.49																					
585.2	598.4	13.2		0.34		N.I										0.34																					
598.4	603.5	5.1		0.09		N.I										0.09																					
603.5	611.9	8.4		0.10												0.10																					
611.9	623.1	11.2		0.77												0.77																					
623.1	632.3	9.2		0.09												0.09																					
632.3	640.0	7.7		0.30												0.30																					
640.0	653.9	13.9		0.18												0.18																					
653.9	663.9	10.0		0.29												0.29																					
663.9	672.6	8.7		0.84	533	0.01	53.5									0.84																					
672.6	682.0	9.4		0.72	2	0.01	2									0.72																					
682.0	691.3	9.3		0.68	0.53	0.02	0.02									0.66																					
691.3	704.4	13.1		0.12		0.01								0.01		0.11																					
704.4	717.2	12.8		0.48		0.03								0.02		0.21	0.24																				
—	—	—																																			
717.2	724.9	7.7		0.19												0.19																					
724.9	735.5	10.6		0.11												0.07	0.04																				
735.5	744.5	9.0		0.17												0.17																					
744.5	753.9	9.4		0.10												0.09	0.01																				
753.9	761.0	7.1		0.07												0.07																					
770.5	770.5	9.5		0.04												0.04																					
770.5	779.7	9.2		0.03												0.03																					
787.2	789.2	9.5		0.01												0.01																					
789.2	798.7	9.0		0.07												0.07																					
798.7	801.7	3.0		0.04												0.04																					

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D-232
Page 3 of 3 Pages
Collar Elev 2,786 ±20
Final Depth 1011.8
Coords. N 31,007 ±20 E 15,394 ±20
Inclination VERTICAL
Logged by N.R.N + R.E.
Date: Start 9-16-67 Finish 10-6-67

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov	Sp Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Wpr. Blue Black	Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem.	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE		(3) Rock Type	Structures (4) Depth	True Dip	Remarks
807.7	814.7	7.0		0.09												0.09		-	Tr	-	-	-	-	-	-	Tr	? - 100%	-	-	-	2	-					As Above, practically no sulf
814.7	824.3	9.6		0.07												0.07		-	Tr	-	-	-	-	-	-	Tr	Tr ? 92%	-	-	-	?	-					As Above
824.3	833.2	8.9		0.02												0.02		-	Tr	-	-	-	-	-	Tr	Tr	37% 95%	-	-	-	?	-					As Above, except that some qtz + well present & the rk is locally mottled.
833.2	842.1	9.2		0.04												0.04		-	Tr	-	-	-	-	-	Tr	Tr	? 1% 75%	-	-	-	?	-	Grn	←	Is Gray Grn. Silicate Hf Low Qtz @ 842.9		60°	This Rk is a gray - green Colored Silicate (?) Hf. This Rk may be composed primarily of V.S.I. grained qtz. It is V. hard. Rk Type
842.1	849.9	7.5		0.01												0.01	Tr	-	Tr	-	-	-	-	-	-	Tr	Sp 1% 70%	-	-	-	25%		Grn					This does not represent a change but is re-interpretation of Mineralogy. The rk is locally better & more hdd.
849.9	854.6	4.7		0.07												0.07		-	Tr	Tr	-	-	-	-	-	Sp	Wk ?	-	-	-	-	?	Grn	←	Is Gray Grn. Silicate Hf 849.9	855.0	56°	This rk has a weak porphyritic tex. of lt green RECTANGULAR + Sp. Soft. Phenos (?) not is a V.V. finely speckled grn + tan grnd mass. Wk Hd Rk. Vesicular. Sp well disem Mo & Low Tr.
854.6	862.5	7.9		0.02												0.02		-	Tr	-	Sp	-	-	-	-	Sp	7% 80%	-	-	-	-	-	Grn		Wk Tan Grn Hf 854.6	Cont	75°	Well & large qtz tram occur is about good acts. Tr. Hence been secret already work. Tr. Bo.
862.5	867.5	5.0		0.11												0.09	0.02	-	Tr	-	Sp	-	-	-	-	Tr	Sp 4% 90%	-	-	2%	4%	?	Grn		Wk Tan Grn Hf 862.5	867.5	80°	V.V. grained + quite hard - somewhat similar to that described 832 - 849.9 - Rk. filled w/ qtz well. Tan - Grn Hf. is locally well, f. to med. grained calcareous. Sp Born assoc.
867.5	877.9	10.4		0.10												0.05	0.05	-	Tr	-	-	-	-	-	-	Tr	Sp 1% 95%	-	-	-	?	-	Grn		Silicate Hf Wk Tan Grn 867.5			The Silicate Hf. is the v.v. grained + the hard Hf described previously. Up. Cont. very + appears to
877.9	886.0	8.1		0.02												0.02		-	Tr	-	-	-	-	-	-	Tr	1% 90%	-	-	-	?	-	Grn		Wk Tan Grn 877.9			This Tran. present. well locally forms in along fracts. Through Tran. Sp Bo occ.
886.0	894.7	8.7		1.89	8.1' 2 1.39	0.01	8.1' 2 0.01							0.01		0.20	1.67	-	Tr	-	-	-	-	-	-	Tr	Sp 20% 75%	-	-	-	?	-					The rk is mottled in a wk scale patches of well tran + Sp as the assoc of 4 to 8" Mod Sp assoc w/ high med. grained qtz. Content in interval 892.0 + 898.0
894.7	904.1	9.4		0.94		0.01								0.01		0.15	.78	-	Tr	-	-	-	-	-	-	Tr	10% 80%	-	-	-	?	-	Grn					Mottl as above but less Tran Tran (?) & Bo Sp Content to 898'
904.1	912.9	8.8		0.06												0.06		-	Tr	-	Sp	-	-	-	-	Tr	4% 80%	-	-	-	?	-					This rk could possibly be highly Siliceous. It is quite hard but appears to be v.f. Calcium Silicate.
912.9	922.3	9.4		0.05												0.05		-	Tr	-	Tr	-	-	-	Tr	Sp	8% 80%	-	-	-	?	-					The Rock is gen. light Hf. The Sample has been described previous times above. Cont w/ well Hf quite irregular. Well Hf. has increased but content decreased.
922.3	931.7	9.7		0.30												0.15	0.15	-	Tr	-	-	-	-	-	-	Tr	Sp 35% 75%	-	-	-	?	-					But is picked in Tr. The v.v. silicate is as seen above
931.7	940.6	8.9		0.18												0.15	0.03	-	Tr	-	-	-	-	-	-	Tr	4% 95%	-	-	1%	1%	-	Grn Tr Grn					As Above. Rk is a little coarse grained + appears to be primarily Tran (?) w/ lesser well and minor qtz. Bo locally present
940.6	943.9	3.3		0.30												0.20	0.10	-	Tr	-	-	-	-	-	-	Tr	1% 95%	-	-	-	-	Tr	Grn Tr Grn					Tran - well bec. rk. v. weakly mottled. Dark color Hf. Sp 941.6 - 943.9, 943.8 - 944.3, + 951.3 - 951.6
943.9	958.8	8.9		0.04												0.04		-	-	-	-	-	-	-	-	Tr	?	-	-	-	?	-	Grn		Wk Tan Grn Silicate Hf Dip at 949.9			This rk is lt. green - gray. V.f. grained w/ slight coccoid - vitreous luster. It is probably a Calc. silicate. Well bonded probably by a v.f. gr. silicate.
958.8	966.0	7.2		0.10												0.10		-	-	-	-	-	-	-	-	Tr	1% 75%	-	-	-	?	-	Grn 2% Grn					Just Checked Spec Gene. Color - Hardness - Rk is quite probably a v.f. grained Disp.
966.0	974.8	8.8		0.37												0.15	0.22	-	Sp	-	Tr	-	-	Sp	Tr	Wk	10% 80%	-	-	-	-	-	Grn 7% Grn		Tan Grn Silicate Hf Associated w/ Disp.	80° 65°		Fair Rk is tan is Sil + ssly recrystal w/ Disp. - Rk. Occurance of 1% x CM. Slight Stress is Rk - locally high Garnet.
974.8	984.0	9.2		0.22												0.10	0.12	-	Tr	-	-	-	-	Tr Sp	-	Sp	- 80%	-	-	-	-	-	Grn 4% Grn		Tan Grn Hf Mineralization Hf Dip at 988.0	≥90°		Rk is probably still a disp. Hf. The color is a little duller + rk contains more calcite. Tr - Sp. Sph.
984.0	992.8	8.8		0.07												0.07		-	-	-	-	-	-	-	-	Tr -	98%	-	-	-	-	1%	Grn 2% Grn					As Above. The rk continues to be broken and shattered by Gypsum + Calcite
992.8	1006.0	13.2		2.08	13.0' 2 1.70	0.01	13.0' 2 0.01							0.01		0.20	1.87	-	-	-	-	-	-	-	-	Tr	15% 75%	-	-	-	-	-	Grn 7% Grn	Contact	Dark Grn Tran Dio Hf 992.8 Hf 1004 Cont 1006	≈50°		Contact fairly distinct. Med grained radiating well of irregular intergrown tr Bo qtz + Med uniformly distributed Cpy - Born grains. Good str. Some bedding of sulfides dip 60°
1006.0	1011.8	5.8		0.83		0.01								0.01		0.15	.68	-	-	-	-	-	-	-	-	Tr	10% 60%	-	-	10%	-						Begins as above, gtz qtz. slaty ghost - 1023.5 and end of interval appears to be Dacite with Hf intermixed.
E.O.H.																																						

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO- SILVER BELL UNIT

Notes:

(1) Est. % Cu represented by each mineral

(2) Est. mineral %; or, as follows: Trace (Tr); Sparce (Sp) < 5 %
Moderate (Md) 5-50 %
Stong (St) +50 %

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D-259
Page 1 of 1 Pages
Collar Elev. 2,723.81
Final Depth 220.0
Coords. N 36,126.04 E 15,472.21
Inclination VERTICAL
Logged by N.R.N.
Date: Start 8-31-67 Finish 9-6-67

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Unk. Mod. Sulf.	Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	Rut	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0.0	27.0	27.0																																			
27.0	32.0	5.0		0.05										0.05				Sp Wk	-	-	Mod St	-	-	-	-	-	-	-	Tr	Sp	?	45%			Ak			Stl stained Ak. Qtz is about only of original minerals present.
32.0	37.0	5.0		0.05										0.05				Wk	-	-	Mod	-	-	-	-	-	-	-	Sp	Sp	?	45%						As Above. Hem-Lim staining is pervasive, but of dull red color
37.0	42.0	5.0		0.03										0.03				Wk	-	-	Wk Mod	-	-	-	-	-	-	-	Sp Wk	Sp	?	45%						More ser. remaining. Absence of Clay probably due to washing away
42.0	47.0	5.0		0.03										0.03				Wk	-	-	Wk Mod	-	-	-	-	-	-	-	Sp	Sp	?	45%						
47.0	52.0	5.0		0.02										0.02				Wk Jar	-	-	Wk Mod	-	-	-	-	-	-	-	Sp	Sp	?	45%						Jarositic Limonite Content increasing
52.0	57.0	5.0		0.03										0.03				Wk Mod	-	-	Wk Mod	-	-	-	-	-	-	-	Sp	Sp	?	45%						
57.0	62.0	5.0		0.03										0.03				Wk Mod	-	-	Wk Mod	-	-	-	-	-	-	-	Sp	Sp	?	45%						St Hem-Lim Staining continues - Not much evidence of the feldspars
62.0	67.0	5.0		0.04										0.04				Wk	-	-	Wk	-	-	-	-	-	-	-	Sp	Sp	?	40%						
67.0	72.0	5.0		0.05										0.04	0.01			Wk	Tr	-	Wk	-	-	-	-	-	-	-	Sp	Sp	?	40%						Tr of Sulf intermixed w/ weakening Lim-Hem
72.0	77.0	5.0		0.12										0.03	0.08	0.01		Sp	1%	-	Sp	-	-	-	-	-	-	-	Tr	Wk	?	35%						Wk-Mod Alt. w. wk Sulf. Cont. Still some stained Lim-Hem.
77.0	82.0	5.0		0.15										0.02	0.06	0.07		Tr-Sp	1%	-	Tr Sp	-	-	-	-	-	-	-	Sp	Wk Mod	?	40%						v. weak C.P. development.
82.0	87.0	5.0		0.17										0.01	0.11	0.05		Sp	2%	-	Sp	-	-	-	-	-	-	-	Sp	Wk	?	40%						
87.0	92.0	5.0		0.15											0.08	0.07		Tr	2%	-	Tr	-	-	-	-	-	-	-	Sp	Wk	?	35%						K-feldspars are only weakly alt.
92.0	97.0	5.0		0.08											0.03	0.02	0.03	Tr	1-2%	-	Tr	-	-	-	-	-	-	-	Sp	Wk	?	30%						
97.0	102.0	5.0		0.15						Tr				Sup. 0.02	0.09	0.04		Tr	1%	-	Tr	-	-	-	-	-	-	-	Sp	Mod	?	40%						Mod alt. of macerbrative
102.0	107.0	5.0		0.19											0.14	0.05		-	1%	-	Tr Sp	-	-	-	-	-	-	-	Sp Wk	Mod	?	40%						
107.0	112.0	5.0		0.08											0.04	0.04		-	1-2%	-	Tr Sp	-	-	-	-	-	-	-	Wk	Mod	?	45%						C.P. Coating CP4 only - 1% of the pistachio green Fe sulfate present
112.0	117.0	5.0																																			
117.0	122.0	5.0		0.14						0.01				Sup 0.07	0.03	0.03		Tr	1-2%	-	Tr Sp	-	-	-	-	-	-	-	Sp	Sp	?	35%	Tr Sp					Some secondary biot.
122.0	127.0	5.0		0.07						Tr				Sup 0.02	0.03	0.02		-	1-2%	-	Tr	-	-	-	-	-	-	-	Tr Sp	Sp	?	30%	Tr Sp					wkly alt'd. Tr. Sp 2nd. Biot
127.0	132.0	5.0		0.14						Tr				Tr	0.07	0.07		Tr	1%	-	-	-	-	-	-	-	-	-	Tr	Wk Sp	?	35%						
132.0	137.0	5.0		0.28											0.05	0.23		Tr	3%	-	Tr	-	-	-	-	-	-	-	Wk	Wk	?	40%						Much gtz., higher total sulfi. cont.
137.0	142.0	5.0		0.30											0.15	0.15		Tr	2-5%	-	Tr	-	-	-	-	-	-	-	Mod	Sp	?	45%						
142.0	147.0	5.0		0.11											0.05	0.06		Tr Sp	2-3%	-	Tr	-	-	-	-	-	-	-	Wk	Sp	?	40%						Mod. alt, wk min.
147.0	152.0	5.0		0.09											0.06	0.03		Tr	1%	-	Tr	-	-	-	-	-	-	-	Sp	Wk	?	45%						
152.0	157.0	5.0		0.15											0.08	0.07		Tr	0.5%	-	-	-	-	-	-	-	-	-	Sp	Sp	?	35%						
157.0	162.0	5.0		0.19											0.10	0.09		Tr Sp	2%	-	Sp	-	-	-	-	-	-	-	Sp	Wk	?	40%						
162.0	167.0	5.0		0.16											0.10	0.06		Tr	2%	-	Tr	-	-	-	-	-	-	-	Sp	Wk	?	45%						wk-mod alt.
167.0	172.0	5.0		0.15											0.08	0.07		-	1%	-	-	-	-	-	-	-	-	-	Sp Wk	Wk	?	45%						
172.0	177.0	5.0		0.12											0.06	0.06		-	0.5%	-	-	-	-	-	-	-	-	-	Sp	Sp	?	40%						K-feldspars only slightly bleached.
177.0	182.0	5.0		0.16											0.06	0.10		-	0.5%	-	Tr	-	-	-	-	-	-	-	Sp	Sp	?	40%						
182.0	187.0	5.0		0.08											0.02	0.06		-	0.5%	-	-	-	-	-	-	-	-	-	Tr Sp	Sp	?	35%						
187.0	192.0	5.0		0.15											0.09	0.06		-	1%	-	-	-	-	-	-	-	-	-	Tr Sp	Sp	?	35%						Sp-wk alt.
192.0	197.0	5.0		0.12											0.06	0.06		-	0.5%	-	-	-	-	-	-	-	-	-	Tr	Tr Sp	?	30%						
197.0	202.0	5.0		0.16											0.08	0.08		-	1%	-	-	-	-	-	-	-	-	-	Sp	Sp Wk	?	30%						wk alt. [illegible] in alt.
202.0	207.0	5.0		0.08											0.04	0.04			0.5%	-	-	-	-	-	-	-	-	-	Sp	Sp	?	35%						
207.0	212.0	5.0		0.15											0.07	0.08			0.5%	-	-	-	-	-	-	-	-	-	Tr Sp	Sp	?	35%						
212.0	217.0	5.0		0.10											0.08	0.05			0.5%	-	-	-	-	-	-	-	-	-	Tr Sp	Tr Sp	?	30						
217.0	222.0	5.0		0.17											0.10	0.07		-	1%	-	-	-	-	-	-	-	-	-	Sp	Sp Wk	?	30%						wk alt., slight increase in min
222.0	227.0	5.0		0.35						0.02					0.20	0.13		-	1-2%	-	-	-	-	-	-	-	-	-	Sp	Sp	?	35%						
227.0	232.0	5.0		0.26											0.20	0.06		-	1-2%	-	-	-	-	-	-	-	-	-	Wk	Tr Sp	?	40%						
232.0	237.0	5.0		0.29											0.20	0.09		-	1%	-	-	-	-	-	-	-	-	-	Wk Sp	Sp	?	40%						wk-mod alt.
237.0	242.0	5.0		0.28											0.20	0.08		-	1%	-	-	-	-	-	-	-	-	-	Sp Wk	Wk	?	35%						There has been a gradual increase in C.P. as Hob table was approached
E.O.H.																																					

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO- SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
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Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

HAMMAR DRILL Hole No. D-260
Page 1 of 1 Pages
Collar Elev 2,716 73 Final Depth 147.0
Coords. N 35,998 42 E 15,325 55
Inclination VERTICAL
Logged by N.R.N.
Date: Start 9-6-67 Finish 9-7-67

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Unk. Non Sulf.	Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem Spec.	Other (2) Galena	Sphal.	Molyb.	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0.0	22.0	22.0																																		DUMP MATERIAL
22.0	27.0	5		0.02										0.02				Sp	-	-	Mod ST -	-	-	-	-	-	-	Sp	Wk Sp	? 35%			Ak			Typical Ak. some alt. Bisf Present (Hydromica)
27.0	32.0			0.01										0.01				Wk	-	-	Sp Wk -	-	-	-	-	-	-	-	Sp Wk	? 30%						
32.0	37.0			0.02										0.02				Sp Wk	-	-	Wk -	-	-	-	-	-	-	-	Wk	? 40%						
37.0	42.0			0.01										0.01				Sp	-	-	Wk -	-	-	-	-	-	-	Sp	Wk Mod.	? 45%						Hem as stain, Tr-Sp Jar.
42.0	47.0			0.01										0.01				Sp	-	-	Wk Mod -	-	-	-	-	-	-	Tr Sp	Wk Mod	? 45%						
47.0	52.0			0.02										0.02				Sp	-	-	Wk Mod -	-	-	-	-	-	-	Sp	Mod	? 40%						Mod-St. Alt'd. Hem is bright red when wet, Mag. Lim is Jar.
52.0	57.0			0.02										0.02				Wk	-	-	Mod	-	-	?	-	-	-	Tr Sp	Wk Mod	? 45%						Hem-Lim. occurring as thicker coating. - Possibly some Ferrimolybdate present
57.0	62.0			0.03										0.03				Wk Jar	-	-	Wk Mod -	-	-	?	-	-	-	Tr Sp	Wk Mod	? 40%						
62.0	67.0			0.04										0.04				Wk Jar Sp	-	-	Wk Mod -	-	-	-	-	-	-	Tr	Wk Mod	? 40%						Hem is light red. Magn. Lim is Jar. -
67.0	72.0			0.07										0.02	0.05			Tr Sp	1%	Tr Sp	-	-	-	-	-	-	-	Tr	Wk Mod	? 40%			GND SP LEVEL DATUM ELEV. 68			Ak is only sparsely stained - wk-Mod. Alt - Mod bleaching of K-feldsp.
72.0	77.0			0.47		0.04								0.04	0.30	0.13		Tr	2-3%	Tr	-	-	-	-	-	-	-	Wk	Mod	? 40%						Mod-St Alt. - Almost complete bleaching. Notable increase in Py. content and Sec
77.0	82.0			0.53		0.02								0.02	0.40	0.11		Tr	3-4%	-	Tr -	-	-	-	-	-	-	Wk Mod.	Mod	? 50%						Evidence of qtz. shrig. Alt. St.
82.0	87.0			0.29										0.01	0.24	0.04		Tr	2-3%	-	Tr -	-	-	-	-	-	-	Wk Mod	Mod	? 47%						Py content about the same while Cpy + Cc. notably less. Cc. as occasional coating
87.0	92.0			0.14										0.01	0.08	0.05		-	2%	-	Tr -	-	-	-	-	-	-	Wk	Wk Mod	? 47%						Alt Mod-St - slight color of K-spar staining. Alt intsn. of P-feldsp slightly less.
92.0	97.0			0.20										0.01	0.08	0.11		-	2%	-	Tr -	-	-	-	-	-	-	Wk	Wk Mod	? 45%						As Above.
97.0	102.0			0.29										0.01	0.15	0.13		-	2-3%	-	Tr -	-	-	-	-	-	-	Sp Wk	Wk Mod	? 47%						
102.0	107.0			0.36										0.01	0.27	0.08		-	2-3%	-	- -	-	-	-	-	-	-	Wk	Wk Mod	? 45%						More Cc., about same Py + Sec. Alt less intsn - K-feldsp all wkly pink.
107.0	112.0			0.31										0.01	0.15	0.15		-	3%	-	Tr -	-	-	-	-	-	-	Wk	Mod	? 47%						Mod - St Alt.
112.0	117.0			0.29										0.01	0.18	0.10		-	2-3%	-	Tr. -	-	-	-	-	-	-	Sp Wk	Mod	? 40%						
117.0	122.0			0.20											0.15	0.05		-	2-3%	-	- -	-	-	-	-	-	-	Sp	Wk Mod	? 45%						Alt - Mod-St and weakening
122.0	127.0			0.11											0.06	0.05		-	1%	-	- -	-	-	-	-	-	-	Tr Sp	Wk Mod	? 45%						
127.0	132.0			0.21											0.15	0.06		-	3-4%	-	- -	-	-	-	-	-	-	Sp Wk	Wk Mod	? 45%						Increase in Py but not in Cpy
132.0	137.0			0.12											0.08	0.04		-	3%	-	- -	-	-	-	-	-	-	Sp Wk	Wk Mod	? 40%						
137.0	142.0			0.11											0.06	0.05		Tr	2%	-	- -	-	-	-	-	-	-	Sp	Wk	? 40%						Decreasing alt. to Wk
H2O TABLE → 142.0	147.0	5		0.15											0.10	0.05		-	2%	-	- -	-	-	-	-	-	-	Tr Sp	Wk	? 40%						
	E.O.H																																			

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO- SILVER BELL UNIT

Notes:
(1) Est. % Cu represented by each mineral
(2) Est. mineral %; or, as follows: Trace (Tr); Sparce (Sp) < 5 %, Moderate (Md) 5-50 %, Stong (St) +50 %

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D-261
Page 1 of 1 Pages
Collar Elev. 2,796.27
Final Depth 209.0
Coords. N 37,914.32 E 16,225.81
Inclination VERTICAL
Logged by N.R.N.
Date: Start Sep-8-67 Finish 9-9-67

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Unknown N.S.	Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb.	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	Bort	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0.0	13.0	13.0																																			TALUS DEBRIS
13.0	18.0	5.0																SP wk	J	-	SP wk	-	-	-	-	-	-	?	wk mod	2-3%	15%			Dp	Qtz. Crystal Vns. 50°	60°	Stly bleached Dp. Approx 10% qtz eyes. Mod Sil'z + Qtz Vnlsg. Lim-Hem As stain - v. wk.
18.0	27.0	9.0			.03									.03				SP wk	Tr	-	wk	-	-	-	-	-	-	Mod	Mod	1%	45%						ST Sil'd invasion + Ser alt 30.7-27. Distinct qtz. bed Thin + random, wk Lim gass on fracts.
27.0	36.2	9.2			.02									.02				SP wk	0.5%	-	wk Mod	-	-	-	-	-	-	Mod	Mod	2%	30%						Sil'z + Sep. intensity pulsates. Tax Sericite Wkd variable - fells as angular grains + masses - qtz eyes of different sizes. Sp anta of C.C. + Py
36.2	45.2	9.0			.03									.03				wk Mod	0.5%	-	wk Mod	-	-	-	Tr	-	-	wk Mod	wk Mod	8%	35%				1" Stwp Vn 50 Qtz Vn 50 Pyr Bn 50.2-50 Qtz Grey Vns Bowl. Vns	75° 75° 60-70° 60-70°	As Above w/ increase in Lim (Jar) Rk. is more bkn. Some Tr. Lim in qtz. Vn.
45.2	54.5	9.3			.06									.06				wk	Tr	-	SP wk	-	-	-	-	-	-	wk	wk Mod	7%	35-30%						As Above
54.5	63.4	8.9			.07									.07				wk	Tr	-	wk	-	-	-	-	-	-	wk	wk Mod	4%	35%		Tr				Rk is cut by numerous Lim gassen vns. - Hem stains fill pockets - mod sil'z along fracts.
63.4	72.3	8.9			.07								.04	.03				SP wk	Tr	Tr	SP	-	-	-	-	-	-	SP wk	wk	1%	15%						Locally Felds become euhedral and uniformly disem in Lge graphic gran. mass
72.3	85.3	13.0			.06									.06				SP wk	-	Tr	Tr	-	-	-	-	-	-	-	Sp	wk	-	6%	3%	5%				Rk begins to have high Chlor after 3rd Box Crsn 84' - Gradation into Bloc Hz.
85.3	97.2	11.9			.64(?)		.34							.34(?)	No sulfides!			SP wk	Tr	Tr	Tr	-	-	-	-	-	-	Tr	wk	-	2%	12%	12%	Box No. (1) Crsn 84'			Bloc. Hz. composed of 10% alt baked Box uniformly distributed among small lath-like Felds which comprise Approx 25% of Rk. and set in v. fgr. matrix. Alt is Mod. Min. is Nil
97.2	106.0	8.8			.29									.29				SP wk	Tr	Tr	Sp	-	-	-	-	-	-	Tr	wk mod	-	2%	12%	12%				Rk still somewhat Bkn and mod leached - Mod. Alta - Box is leafy-lepidon (red).
106.0	114.2	8.2			.20									.20	.10			Mod	0.5% Sp	Tr	Tr Sp	-	-	-	-	-	-	Tr	Sp	5%	45%	7%	7%				Rk is quite bkn, mod Alta - Sp Rk, Tr CC, Sp Non Sulf Cu
114.2	120.0	5.8			.23									.13	.10			Mod	0.2%	-	Sp	-	-	-	-	-	-	Tr	Sp	-	2%	7%	7%				As Above
120.0	122.6	2.6			.10									.10				Sp	Tr	-	-	-	-	-	-	-	-	Tr	Sp	-	25%	-	-	Dp @ 120.0			Bleached - Mod alta - df. lim. on fracts. Base of oxidation @ 133.8
122.6	133.8	11.2			.65		.06						.06		.57			SP	Tr	-	-	-	-	-	Tr	-	-	SP	mod	-	10%	8%	10%	MZ	OP-MZ contact @ 122.6		md alted. OP grades into md-st alted Bi. MZ in first 4' of interval
133.8	143.5	9.7			.48		.01							.01	.30	.17		-	Tr	-	-	-	-	-	-	-	-	SP	SP	<1%	10%	6%	12%	Sulfide zone	Sulfide veinlet	60°	alt. decreases from md. to wk. distinct euhedral texture. Tr of dis cpy w/bun. c.c.
143.5	158.1	14.6			.24										.09	.15		-	<1	-	-	-	-	-	Tr	-	-	Tr	SP	<1	10	6	12				As above, wk alt., sp. dis. cpy
158.1	166.9	8.8			.20										.08	.12		-	<1	-	-	-	-	-	Tr	-	-	Tr	Tr	1	10	6	12		QTZ Veins	30/60	As above, some 2nd texture mdy in 60° QTZ vein
166.9	175.5	8.6			.25										.13	.12		-	1	-	-	-	-	-	SP	-	-	Tr	Tr	<1	10	5	10				As above
175.5	184.2	8.7			.38										.23	.15		-	2	-	-	-	-	-	SP	-	-	Tr	Tr	<1	10	5	10		QTZ Sulfide Vein	60°	As above
184.2	193.0	8.8			.24										.12	.12		-	1	-	-	-	-	-	Tr	-	-	SP	Tr	<1	10	5	10				As above small vertical sulfide stringers
193.0	201.6	8.6			.18										.06	.12			2	-	-	-	-	-	-	-	-	md	Tr	<1	10	7	8				slight increase in alt & sericite along veins
201.6	209.0	7.4			.21										.06	.15			2	-	-	-	-	-	Tr	-	-	md	Tr	<1	10	7	8		Veins	60-90	alt of feldspars. Steep veins contain most of sulfides
	EOH																																				

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D262
Page 1 of 2 Pages
Collar Elev. 2,733 73
Final Depth 305.5
Coords. N 36,151 93 E 15,613 92
Inclination VERTICAL
Logged by KE
Date: Start 9-8-67 Finish 10-4-67

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Min. Cu N.S.	Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem.	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0	12.0	12.0																																			
12.0	17.0	5.0		0.03										0.03				ST	Tr		md							sp	sp		40		AK				mod alteration
17.0	22.0			0.01										0.01				ST	-		md							sp	sp		50		AK				
22.0	27.0			0.01										0.01				ST	-		md							sp	sp		50						Quartz and hem-lim stained feldspars in chips up to 1/4"
27.0	32.0			0.01										0.01				ST	-		wk							md	sp		40						
32.0	37.0			0.01										0.01				md	-		md							md	sp		40						
37.0	42.0			0.01										0.01				md	-		md							md	sp		40						
42.0	47.0			0.01										0.01				wk	-		wk							md	sp		40	Tr					mod.- st. alteration, no fresh looking feldspars
47.0	52.0			0.02										0.02				wk	-		wk							md	sp		40	Tr					
52.0	57.0			0.01										0.01				wk			wk							md	sp		40	Tr					
57.0	62.0			0.01										0.01				wk			wk							md	sp		40						
62.0	67.0			0.02										0.02				wk			wk							md	sp	?	40						small amount of leached vein qtz.
67.0	72.0			0.02										0.02				wk			wk							md	sp	?	40						" " " "
72.0	77.0			0.03										0.03				wk	Tr		wk							md	sp	?	40						Tr of uncoated py.
77.0	82.0			0.07										0.03	.03	.01		wk	Tr		Tr							md	sp	?	40						Tr of c.c. coated cpy in vein qtz
82.0	87.0			0.07										0.02	.05			wk	Tr		-							md	sp	?	40						
87.0	92.0			0.46		.02								0.02	.44			Tr	2		-							md	sp		40						Dis py with mod c.c. coating
92.0	97.0			0.77	25.0 @ 0.62	.02	25.0 @ 0.02							0.02	.70	.05		Tr	3		-							md	sp		40						Thick c.c. on cpy, thinner coatings on py
97.0	102.0			0.92		.02								0.02	.80	.10		Tr	3		-							md	sp		40						" " " "
102.0	107.0			0.59		.01								0.01	.49	.09		Tr	3		-							md	sp		50						
107.0	112.0			0.38										0.01	.29	.08		-	2									md	sp		50						
112.0	117.0			0.36											.29	.06		-	2									md	sp		50						
117.0	122.0			0.26											.22	.03		-	2									md	sp		50						most py is uncoated.
122.0	127.0			0.25											.21	.03		-	3									md	sp		50						
127.0	132.0			0.22											.13	.08			2									md	sp		50						
132.0	137.0			0.19											.12	.06			2									md	sp		50						
137.0	142.0			0.16											.13	.02			3									md	sp	??	50						larger chips, less alteration.
142.0	147.0			0.11											.08	.02			3									sp	Tr		50						wk alt.
147.0	152.0			0.14											.11	.02			3									sp	Tr		50						
152.0	157.0			0.21											.18	.02			2									md	Tr		50						
157.0	162.0			0.15											.12	.02			2									st	Tr		50						abundant sericite
162.0	167.0			0.23											.20	.02			3									st	Tr		50						" "
167.0	172.0			0.28											.25	.02			2									md	Tr		50						
172.0	177.0			0.37											.31	.05			2									md	Tr		50						
177.0	182.0			0.67		.01									.64	.02			3									md	Tr		50						c.c. on py
182.0	187.0			0.58	25.0 @ 0.50	.01	25.0 @ 0.01								.55	.02												mp	Tr		50						
187.0	192.0	5.0		0.51		.01									.51	—						Tr						md	Tr		50						
192.0	197.0	5.0		0.40																																	Alternating zones of gouge and silicification to 206.5.
197.5	203.1	8.6		0.29		.01								.01	0.19	0.09		-	3									md	md	3	45		AK	Grassy veins	55°		Generally wk-md alt. py. w/ md c.c. coatings.
203.1	212.0	8.9		0.35										0.01	0.28	0.06			3									md	wk	4	45			"	65°		st alt from 208.-209.5. Pig completely altd to tacky (?) over entire interval
212.0	221.2	9.2		0.30											0.25	0.05			3			Tr						md	md	10	50			QTZ-Py veins	85°		3" thick QTZ-py vein @ 220.6, 85°. Smaller veins spaced about 1.5' apart.
221.2	230.1	8.9		0.20											0.10	0.10			2			-						md	wk	2	45						Gouge from 216.0-217.0. Tr of cpy, good c.c.
230.1	239.2	9.1		0.19											0.06	0.13			2			-						md	wk	<1	45						Increasing cpy in steep veins, c.c., mod alt.
239.2	247.9	8.7		0.44		0.01								0.01	0.22	0.11			2			Tr						md	wk	2	45						wk-mod alt., mod sil., 2" of aplite (?) at 237.6-237.8.
247.9	258.7	10.8		0.30											0.16	0.15			2			-						md	wk	2	55						Varying degrees of silicification, st. sil. at end of interval.
258.7	267.6	8.9		0.31											0.17	0.14			3									md	md	1	50		AK				At contact.
267.6	275.0	7.4		0.16											0.04	0.12			<1									md	wk	3	15		MZ				Good alt texture near 263.5 grades outward to bleached, st. altd. texture with Py altd to hydromica. Vein QTZ 266.6-267.6
																												md	wk	1(?)	45		AK				mod-st alt. sil. local destruction of all feldspars

(*) no sample!

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D262
Page 2 of 2 Pages

Collar Elev. 2,733.73
Final Depth 305.5
Coords. N 36,151.92 E 15,613.98
Inclination VERTICAL
Logged by RE
Date: Start 9-8-67 Finish 10-4-67

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Cu (1) Pitch	Cu (1) Black	Cu (1) Blue Green	Cu (1)	Cu (1) Cc.	Cu (1) Cpy.	Cu (1) Born	Fe (2) Lim. Py	Fe (2) Mag.	Fe (2) Hem	Fe (2) Spec.	Other (2) Galena	Other (2) Sphal.	Other (2) Molyb.	Other (2) Calcite	Other (2) Garnet	Other (2) Silicates	Other (2) Sericite	Other (2) Clay	Other (2) Vn. Qtz	Other (2) QUARTZ	Other (2) CHLORITE	(3) Rock Type	Structures (4) Depth	Structures (4) True Dip	Remarks
275.0	285.0	10.0		0.15											0.25	0.10		<1										mdwk	1	55			AK			mel.-st. silicification
285.0	293.2	8.2		0.16											0.06	0.10		1										mdst	--	45						st. alt. & gouge over most of interval.
293.2	305.5	12.3		0.17											0.04	0.13		1										mdST	1	40				Gtz sulf vein	70°	As above
E.O.H.																																				

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Notes:

(1) Est. % Cu represented by each mineral

(2) Est. mineral %; or, as follows: Trace (Tr); Sparce (Sp) < 5 %; Moderate (Md) 5 - 50 %; Strong (St) + 50 %

Note (3): Tt - Tactite; Hf - Hornfels; Mb - Marble; Qt - Quartzite; Bx - Breccia; Da - Dacite; Mz - Monzonite; An - Andesite

Note (4): V - Vein; F - Fault; D - Dike; C - Contact; Ig - Undif igneous

Hole No. D 263

Page 1 of 1 Pages

Collar Elev. 2,831.35' Final Depth 255.3'

Coords. N 38,347.71' E 16,301.61'

Inclination VERTICAL

Logged by RE, N.P.N.

Date: Start 9/11/67 Finish 9/13/67

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	unknown NS	Cc.	Cpy	Born	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb.	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz.	QUARTZ	CHLORITE	Original Sulfides	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0	21.0																																					Rubble material highly broken & gouged from 25.5 to 300.
21.0	30.0	9.0		.08									.28					md		wk								sp	md	2%	8%	3%	5%	Sericite-Quartzite (?) Shear Mz (?)	Quartz Veins	45-60	St. Sil. Rpl. material 86% white or limonite stained feldspar phenocrysts in a light gray ground mass. Relict biotite. Turquois on fractures
30.0	39.4	9.4		.04										.04				md		md								sp	md	sp	1%	8%	3%	5%				Texture as above, increased hydromica, sp. dis. turquois
39.4	48.4	9.0		.02										.02				md		md								sp	md	sp	1%	8%	3%	5%		Open Fracture (Limonite) 1" beds of Silt	40°	As above without Turq. Shattered zone between 41.0-44.5 / 47.9-48.4
48.4	56.8	8.4		.05									.03		.02			wk	md 0.3%	-	wk	-	-	-	-	-	-	Tr	wk md	-	8%	-	5%				Tec. - Eu/Hed to Sil/Hed to Arg/Ser. Clasts of all sizes up to 6 in. - 2 to 4 in. subrd. Sp. Py + CC. Coating Brch. Sh. Numerous white Anhydrite veins & Green veins 40°-60°
56.8	65.5	8.7		.08									.06		.02			wk	0.3%	-	Sp.	-	-	-	-	-	-	Sp	Md	1%	8%	-	5%				As above with less distinct. tec. Sulfs contained to 58.5.
65.5	73.9	8.4		.12									.07		.05			Sp	2%	-	Sp.	-	-	-	-	-	-	Md	Md Ss	0.2%	5%	-	5%				The Ck. is so to wkly Arg. Gold mica appears to be Ser.-Silic. Fel. + Bio are chl. + Ser.-hydro. mica. Sulfs are v. f. gr. + v. well disseminated. Vn. this C.C.-Qtz. coatings on all - Sp. Sin. Py. Dis.
73.9	82.3	8.4		.32									.06		.26			Sp	3%	-	Sp.	-	-	-	-	-	-	Md	Md Sc	0.2%	26%	-	5%				As above. Some intermixed - leached - zones. Much silica has been released by alt.
82.3	91.3	9.0		.09									.03		.06			wk	1%	-	Sp.	-	-	-	-	-	-	Md	Md Sc	0.2%	25%	-	5%		St. Fracture Zone 1.6 - 2.0 cm	45°	As Above INTERMIXED Sulfs in mostly leached ck. - cc. where present. V. Thin -
91.3	100.4	9.1		.13									.05		.08	Tr		wk	0.4%	-	Sp.	-	-	-	-	-	-	wk	Md Sc	-	7%	-	5%				Rk. almost wholy leached - bio is yellow-orange. Hem. to Rd.
100.4	108.6	8.2		.12									.04		.08			wk	0.6%	-	Tr.	-	-	-	-	-	-	wk	Md Sc	0.2%	25%	-	5%				As Above. bio is primarily Ser. - Intermixed sulfides w/ leached ck. - cc. Thin Py + Cpy
108.6	120.2	11.6		.11									.07		.04			wk Md	Tr	-	Tr	-	-	-	-	-	-	Md	St	-	25%	-	5%		St. Fracture Zone 116.8 - 117.1	Low Angle 33	St. Intermixed Sulf. Rk. has been structurally broken + Chem. alt. wholy f/l. zone.
120.2	126.4	6.2		.74		.05							.05		.37	.50	.02	Tr	3%	-	-	-	-	-	-	-	-	Tr Sp	wk Md	0.5%	25%	-	5%		Open Fracture Zone Non-Sulf. Cc.		Rk. is now wkly alt. Bio. only slightly alt. as with follow. Sulfs Tgc + well disem. Thin CC.
126.4	135.3	8.9		.86		.03							.03		.26	.35	.02	-	2%	-	-	-	-	-	-	-	-	Tr	wk	-	15%	-	5%		Open Fracture 126.4 - 126.8	65°	Rk. wk. - when Hydrolyzed alt. - f. Sulfs are stained by SiO2 + hypes to be K-Spar in grnd mass.
135.3	144.9	9.6		.50		.02							.02		.31	.27		-	2%	-	-	-	-	-	-	-	-	Tr	Sp	-	15%	-	5%				Sulf. almost all above is reddish Turnish + have Thin CC. Coatings. CuO on fracts
144.9	153.7	8.8		.14		.01							.01		.50	.23		-	2%	-	-	-	-	-	-	-	-	-	Sp	-	10%	-	5%				As wk. - K-Spar occurs in grnd mass + in mass veining. Occasional sulf stains coated w/ cc.
153.7	162.3	8.6		.59		.02							.03		.37	.20		-	2%	-	Tr	-	-	-	-	-	-	-	Sp	-	10%	1%	5%		St. Fracture Zone 158.8 - 159		As Above. Sulfs are more widely spaced, and coarser grained. CC. still present as is CuO
162.3	170.7	8.4		.60	103.1 @ 0.66	.02	103.1 @ 0.03						.02		.40	.18		Tr	2%	-	-	-	-	-	-	-	-	-	Sp	-	10%	1%	5%				Rk has more pink K-Spar in grnd mass and here are more stringers + blb. slight veinlets in Sulfs.
170.7	179.3	8.5		.70		.09							.09		.43	.13		Tr	1-2%	-	-	-	-	-	-	-	-	-	Sp	-	10%	5%				md altd QD. Fine dis. sulfides. Texture as above
179.3	188.7	9.4		.60		.03							.03		.40	.17		Tr	1-2%	-	-	-	-	-	-	-	-	Tr	Sp	-	10%	5%				continued gradation of phenocryst size up to 1/4"
188.7	197.8	9.1		.93		.05							.05		.68	.20		sp	2%	-	-	-	-	-	Tr	-	-	Tr	md	-	10%	5%				Fracture zone from 191.4 - 192.8 cf limonite and gouge, otherwise as above
197.8	206.2	8.4		.65		.02						.02	.43		.20			sp	2%	-	-	-	-	-	-	-	-	Tr	sp	<1%	10%	5%				As above
206.2	215.1	8.9		.40		.01						.01	.20		.19			-	1-2%						Tr			-	Tr	<1%	10%	2%				Decrease in alt., dis. carbonates. 5% biotite
215.1	223.3	8.2		.55		.01						.01	.29		.25			-	1%	-	-	-	-	-	-	-	-	Tr	Tr	-	10%	3%				As above
223.3	231.9	8.6		.25									.05		.20			-	1%	-	-	-	-	-	-	-	-	Tr	sp	-	10%	3%		Open Fracture Sulfide veins	≈ 90°	md altd.
231.9	240.5	8.6		.22									.03		.19			-	1-2%	-	-	-	-	-	-	-	-	Tr	sp	<1%	10%	3%				As above. 5% bi., dis. sulfides, minor veining
240.5	248.6	8.1		.20									.03		.17			-	1%	-	-	-	-	-	-	-	-	Tr	Tr sp	-	10%	3%				As Above
248.6	255.3	6.1		.27									.01		.20			-	1%	-	-	-	-	-	-	-	-	Tr	Sp Cc	-	10%	4%				Rk med-stly Arg and wk-med altd. to CC. w/ Sp. Py + Cpy
E.O.H.																																						

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D264
Page 1 of 1 Pages
Collar Elev 2,688.27
Final Depth 157.0
Coords. N 37,291.30 E 14,739.56
Inclination VERTICAL
Logged by R.E.
Date: Start 9-12-67 Finish 9-15-67

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu N S	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Cu (1) Pitch	Cu (1) Black	Cu (1) Blue Green	Cu (1)	Cu (1) Cc.	Cu (1) Cpy.	Cu (1) Born	Fe (2) Lim.	Fe (2) Py	Fe (2) Mag.	Fe (2) Hem.	Fe (2) Spec.	Other (2) Galena	Other (2) Sphal.	Other (2) Molyb.	Other (2) Calcite	Other (2) Garnet	Other (2) Silicates	Other (2) Sericite	Other (2) Clay	Other (2) Vn. Qtz.	Other (2) QUARTZ	Other (2) CHLORITE	(3) Rock Type	Structures (4) Depth	Structures (4) True Dip	Remarks
0	63.0	63.0																																			Dump Material
63.0	67.0	4.0		.05										.05				md		wk								Tr	Tr	-	50	Tr		AK			Sand size chips
67.0	72.0	5.0		.05										.05				md		wk								SP	Tr	-	50	Tr					
72.0	77.0			.03										.03				md	Tr	wk								SP	Tr	-	50	Tr					
77.0	82.0			.05											.06			md	<1	wk								SP	Tr	-	50	Tr					Grand size chips, md. alt., thin c.c. on px
82.0	87.0			.19									.02		.17			sp	<1	-								SP	Tr	-	50	Tr			Base of oxidation		
87.0	92.0			.23									.02		.21			sp	<1	-								SP	Tr	-	50	SP					increase in c.c. on px
92.0	97.0			.21									.02		.19	Tr		Tr	<1	-								SP	SP	-	60	SP					
97.0	102.0			.27											.25	.02		sp	<1	-								SP	Tr	-	50	SP					md alt., c.c. on px, Tr of cpy w/ c.c. coating
102.0	107.0			.19											.17	.02		Tr	<1%	-								SP	Tr	-	50	SP					
107.0	112.0			.18											.15	.03		Tr	<1%									SP	Tr	-	50	SP					wk-md alt., 1% pyrite (?)
112.0	117.0			.30											.27	.03		Tr	<1%									SP	Tr	-	50	SP					
117.0	122.0			.15											.13	.02		Tr	<1%									Tr	Tr	-	50	SP					
122.0	127.0			.04											.04			-	<1%									Tr	Tr	-	50	SP					
127.0	132.0			.07											.04	.03			<1%									Tr	Tr	-	50	Tr					wk alt.
132.0	137.0			.07											.04	.03			<1%									Tr	Tr	-	50	Tr					
137.0	142.0			.06											.05	.01			<1%									Tr	Tr	-	50	SP					
142.0	147.0			.07											.06	.01			<1%									Tr	Tr	-	50	SP					
147.0	152.0			.09											.07	.02			<1%									Tr	Tr	-	50	SP					
152.0	157.0	5.0		.09											.07	.02			<1%									Tr	Tr	-	50	SP					Ends with wkly altd. AK, thin c.c. on px, Tr of cpy
E.O.H.																																					

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D-265
Page 1 of 1 Pages
Collar Elev. 2,747.27 Final Depth 237.0
Coords. N 37,087.46 E 14,439.55
Inclination VERTICAL
Logged by N.R.N.
Date: Start 9-16-67 Finish 9-26-67

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Sulf. Nom	Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb.	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz.	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0.0	57.0	57.0																																			Dump MATERIAL
57.0	62.0	5		0.06										0.06				Sp	-	Mod	-		-	-	-	-	-	-	Sp	?	45%	1%		Ah			Sp wkly Alt'd, Mod Lt Red-Brn stain of Fe'ds
62.0	67.0			0.07										0.07				Sp	-	Mod	-		-	-	-	-	-	-	Sp wk	?	4%						As Above
67.0	72.0			0.01										0.01				Sp	-	wk Mod	-		-	-	-	-	-	-	Sp wk	?	4%						As Above. Also salt centers visible.
72.0	77.0			0.03										0.03				Sp	-	wk Mod	-		-	-	-	-	-	Tr	wk	?	4%						slightly more intensive of coarser veins.
77.0	82.0			0.03										0.03				Sp	-	wk	-		-	-	-	-	-	Tr	Sp wk	?	40%						wkly altd As Above.
82.0	87.0			0.06										0.06				Sp	-	wk Mod	-		-	-	-	-	-	Tr	wk	?	40%						" " " "
87.0	92.0			0.07										0.07				Tr Sp	-	wk Mod	-		-	-	-	-	-	Tr	wk	?	40%						As Above
92.0	97.0			0.04										0.04				Sp	Tr	wk Mod	-		-	-	-	-	-	Tr Sp	wk	?	40%						Tr sulf of clear pl present. Otherwise As is the same
97.0	102.0			0.05										0.05				Tr Sp	-	Sp wk	-		-	-	-	-	-	Tr	wk Mod	?	4%						Notable coarse in this stage. Lt & wkly prevalent
102.0	107.0			0.05										0.05				Sp	-	Tr	-		-	-	-	-	-	Tr Sp	wk Mod	?	38%						S gtly more altd. No sulf. visible
107.0	112.0			0.03										0.03				Sp	-	Sp	-		-	-	-	-	-	Tr Sp	wk Mod	?	40%						As Above
112.0	117.0			0.04										0.04				Sp	-	Sp	-		-	-	-	-	-	Tr Sp	wk	?	40%						Lim is slight, stronger and a strong brn. color. Mor sulf centers
117.0	122.0			0.25										0.04	0.19	0.02		Sp wk 10%		Tr Sp	-		-	-	-	-	-	-	Sp	wk Mod	?	35%			Sericite Zone		Mod Alt., Sp Py + trace C.C. Coating. Sulfs are fragmented
122.0	127.0			0.50	200		0.01	200						0.01	0.37	.10		Sp	2%	Sp	-		-	-	-	-	-	-	wk Mod	Mod	?	35%						Simple seams to hair. Out a shear zone. Alt is Mod-ST. Still intermixed w/ clay
127.0	132.0			0.51	0		0.02	0						0.02	0.38	0.14		Tr	2%	Tr	-		-	-	-	-	-	-	Mod ST	Mod ST	?	30%						STly altd, wkly mineralized.
132.0	137.0			0.35	0.44			0.0						0.01	0.26	0.08		Tr	1%	Tr	-		-	-	-	-	-	-	wk	wk Mod	?	30%						Mod Alt, Low Total Sulf Content.
137.0	142.0			0.35										0.0	0.2	0.08		Tr	2%	Tr	-		-	-	-	-	-	-	wk Mod	wk Mod	?	30%						Mod. ST Alt., Sulf. are fair fragmented & well dissem.
142.0	147.0			0.31										0.01	0.25	0.05		Tr	2%	Tr	-		-	-	-	-	-	-	wk	wk Mod	?	30%						Mod Alt. Mod amt of Lt. green clay (?) altd of P.Felds.
147.0	152.0			0.32										0.02	0.25	0.05			1%		-		-	-	-	-	-	-	wk	wk Mod	?	30%						As Above
152.0	157.0			0.32										0.01	0.23	0.08			1%		-		-	-	-	-	-	-	Sp	wk Mod	?	30%						Mod. alt. Mod. green clay(?) alt.
157.0	162.0			0.39											0.33	0.06			2%		-		-	-	-	-	-	-	Sp	Mod	?	35%						Mod Alt. Sulfs coarser and assoc. w/ med. green alt. Clay-chlor
162.0	167.0			0.30											0.22	0.08		Tr	1%		-		-	-	-	-	-	-	Sp	wk	?	30%						Alt. Decreased. Sulf. are on fracts. Sp. occurrence of [illegible]
167.0	172.0			0.27											0.21	0.06		Tr	2%		-		-	-	-	-	-	-	Sp	wk Mod	?	40%	?					Apparent increase in glz + sulfs - probably varig - lim. increased
172.0	177.0			0.23										0.07	0.10	0.05		Sp	1-2%		-		-	-	-	-	-	-	Sp	Mod	?	40%	5%					Sudden occurrence of an med CHLX(?), Cpy'te + some epdote.
177.0	182.0			0.21										0.03	0.10	0.08		Tr	2-3%		-		-	-	-	-	-	-	Tr	Mod	?	45%	Tr					Change back to High Sil Ax w/ increased Py + CPY + less CC.
182.0	187.0			0.11											0.04	0.07		Tr	2%		-		-	-	-	-	-	-	Tr	wk	?	40%	3%					Py content still up, but C.C. is quite sparse occurring on cpy.
187.0	192.0			0.08											0.02	0.06		Tr	1-2%	Tr	-		-	-	-	-	-	-	Tr	wk	?	38%	1%					Alt. is Lt green clay(?). Also P.felds.
192.0	197.0			0.10											0.04	0.06		Tr	1%		-		-	-	-	-	-	-		wk	?	40%						As wk-Mod. and as above
197.0	202.0			0.08											0.03	0.05		Tr	1%	Sp	-		-	-	-	-	-	-		wk	?	36%						Remarks alt. is wkly clay(?) Also P.felds.
202.0	207.0			0.08											0.02	0.06			2-3%		-		-	-	-	-	-	-	Sp	Mod	?	38%						Scrimpier sulfs + alt. some intersections & a small shear zone
207.0	212.0			0.11											0.03	0.08			2%		-		-	-	-	-	-	-	Sp wk	Mod	?	38%						As Mod-ST. Increase in total sulfs. Mostly controlled by fracts.
212.0	217.0			0.12											0.04	0.08			2%		-		-	-	-	-	-	-	Sp wk	Mod	?	45%						As Above
217.0	222.0			0.12											0.06	0.06			2-3%		-		-	-	-	-	-	-	wk	Mod	?	40%						ST alt. Some increase in sulfs, but C.C. remains low.
Water Table 222.0 → 227.0				0.16											0.02	0.14			3%		-		-	-	-	-	-	-	Mod	Mod	?	47%						As Above
227.0	232.0			0.12											0.03	0.09			2-3%		-		-	-	-	-	-	-	Mod	Mod	?	40%						Lim. CPY + Py ratio.
232.0	237.0	5		0.12											0.04	0.08			2%		-		-	-	-	-	-	-	wk Mod	Mod	?	40%						Mod-ST alt, - generally as above
E.O.H.																																					

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO- SILVER BELL UNIT

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Mb - Marble
Qt - Quartzite
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Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D-266
Page 1 of 1 Pages
Collar Elev 2,829 78
Final Depth 311.0
Coords. N 86,757 80 E 14,991 44
Inclination VERTICAL
Logged by N.R.N.
Date: Start 8-20-67 Finish 8-27-67

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu N S	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Wax plus Sulf	Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag	Hem	Spec.	Other (2) Galena	Sphal.	Molyb.	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0.0	83.9	83.9																																			DUMP MATERIAL
83.9	93.1	9.2		0.13									0.02	0.11				Wk	-	05	Mod	-	-	-	-	-	-	-	Wk Mod	-	35%	3%		Ac			Wk alt. folds stained w/ Hem + some Lim. No Residual Lim. Mag. is alt'd to hem
93.1	102.1	9.0		0.10										0.08	0.02			Mod	-	0.5	Wk Mod	-	-	-	-	-	-	Sp	Wk	Mod	Sp	45%	3%		Qtz-Ser Rosan Vn	80°	Rx mod Acid. P. folds showing 32 gra. present (most ?). Box work + staining along Vn
102.1	111.0	8.9		0.15									0.05	0.10				Mod	-	Tr	Wk Mod	-	-	-	-	-	-	Tr	Wk Mod	Tr	40%	Tr					St. Lim-iron staining of Mod alt'd folds. Sp gib Cu staining
111.0	119.0	8.9		0.08										0.08				Mod	-	Tr	Wk Mod	-	-	-	-	-	-	Tr	Mod		45%	Tr					Mod Act Staining as above. Sp empty lg box work on some fracts.
119.0	128.7	9.0		0.25									0.01	0.04				Sp Wk	-	0.5	St	-	-	-	-	-	-	Sp	Mod St	-	40%	3%			6" Bg. Zone @ 1240'	60°	Mod-St Act. Rx is somewhat brka + shows micro shattering of grains. Much salt Nas on fracts
128.7	137.6	8.7		0.04										0.04				Wk	-	Tr	Mod St	-	-	-	-	-	-	Sp	Mod St	Tr	40%	2%					Much as Above
137.6	146.7	9.1		0.18										0.03	0.07	0.06	0.03	Tr	01	1%	Tr	-	-	-	-	-	-	Tr	Wk Mod	-	40%	1%		End of Ok Hole Sur @ 137.6		Alt Wk. Some fresh biot. Total sulfs. very low. Lt gra Clay on fracts. St micro shattering.
146.7	155.5	8.8		0.41		0.32								0.02	0.30	0.09		-	1%	-	-	-	-	-	-	-	-	Tr	Wk Mod	-	40%	2%					Alt Mod - Two stages of bot. some fresh other alt'd to chlorite. low total sulf., but st. ch. replacement
155.5	164.4	8.9		0.40		0.01							0.01		0.35	0.04		Tr	1%	1%	Tr	-	-	-	-	-	-	Tr Sp	Wk Mod	Tr	40%	1%		Tr. Hole only	80°	Mod Alt. K gives are not affected appreciably. Sulf along numerous irreg fracts.
164.4	173.6	9.2		0.55		0.1									0.48	0.07		Tr	1%	1%	-	-	-	-	-	-	-	Sp	Wk Mod	Tr	40%	2%		1682-1703		As Above. Original bot content is 4%. Some green CuO staining on fracts
173.6	181.1	7.5		0.51		"							0.02		0.44	0.15		Sp	2%	Tr	-	-	-	-	-	-	-	Sp	Wk Mod	Tr	40%	1%		Sulf. ser veins 1/32" 2" spacing	45°	Increase in total sulfs. Oxidation along high angle fract.
181.1	190.7	9.6		0.70		"							0.02		0.48	0.20		Sp	3%	-	-	-	-	-	-	-	-	-	Wk Mod	Sp	40%	3%					Mod-St. Act. Wk Hem. Qtz-ser-sulf veining - c.c. still present
190.7	199.7	9.0		0.23		"									0.16	0.05		Sp	4%	-	-	-	-	-	-	-	-	-	Wk Mod	St	45%	4%		UNS	70°		Mod-St Act. Sulfs. assoc. w/ 2" ser-qtz alt bands. Stained fracts. Wk gauge
199.7	209.2	9.5		1.00		"									0.80	0.20		Tr	8%	Sp	-	-	-	-	-	-	-	St	St	?	45%	-		Mod Pat 4" @ 200.1	75°	St-Intem Act. Ser. has replaced most of P. folds. Sulfs well dissem. and massive in fft
209.2	217.6	8.4		0.28		"									0.25	0.03		-	3%	Sp	-	-	-	-	-	-	-	-	Mod	Mod	-	40%	3%				St Act. Rx gate brka. Sulf content down. c.c. mainly on opx
217.6	226.8	9.2		0.28		"									0.25	0.03		-	2%	1%	-	-	-	-	-	-	-	Sp	Wk Mod	-	40%	3%					Alt Mod-Wk, structurally unaffected. Sulfs only on a few more fracts
226.8	236.0	9.2		0.11		"									0.10	0.01		-	2%	1%	-	-	-	-	-	-	-	Sp	Wk	-	40%	3%					Wk Act. Some 2nd bot. sulfs. dissem, but sparse. c.c. still present.
236.0	245.2	9.2		0.83		0.01							0.01		0.62	0.20		-	2%	1%	-	-	-	-	-	-	-	Sp Wk	Sp Wk	-	40%	2%		Alt. Min Band. Final Min. Band. Final	80° 80°	Sulfs along 2" ser-qtz-sulf alt. band. also fract. Intermediate rk has fresh biot. + only Tr sulfs.
245.2	254.5	9.3		0.32		0.1									0.22	0.10		Tr	1%	1%	-	-	-	-	-	-	-	Wk Mod	Wk Mod	?	45%	3%					St Act. Assoc. with fracts. c.c. decreasing
254.5	263.7	9.2		0.38		"									0.28	0.10		Tr	3%	1%	-	-	-	-	-	-	-	Wk	Wk	?	45%	3%		8" Spaced min Alt Fine	60°	As Above
263.7	272.0	8.3		1.39		"							0.02		1.07	0.30		Tr	5%	Tr	-	-	-	-	-	-	-	St	Wk	?	50%	1%					St Rx alt'd and min frac zone. Much cc. assoc.
272.0	280.5	8.5		0.13									0.01		0.08	0.06		-	1%	-	-	-	-	-	Tr	-	-	Sp	Wk Mod		40%	1%		Qtz-Sulf Veining	60°	Wk-Mod Act. Sp. Sulfs. Tr. c.c. Rx Mid Brka of Sp gg.
280.5	289.3	8.8		0.17											0.09	0.08		-	2%	-	-	-	-	-	-	-	-	Tr	Wk	Tr	38%	1%					Wk-Mod Act. Rx. Mid Brka 284-285 + 288-289.3
289.3	298.5	9.2		0.14									0.02		0.06	0.06		-	1%	-	-	-	-	-	-	-	-	Tr	Wk Wk	-	35%	4%		Fit 289.8 -293'	50°	Wk Act. Sp. Sulfs. Tr. cc.
298.5	311.0	12.5		0.15											0.09	0.06		-	2%	-	-	-	-	-	-	-	-	Sp	Mod	Tr	38%	4%					Wk-Mod alt. P folds altd to green + yellow product (most ?) still c.c., but total sulf. Dnt too low
E.O.H.																																					

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO- SILVER BELL UNIT

Note (3)
Tt - Tactite
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Bx - Breccia
Da - Dacite
Mz - Monzonite
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Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D 267
Page 1 of 1 Pages
Collar Elev 2,790 16
Final Depth 254.6
Coords. N 37,763 00 E 6,334 39
Inclination VERTICAL
Logged by RE + N.R.N
Date: Start 10/25/67 Finish 10-26-67

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Mon Mar Sulf	Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn Qtz	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0	66.2	66.2																																			Dump
66.2	75.9	9.7		0.07									0.03	0.06				md		-									SP	SP	1	30?	-		Da	QTZ Vein	85°	Fine grained, aplatic texture. Thin complex QTZ veining. Broken floats
75.9	84.1	8.2		0.12									0.06	0.06				ST		-									SP	SP	1	30?	-		Da			Becomes coarser grained with vague outlines of large (secondary?) feldspars
84.1	92.6	8.5		0.27									0.20	0.07				md	Tr		SP								SP	SP	<1	25			sprinkles begin 88.0'			Rock is porous from 91.6-92.2 with 1/8" limonite filled cavities - not sulfide.
92.6	103.0	10.4		0.13									0.03	0.10				md	-		SP								SP	SP	1	25			Da			Porous rock could be leached MZ. Definite Da: 97.2 to 103.0, long dip at all angles
103.0	112.0	9.0		0.12									0.02	0.10				md	-		Tr								SP	SP	1?	20?			MZ			10% hydrous wt. mdly. alt'd MZ with Da inclusions. Interval may end in Da. ^
112.0	120.7	8.7		0.15							? 0.10			0.05				ST	-		Tr								SP	md	1?	30?			Da & MZ	QTZ Vein	50°	Broken zone of mixed Da / MZ. Ends in MZ. Steep fractures.
120.7	128.9	8.2		0.16									0.02	0.12	0.02	Tr		ST	Tr		-								SP	md	<1	15			Da & MZ			As above. Begins and ends in MZ with Da between. MZ is coarse grained but 10% alt'd bi. Da is fine grained, strongly broken and gouge. Trace QTZ
128.9	138.4	9.5		0.13										0.13				md			-								SP	md	≤1	15			Da & MZ			Mostly Da with thin lenses of MZ. fault gouge 132.9-133.3.
138.4	149.5	11.1		0.24									0.03	0.10	0.11			wk md			-								Tr	SP	≤1	20			MZ?			From here on MZ and Da are very similar and hard to separate
149.5	159.9	10.4		0.29										0.05	0.20	0.04		wk	SP										SP	SP	<1	20			Da	QTZ vein w. trace PY	70°	MZ is medium grained and subject or intermittent while Da contains Biotite. Da becomes green near end of int, possibly due to fine chlorite
159.9	167.5	7.6		0.81		0.04								0.04	0.69	0.08		-	≤1		-								SP	SP	<1	15			MZ			Dis. py, cpy & cc., serpentine & chlorite alteration
167.5	174.9	7.4		0.33		0.01								0.01	0.24	0.08		-	≤1		-				TY				Tr	SP	<1	20?			Da?			Da resembles MZ. dis sulfides, green alteration product, 2nd type
174.9	186.3	11.4		0.46		0.01								0.01	0.01	0.20	0.24 cov	-	<1		-								Tr	Tr	1	20?			MZ & Da	QTZ & cpy vein	70°	Steep QTZ-sulf veining in Da. Begins in MZ with up to 30% biotite, ends in dark green fine grained Da. ^
186.3	196.5	10.2		0.36											0.08	0.20	0.08 cov		<1										Tr	Tr	1	20			MZ & Da			Bi-MZ to 188.0, Da to 196.5. Dis sulfides with thick CC on cpy
196.5	204.8	8.3		0.22											0.05	0.15	0.02 cov		<1						Tr				Tr	Tr	1	20			MZ	QTZ & cpy veins	60°-80°	Coarse grained, indistinct texture. mod mineralization 2-3% total sulfides outside of CC
204.8	212.7	7.9		0.24											0.05	0.15	0.04 cov		2%										Tr	Tr	1	20			MZ & Da			Steep fracturing, highly broken 208.0-208.2. End in Da. ^
212.7	220.8	8.1		0.31											0.03	0.25	0.03 cov		2%	-	-	-	-	-	-	-	-	-	Tr	Tr	1	?	3%		Da to 213.5 MZ			Rx is first appearing. Fr Da are uniform gray-to white (lighter alt). Bot. less alt'd. Sulfs v. well disseminated.
220.8	228.4	8.1		0.41		N.I									0.05	0.30	0.06		2%	-	-	-	-	Tr	Tr	-	-	-	Tr	Tr	-	3%	4%					Rx Rx. Grad. mass is uniform gray. Only locally fract controlled alt. Rx is mrdlyc w/ some sulfs in v-ts 228-229
228.4	237.6	8.7		0.35											0.18	0.15	0.03		2%	-	-	-	-	-	-	OX	-	-	Tr	Tr	-	3%	4%			Qtz, Py + mus in 66° Fr 89		GENERALLY As Above. Sulfs well disem, but some definitely fract controlled. Good Cu-Mo Rel.
237.6	246.1	8.5		0.29											0.04	0.25			2% 3%	-	-	-	-	-	-	0.01	-	-	Tr	Tr	-	5%	3%					As Above
246.1	254.6	8.5		0.37											0.08	0.27			2%	-	-		-	-	-	0.0	-	-	Sp	Sp	-	6%	6%			247.25		Mod Alt. Some variety. Rx more gray from Alt.
E.O.H.																																					

PRELIMINARY GEOLOGIC LOG
(Subject to Revised Logging)

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Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D 208
Page 1 of 1 Pages
Collar Elev 2,856.65 Final Depth 247.2
Coords. N 38,215.83 E 16,372.00
Inclination Vertical
Logged by RE
Date: Start 9-25-67 Finish 9-28-67

Depth From	Depth To	Depth int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Unc. Non Sulf. Cu	Cc.	Cpy.	Born	Fe (2) Lim	Py	Mag.	Hem Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0	53.8	53.8																																			
53.8	62.4	8.6		0.08									0.04	0.04				ST										Tr	SP	1	15	7%	G.O.(?)	QTZ Veins	50°	RK has texture characteristic of Granodiorite, but separation of FS & SP from specimen MZ is uncertain in hand specimen. RK is weakly alt., phenocrysts rare in size up to 0.2". 25% phen.s. 10-15% original biotite in varying stages of alt. to chlorite & sericite. At 110' abundance of phenocrysts decreases to 20-25%. Groundmass becomes darker. Appears to be lotite porphyry in hand specimen. Intrusive ends with inclusions of dark RK within light color change due to end Bx. At 87.0 RK has general appearance of monzonite
62.4	74.0	11.6		0.10										0.10				ST										SP	SP	<1	15	7%				
74.0	87.0	13.0		0.16									0.01	0.04	0.11			ST	<1%									SP	SP	1%	5%	10%		Qtz vein		
87.0	89.2	2.2		0.19										0.03	0.16			md	<1									md	SP	-	10%	7%	Mz	86.6	60°	
89.2	97.6	8.4		0.19										0.02	0.15	0.02		md	1%						Tr			md	SP	2	10%	5%		QTZ veins	40°	
97.6	106.3	8.7		0.30									0.01	0.02	0.17	0.10		md	1%									md	md	3	10%	5%				md alt., 5% Phenocrysts, wdcc on py, cpy
106.3	115.5	9.2		0.25										0.02	0.15	0.09		md	1%									md	SP	20%	30%	4%		QTZ veins	40°	leached veins, cc on cpy, less cc on py. Texture varies from Trachyte MZ to white feldspar in dark groundmass with little Bi. Parallel ½"-¼" QTZ veins spaced 1"-2", partially leached.
115.5	124.3	8.8		0.38										0.02	0.27	0.09		md	2%									md	SP	10%	20%	5%				dis cpy with cc, py in veins and lin restricted to fractures. Broken gouge. St lim and abrupt end completely at 123.3.
124.3	133.0	8.7		0.39									Tr	0.02	0.30	0.07		ST	1%									md	ST	2%	10%	5%				123.3-133.0 mostly gouge with mal on fracture
133.0	142.3	9.3		0.67		0.01							0.01	c	0.37	0.19		wk	1%									md	md	1%	10%	5%				Highly broken but less alt. than above, calc lin and blue-green cc on fracts
142.3	151.0	8.7		0.44		0.02							0.01	0.01	0.46	0.16		md	1%									md	ST	<1	5%	5%				Broken, gouge. St gouge for last half of interval
151.0	161.5	10.5		0.52		0.03							0.01	0.02	0.25	0.24		wk	<1%									md	md	1%	5%	5%				As above, less alt. near end of interval
161.5	172.3	10.8		0.41	0.08 @ 0.53	0.01	0.08 @ 0.015							0.01	0.30	0.10		sp	<1%									md	md	1%	5	10	5%			Broken, dis cpy, cc, calc and alt.
172.3	180.6	8.3		0.52		0.01								0.01	0.35	0.16		sp	<1									st	md	1%	10	5%				Fracture spacing app. 3", fine dis. sulfides - total ≤2%
180.6	189.8	9.2		0.52		0.01								0.01	0.41	0.10		wk	<1									md	md	1%	10	10%				md alt.
189.8	197.6	7.8		0.38		Nil									0.31	0.07		wk	<1									md	ST	<1	10	10				As above. highly broken, gouge over most of interval
197.6	205.4	8.8		0.60		0.01								0.01	0.50	0.09		wk	<1									md	md	<1	10	10				Fracture spacing: 2", calc lin in fracture
205.4	213.9	7.5		0.37		N.I									0.17	0.20		Tr	<1									md	ST	<1	10	10				Gouge from 206.1-208.1.
213.9	221.8	7.9		0.71		0.02												Tr	<1									md	md	1	10	8		QTZ Veins 217.2	0°-50°	md, localized silicification. Broken
221.8	231.0	9.2		0.17											0.05	0.12		Tr	≤1									md	wk	1	10	8		QTZ-sulf Veins	30°-50°	2 QTZ, py, cpy veins between 221.8 and 222.8.
231.0	237.6	6.6		0.12											0.02	0.10		Tr	1									md	wk	≤1	10	8		Sulfide Veins	60°	Py, cpy veins with sparse cc (Probably below C.S. zone), local silic. white feldspar in dark groundmass. Broken gouge.
237.6	247.2	9.6		0.11											Tr	0.11		-	<1									md	md	Tr	10	8				Small py dissemination lack cc coating. md silicification
	Total																																				

PRELIMINARY GEOLOGIC LOG

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V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D269
Page 2 of 2 Pages
Collar Elev 2,793 ft
Final Depth 640.9'
Coords. N 37,878 ft E 15,329 ft
Inclination VERTICAL
Logged by RS + N.R.N.
Date: Start 10/13/67 Finish 10-26-67

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green		Cc.	Cpy.	Born	Fe (2) Lim.	Py.	Mag.	Hem.	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE		(3) Rock Type	Structures (4) Depth	True Dip	Remarks
414.2	424.0	9.8		0.14												0.14			5%						Tr			mod	sp	5%	50	-						Mod-ST alt of Fspars. decrease in sulfides and vein thickness
424.0	433.4	9.4		0.30												0.30			1%						Tr			mod	sp	1%	50							As above, sericite with thin. steep Qtz-sulf veinlets
433.4	441.7	8.3		0.49												0.49			0.5%	-	-	-	-	-	Sp wk	-	-	sp wk	sp	-	40%	-						Mod Alt. Qtz to Py ratio > 1. Sulfs line fracts. Thin calcite coating on many fracts.
441.7	450.5	8.8		0.46												0.46			2%	-	-	-	-	-	0.03	Sp	-	-	Mod	sp	2%	45%						Much high sulf content. Alt. Mess stronger. Sulfs both veined + well dissem.
450.5	458.6	8.1		0.25												0.25			<1%	-	-	-	-	-	Tr	Tr Sp	-	-	wk	sp	1%	45%			varing 80°			Mod Alt. Decrease in min + Alt. Generally as above
458.6	467.4	8.8		0.18												0.18			1%	-	-	-	-	-	0.03	Tr Nil	-	-	sp wk	sp	<1%	40%						As Above
467.4	475.9	8.5		0.24												0.24			1%	-	-	-	-	-	0.04	Tr	-	-	wk	sp	2%	45%			varing	90°		Slightly stronger Varing. Moss + Cpy in some vns
475.9	480.8	4.9		0.28												0.28			<1%	-	-	-	-	-	0.01	Tr	-	-	wk	sp	-	40%						As Above
480.8	489.3	8.5		0.16												0.16			<1%	-	-	-	-	-	0.01	Sp	-	-	wk	wk	-	40%						Mod-ST Alt., Sp mineralization. Some "thick" bands of calcite on fracts.
489.3	498.2	8.9		0.27												0.27			1%	-	-	-	-	-	0.03	Tr	-	-	wk	sp wk	-	45%			Qtz, Sr-Sulf vns 1/4"	65-75		Mod-ST Alt. INCREASE IN varing. Spacing 3"
498.2	507.1	8.9		0.20												0.20			<1%	-	-	-	-	-	Tr	-	-	-	Tr	sp	-	45%						wk mod Alt. Generally as above
507.1	516.4	9.3		0.15												0.15			<1%	-	-	-	-	-	Tr	Tr	-	-	sp	sp	-	45%						As Above
516.4	526.5	10.1		0.16												0.16		-	1%	-	-	-	-	-	0.03	Tr	-	-	wk	sp	-	45%			Tr 0.9. 518-519.8			Mod-SS Alt., some slight increase in Py content
526.5	534.7	8.2		0.13												0.13		-	1%	-	-	-	-	-	Tr	-	-	-	sp	sp	Tr	40%						Mod-Alt -
534.7	543.1	8.4		0.12												0.12		-	1%	-	-	-	-	-	0.03	Sp	-	-	wk Mod	sp	3%	45%						Mod-ST Alt. Sulfs rare fract. Controlled. Locally thick calcite on fracts
543.1	552.2	9.1		0.09												0.09		-	2-3%	-	-	-	-	-	0.10	Sp	-	-	Mod	wk Mod	1%	55%			2" Qtz Vn w/Moss	≈ 90		Thick qtz vns. Similar to that seen in D-231, Mod Moss assoc.
552.2	562.1	9.6		0.14												0.14		-	2-3%	-	-	-	-	-	0.03	Sp	-	-	Mod	wk	3%	45%						Mod-ST Alt. prob assoc. w/ varing. Calcite becoming more wide spread.
562.1	571.4	9.3		0.22												0.22			2-3%	-	-	-	-	-	0.03	Tr	-	-	wk	wk	3%	45%						As Above
571.4	580.3	8.9		0.22												0.22		-	<1%	-	-	-	-	-	0.03	Tr Sp	-	-	Sp wk	Sp wk	3%	45%						Mod Alt. - Sp min. 0.04 to 0.4 % I
580.3	588.7	8.4		0.14												0.14		-	<1%	-	-	-	-	-	0.02	Sp wk	-	-	Sp	sp	1%	40%						As Above.
588.7	598.4	9.7		0.19												0.19		-	1%	-	-	-	-	-	0.01	Tr Sp	-	-	Mod	Sp	4%	45%			Qtz-Sulf-Sulf fract zone	85°		Mod-ST Alt, mod min. fract zone controlled
598.4	607.2	8.8		0.39												0.39		-	2%	-	-	-	-	-	0.03	Sp	-	-	Sp wk	Sp wk	5%	50%						weaker alt., but more qtz. Sulf content lower.
607.2	616.5	9.3		0.18												0.18		-	2%	-	-	-	-	-	0.02	Sp	-	-	Sp	sp	1%	45%						wk alt., Sp min.
616.5	625.4	8.9		0.10												0.10		-	5%	-	-	-	-	-	Tr	Sp	-	-	Tr Sp	sp	2%	35%						The Mz is the same as seen in surrounding holes. Well dissem Py is prob secondary
625.4	633.6	8.2		0.20												0.20		-	3%	-	-	-	-	-	0.02	Sp	-	-	Mod	sp	1%	45%			Sulf-Sec-Qtz Vn	65°		Mod Alt + Sp/y. min. Ab
633.6	640.9	7.3		0.20												0.20		-	6%	-	-	-	-	-	0.01	Sp	-	-	Mod	sp	3%	50%			No 633-636.5			Mod-Stly altd Ab. Sty altd + min fract zone.
F.O.H.																																						

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D-269
Page 1 of 2 Pages
Collar Elev 2,793.70 Final Depth 640.9'
Coords. N 37,878.89 E 15,329.60
Inclination VERTICAL
Logged by N.R.N. + R.E.
Date: Start 10-13-67 Finish 10-26-67

Depth From	Depth To	Int'vl	Elev.	% Cu Total	Avg.	NS	Avg	% Core Recov	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Wk. Non Sulf.	Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	ALUNITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0.0	6.5	6.5																																				Rock Bit
6.5	22.3	15.8		0.04										0.04	-			Wk	-	-	Wk	-	-	-	-	-	-	-	Wk Mod	Mod	10%	50-60	Tr		Ak	Qtz. Vning	80°	Stly Altd + silicified. Rk is stly brkn. Lim + lt. yellow + sp cavities seen. local Hem vning
22.3	33.7	11.4		0.02										0.02				Sp	-	-	Mod St	-	-	-	-	-	-	-	Sp Wk	Mod St	1%	48%			Ap 21-25' An @ 25'	St Flt Material		Rk. is stly shattered, brkn + altd as a result of faulting. St Hem staining of felds + in vns.
33.7	42.5	8.8		0.02										0.02				Sp	-	-	Mod-St	-	-	-	-	-	-	-	Sp-Wk	Mod St	-	48%	? 1%	4%		Alunite Vning	88°	Rk is still stly altd, but less gougy. 4% alunite vning. Mod-St Hem staining folds
42.5	51.4	8.9		0.02										0.02				Sp	-	-	Wk Mod	-	-	-	-	-	-	Tr	Wk	-	48%		1%					Rk much less altd, shattered + Hem stained. Occasional groups of sulf coats
51.4	60.2	8.8		0.01										0.01				Sp	-	-	Wk	-	-	-	-	-	-	Tr	Wk Mod	-	40%		2%					P-felds altd to point of being soft. Still some flt + high angle alunite vns.
60.2	68.9	8.7		0.02										0.02				Sp	-	-	Wk	-	-	-	-	-	-	-	Wk Mod	-	40%		Tr					The Limonite is still the lt. yellow - Jar.
68.9	77.5	8.6		0.03										0.03				Sp	Tr	-	Sp Wk	-	-	-	-	-	-	Sp	Mod	3%	45%	-	2%			Qtz-Ser vns 1/8"-	90° + 60°	Rk is suddenly Mod-stly altd, and leached qtz-ser sulf vns are present. Tr of CC + PY
77.5	85.7	8.2		0.03										0.03				Mod	Tr	-	Sp	-	-	-	-	-	-	Mod	Mod St	8%	65%	-	4%			Flt + Vn	≈ 80°-90°	St Alt, st sil'n + ser alt. Mod yellow + (Lt.) Brn Lim in Vn. Rk has Mod. open space in Vn zone
85.7	95.0	9.3		0.04										0.04				Sp Wk	Tr	-	Sp	-	-	-	-	-	-	St	St	-	?	-	3%			1/2" Alunite Vn 91'	75°	Rk becomes intensely altd. Circa 91' and below Tex destroyed. Rk is soft white mix of ser. qtz + clay. sp dissim CC (?). Alunite + yellow Lim. in Vn zone
95.0	105.4	10.4		0.03										0.03				Tr Sp	Tr	-	Tr	-	-	-	-	-	-	St	St	-	? 35%	-	-			G.G.		Rk continues to be St - Intensely altd. qtz. grains again become visible. St gg. locally.
105.4	113.6	8.2		0.54		0.01								0.01	0.35	0.18		Tr Sp	2-3%	-	Sp	-	-	-	-	-	-	Sp Wk	Wk Mod	3%	40%	-				Sulf Coat Circa 110'		Mod Alt. - End of leaching + Lim-Hem staining @ 110'. PY + CPY coated w/ CC. well dissem. Pistachio Clay in faults in Sulf. zone.
113.6	122.4	8.8		0.32		0.02								0.02	0.22	0.08		-	3%	-	-	-	-	-	-	-	-	Mod	Mod	15%	55%	-	-					St Alt. St qtz-ser sulf vning (not sharp walled). CC developed on most py + CPY.
122.4	131.5	9.1		0.55		0.02								0.02	0.45	0.08		-	2-3%	-	-	-	-	-	0.02	-	-	-	Mod St	Mod	15%	55%	-	-		Flt, G.G. 31.9-32.4 + 40' vns		St Alt, qtz-ser-sulf alt. Most sulfs assoc w/ these zones. The qtz dev mix still present
131.5	141.0	9.5		0.58		0.02								0.02	0.37	0.19		-	4%	-	-	-	-	-	?	-	-	-	St	St	?	50%	-	-			85°	St - Inten Alt. St ser develop. Good dissim of sulfs local g.g. zones.
141.0	150.2	9.2		0.36	138.7' @ 0.73	0.02								0.02	0.17	0.17		-	2%	-	-	-	-	-	-	-	-	-	Wk	Mod	3%	45%	-	-				Mod-St Alt, Total sulfs somewhat low. Controlled primarily by thin fracts.
150.2	160.7	10.5		0.56		0.01	138.2' @ 0.009							0.01	0.41	0.14		-	4%	-	-	-	-	-	-	-	-	-	Mod St	Mod	6%	50%						St qtz. ser alt along mineralized fracts. locally st sil'n. Rk evidences faulting 151-157
160.7	169.4	8.7		0.71		0.01								0.01	0.45	0.25		-	3%	-	-	-	-	-	-	-	-	-	Mod St	Wk	10%	55%				Qtz-Ser-Sulf vning (thick)	≈ 90°	As Above. Zones of qtz-ser-sulf alt are thick + irreg. sulfs dissem in zones.
169.4	181.0	11.6		0.67		0.01								0.01	0.48	0.18		-	4%	-	-	-	-	-	-	-	-	-	Mod St	Wk	7%	55%				Min. Fracts; Qtz-Ser vns	65°; 70°-90°	St sil'n + sericitization. Min assoc w/ qtz-ser + along numerous parallel micro fracs.
181.0	189.8	8.8		0.60		0.01								0.01	0.43	0.16		-	4%	-	-	-	-	-	Tr	-	-	-	Mod St	Wk	7%	50%						Much as above. Still a thin CC coating on CPY.
189.8	198.4	8.6		0.82		0.01								0.01	0.51	0.30		-	8%	-	-	-	-	-	-	-	-	-	St	Wk	15%	60%				Qtz-Ser-Sulf vning	60°-85°	St qtz-ser-sulf alt. Broad zones. Still some CC. High total sulf content + lack of calcite make possibility of seds. at depth pretty low.
198.4	206.7	8.3		0.61		0.01								0.01	0.45	0.15		-	10%	-	-	-	-	-	Tr	-	-	-	St	St Wk	15%	65%				Qtz-Ser-Sulf Seams	80°	As Above. Sulfs veined + dissem throughout qtz-ser alt. CC getting quite sparse
206.7	215.1	8.4		0.98		Nil									0.83	0.15		-	8%	-	-	-	-	-	0.03	-	-	-	St	Sp	10%	60%				St Flt G.G. + Bx 215.2-221	55°-70°	Rk is stly alts w/ tex disturbed. Primary alt. is qtz-ser-sulf. 1" spacing on fracts. some barite present.
215.1	225.5	10.4		0.88		Nil									0.68	0.20		-	4%	-	-	-	-	-	0.04	-	-	-	St Inten	Sp	?	65%			Pst. Qtz Mz Circa 230	Flt G.G. + Bx 225-232.1	60°	St. Pre + Post Min Flt Zone. St Bx at 215' is unconsolidated + Post Min, St sil'n + ser assoc.
225.5	232.1	6.6		3.02		0.02								0.02	2.70	0.30		-	8%	-	-	-	-	-	0.03	-	-	-	Inten	Sp	?	60%						This Flt material is intensely altered + stly min. indicating fault is Pre min
232.1	243.6	11.5		0.38		0.004								0.004	0.19	0.18		-	5%	-	-	-	-	-	0.02	-	-	-	Mod St	Mod St	-	5%			Ap (?) Circa 243.3'	3" Bx Dike @ 349	75°	This monzonite is same as other Pork. Qtz Mz described. St to Inten. Alt. Sulf v. well dissem C.C. still thin. This Mz. was probably introduced along the fault zone.
243.6	252.1	8.5		0.31											0.10	0.21		-	3%	-	-	-	-	-	?	-	-	-	Mod	-	?	30%			Ak Circa 254	Main vning	70°	The rk has v. poor tex. Mod. shattered + rehealed. Sulf primarily controlled on fracts. Intrusive Bx is pre mineral.
252.1	260.5	8.4		0.31											0.10	0.21		-	3%	-	-	-	-	-	0.02	-	-	-	Sp	Sp Wk	?	45%						Tex grades into Ak. Still numerous ser-qtz-sulf fract carrying Py + CPY.
260.5	268.7	8.2		0.20											0.15	0.22		-	2-3%	-	-	-	-	-	0.02	-	-	-	Tr	Sp	?	45%						Tex not well developed. Min is controlled by series of micro fracts dipping @ 75°. Tr of CC. Tr [illegible]
268.7	276.9	8.2		0.37											0.03	0.18		-	3%	-	-	-	-	-	Tr	-	-	-	Tr Sp	Sp	5%	45%						As Above: Some sharp walled qtz-sulf vns present.
276.9	286.0	9.1		0.21											0.02	0.18		-	3%	-	-	-	-	-	0.03	-	-	-	Sp Wk	Sp	7%	45%				Qtz-ser-sulf vns	75°	Wk Alt except along fract. Qtz-ser-sulf vns numerous.
286.0	294.4	8.4		0.21											0.05	0.16		-	5%	-	-	-	-	-	0.03	-	-	-	St	Sp	?	50%						Rk becomes stly altd to qtz ser-sulf at 290. Sulfs are well dissem in stly altd zones
294.4	303.3	8.9		0.36											0.16	0.20		-	3%	-	-	-	-	Tr	Sp	Tr	-	-	St	Sp	?	45%				Alt-Min-Fracts	≈ 85°	As Above. Rk is stly brkn + there has been core loss. CPY + predominant sulf.
303.3	312.8	9.5		0.38											0.05	0.33		-	4%	-	-	-	-	Tr	0.08	Sp	-	-	St	Sp	3%	55%				Qtz-MoS2-CPY vnlets	≈ 80°-90°	St Ser-Qtz-Sulf Alt. Rk Now and above has been strongly structurally affected - High angle shear zone. There has been both pre and post min movement.
312.8	322.3	9.5		0.19											0.02	0.17		-	2%	-	-	-	-	Tr	0.08	Tr	-	-	Wk	Sp	5%	55%						Qtz-ser-sulf alt decreased, but now numerous 1/4-1/2" Qtz MoS2-CPY vns cutting rk. - Spaced 2"
322.3	332.2	9.9		0.19											0.02	0.17		-	2%	-	-	-	? Tr		0.05	Tr	-	-	Wk Mod	Sp	7%	55%			8" Mz Circa 326			Some Ak tex visible but rk mod-stly altd to ser-qtz. Sulf controlled on v. thin qtz-vnlets + dissem along micro fracts in P. felds. Rk is still brkn
332.2	341.4	9.2		0.21											0.01	0.20		-	2%	-	-	-	-	-	0.0026 0.04	Sp	-	-	Wk Mod	Sp	6%	50%						Numerous qtz-ser-sulf stringers. MoS2 generally assoc. - Some Xline calcite on some fracts
341.4	349.5	8.1		0.30											0.01	0.29		-	2%	-	-	-	-	-	0.0041 0.03	Tr	-	-	Wk	Sp	5%	50%						Rk stly altd, but tex is distinct. Much as above. Sulfs closely assoc w/ filled fracts.
349.5	357.9	8.4		0.23											0.02	0.21		-	2%	-	-	-	-	-	0.0106 0.02	Tr	-	-	Wk	Sp	5%	45%				Stringer intervals 1/inch	~75-90	Mod-St Alt. K-spars beginning to show a little pink color.
357.9	365.7	7.8		0.21											0.01	0.20		-	1%	-	-	-	-	-	0.0076 0.07	Tr	-	-	Sp Wk	Sp	2%	40%						Mod Alt. Intensity of vning decreasing and concurrently the min. CPY to PY ≈ 2:1
365.7	375.0	9.3		0.36											0.04	0.32		-	1%	-	-	-	-	-	0.0236 0.04	-	-	-	Sp Wk	Sp	10%	38%				Min. Stringers	80°	Mod Alt. Rx as above
375.0	383.5	8.5		0.23												0.23		-	2-3%	-	-	-	-	-	0.0122 0.02	-	-	-	Sp Wk	Sp	4%	45%						Intensity of micro fracturing decreasing, but one large (2") qtz-ser-sulf present
383.5	387.8	4.3		0.44		0.01								0.01	0.04	0.39		-	3%	-	-	-	-	-	0.0104 0.05	-	-	-	St	Sp	10%	60%				2" Qtz-Ser-Sulf vn.	75°-85°	Thick qtz-ser-sulf vn occupies most of volume of core in this interval
387.8	396.6	8.8		0.37											0.01	0.36		-	2%	-	-	-	-			Tr	-	-	ST	SP	5%	55%				veins	60-90	continued st. qtz-ser-py-cpy-moly veining
396.6	404.2	7.6		0.22												0.22			2%							Tr			md st	SP	2%	55%						less veining, sulfides in thin steep veins, wk-md silicification
404.2	414.2	10.0		0.22												0.22			1-2							Tr			md st	SP	1%	55%						md-st alt. rock weakened b[illegible] alteration of plag to clay [illegible]

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO- SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
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Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D-270
Page 1 of 1 Pages
Collar Elev 2785.12
Final Depth 199.0
Coords. N 38,512.33 E 16,197.00
Inclination VERTICAL
Logged by N.R.N + R.E.
Date: Start Oct 13, 67 Finish Oct 14, 67

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Cu (1) Pitch	Cu (1) Black	Cu (1) Blue Green	Cu (1) Wk. Mod Sulf	Cu (1) Cc.	Cu (1) Cpy.	Cu (1) Born	Fe (2) Lim.	Fe (2) Py	Fe (2) Mag.	Fe (2) Hem Spec.	Other (2) Galena	Other (2) Sphal.	Other (2) Molyb	Other (2) Calcite	Other (2) Garnet	Other (2) Silicates	Other (2) Sericite	Other (2) Clay	Other (2) Vn. Qtz	Other (2) QUARTZ	Other (2) CHLORITE	(3) Rock Type	Structures (4) Depth	Structures (4) True Dip	Remarks
0.0	10.0	10.0																																		Rock Bit
10.0	20.5	10.5		0.07										0.07				Wk	-	-	-	-	-	-	-	-	-	Wk	Mod	5%	30%	-	Dp			Stly alt, cut by numerous qtz-ser sulf (leached) valets. Residual + rotation on fracts. Lt orange Bx. Rk is stly brec to 1-2" frags.
20.5	30.0	9.5		0.17										0.17				Wk	-	-	-	-	-	-	-	-	-	Sp Wk	Mod	5%	20%	-				As Above. Crossbreed mz frags + valets are seemingly random. Sp mod assoc w/ lim.
30.0	35.1	5.1		0.24										0.18	0.06			Wk	-	-	-	-	-	-	-	-	-	Sp	Wk Mod	1%	25%					As Above. Rk is strongly skeltered + some altd is healed. Tech brn lim on fracts, Tr Cpy O.O
35.1	42.3	7.2		0.09										0.09				Wk	Tr	-	Tr	-	-	-	-	-	-	Tr Sp	Wk	Tr	10%		Bxt Mz 35.1-42.3 Dp ? 42.3			Structurally skeltered, but not stly altd. 10% orig. bxt. wkly altd. Attitude of Dike Not Determined but probably low angled
42.3	48.3	6.0		0.05										0.05				Wk	-	-	-	-	-	-	-	-	-	Sp	Mod	4%	35%					Mod-stly altd. Cut by numerous qtz-ser valets (RNWOOM). Lim is Lt Brn
48.3	57.8	9.5		0.07										0.07				Wk	Tr	-	-	-	-	-	-	-	-	Tr Sp	Wk Mod	?	30%	1%				Mod Alt. Generally as above. Tr of C.C. on Tr Py.
57.8	66.6	8.8		0.03										0.03				Wk	0.07	-	Tr Sp	-	-	-	-	-	-	Sp	Wk Mod	?	30%	Tr				Rk has been stly skeltered. Occassional 1 Tex ser-qtz valets (25°) local sulf.
66.6	75.6	9.0		0.07										0.07				Sp. Wk	-	-	Tr	-	-	-	-	-	-	Tr	Wk	-	30%	1%				Alt Decreasing slightly. Lim is orange brn on fracts. Rk more competent.
75.6	83.7	8.1		0.05										0.05				Wk	-	-	Tr	-	-	-	-	-	-	Tr Sp	Wk	-	25%	1%				As Above. BCT brn. somewhat thicker on fracts.
83.7	92.5	8.8		0.01										0.01				Wk	0.3%	-	Sp	-	-	-	-	-	-	Sp Wk	Wk	6%	35%	Tr		Qtz-Ser-Sulf vns 1/2"	5°	Sudden increase in lim-Hem, increase in qtz-ser-sulf veins + fracturing. Patchy Alt w/out C.C.
92.5	106.0	13.5		0.07										0.07				Wk	3%	-	Sp	-	-	-	-	-	-	Wk	Wk	10%	40%		Gulf Rt Circa 66 Dp W/ Mz intrusive	Circa 66. Circa 93-86		Rk has been broken, and mineralized to of wk-mod extent. qtz-ser-sulf alt along fracts intermixed Lim + sulfs. only Tr C.C. + Py.
106.0	113.5	6.5		0.23										0.04	0.19			Tr Sp	1%									Sp	Wk	-	25%	4%				Sharp decrease in lim. + appearance of sulfs @ 106'. Sp PYRITE CPY coated w/ C.C. Mz better bxd
113.5	122.0	9.5		0.38		.02								0.02	0.29	0.06	0.01	Tr Sp	2%									Sp Wk	Sp Wk	2%	20%	4%				Mod Alt., Sulfs are wkly disseminated. more fract. Controlled. Sprnkt of Mz intermixed. Thin C.C. on Py + CPY
122.0	130.6	8.6		0.66		.13								0.13	0.41	0.12		Tr	1-2%	-	2%	-	-	-	-	-	-	Tr	Sp Wk	-	15%	7%		Bxt Mz Circa 22		wkly Alt'd. Sulfs are strongest in fracts. Less tetal sulf content 2% disseminated. Lim is now altd to hem.
130.6	140.0	9.4		0.65		.16								0.16	0.39	0.10		Tr	3%	-	1%	-	-	-	-	-	-	Tr	Sp Wk	-	10%	7%				wkly Alt'd. Sulfs are well disseminated + more present than first thought. Good CPY + Py in Qtz. mod. C.C. replacement
140.0	149.0	9.0		0.41		.02								0.02	0.31	0.08		Tr	1%	-	1%	-	-	-	-	-	-	Tr	Sp Wk	-	10%	8%				Wk A.T. Sulf content appears to be down. Less C.C. on Py + CPY.
149.0	157.3	8.3		0.31										0.01?	0.22	0.08		Tr	<1	-	-							Mod	Sp	Tr	10%	8%				mod alt. B. in various stages of alteration to hydromica. Altd Plag.
157.3	166.4	9.1		0.19											0.11	0.08		-	<1					SP				Sp	Sp	Tr	10%	10%				mod alt., thin veins w/sericite, Malk on fractures. St alt of plag. wk sulfides
166.4	175.6	9.2		0.16											0.09	0.07		Tr	<1					-				Sp	Sp	1%	10%	10%			QTZ vns 80°	Thin open QTZ veins lined with QTZ xtals. mod alt.
175.6	184.2	8.6		0.14											0.08	0.06		-	<1									Mod	Sp	Sp	10%	10%			CPY stringers 80°	As above, mod alt., mod sericite along QTZ-sulf veinlets
184.2	193.5	9.3		0.12											0.07	0.05		-	1%									Mod	Sp	Tr	10%	8%				wk silicification, C.C. on spx., little C.C. on Px
193.5	199.0	5.5		0.15											0.09	0.06		-	4%									Sp	Sp	Tr	10%	8%				stly silicified from 195.0-199.0, wk dis sulfs including spec
E.O.H.																																				

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Note (3):
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D 271
Page 1 of 1 Pages
Collar Elev 2,834 96
Final Depth 272.6
Coords. N 38,486 83
E 16,050 19
Inclination VERTICAL
Logged by RC
Date: Start 10/19/67 Finish 10-21-67

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Mag. or Carbonate N.S.	Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem.	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	Mylonite	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0	10.0	10.0																																				All alluvium
10.0	21.3	11.3		.06									.06					Vst		md								sp md	md	1	15	Tr	15%		MZ	leached veins	30°-90°	Str leached MZ limonite filled veins with sulfide cavities. some vug limonite in strength 15% Hydromica., sp. malachite
21.3	28.7	7.4		.07									.04	.03				vst		md								sp	st	<1	15	3%	10%			Qtz. vein	40°	1st half of interval highly broken, gouger. malachite along veins.
28.7	39.6	10.9		.07									.05	.02				vst		md								md	vst	<1	15	3	10					Rock is soft, broken, gouger. sericite along qtz veins (where veins remain)
39.6	48.4	8.8		.11									.09	.02				st		md								md	st	1	15	5	10			Qtz ser veins	30°-75°	limonite filled qtz-sericite veins - widely spaced. md malachite staining
48.4	57.2	8.8		.08									.02	.06				st		md								sp st vst	<1	15	10	10						STly altd or weathered. Very soft, crumbles in hand.
57.2	66.0	8.8		.05										.05				st		md								md	st	≤1	15	5	10			Qtz ser vein 595	25°	As above. Possible fault zone about 640'
66.0	75.3	9.3		.08									.04	.04				st		md								md	st	≤1	15	5	10					As above. malachite staining along fractures
75.3	83.0	7.7		.05									.02	.03				st		wk								md	st	≤1	15	8	8					strongly decomposed, as above.
83.0	91.4	8.4		.06									.04	.02				st		wk								md	st	<1	15	8	8					slightly harder, less alteration, less gouge. Trace turquoise (?)
91.4	100.8	9.4		.08									.08					md		Tr								md	wk	<1	15	10	5			Qtz ser veins	35°-50°	marked decrease in alteration, gouge, limonite. no sulfides
100.8	112.6	11.8		.10									.10					md	Tr	Tr								md	md	<1	15	10	5		Gossan & oxidation at 112.6		70°	slight increase in limonite approaching sharp oxide-sulfide contact
112.6	118.6	6.0		.42		.05							.05		.32	.05		Tr	1%	-								st md	st	md	1	15	10	2					Px, epx with md cc coatings, sericite along veinlets, blue-green cu minerals on trace fractures.
118.6	127.5	8.9		.26		.01							.01		.20	.05		Tr	1-2	-								st wk st	md	1	15	7	1			sulf veins	30°-80°	Qtz-ser-sulf veins 30°-80°. good cc on epx but sp cc on py. 20% original Biotite intersecting veins - 20-30 per ft. wk cc. Tr of 2nd repeating vein.
127.5	135.9	8.4		.45		.03							.03		.35	.07		Tr	2	-								st wk	st	3	15	10	1					blue-green cu, limonite halos around some py. sp mostly in qtz veins
135.9	144.2	8.3		.42		.02							.02		.33	.07		Tr	1		Tr		sp					md	sp	1-2	15	8	1					As above, wk cc, malachite along fractures, Tr of Hematite mag.
144.2	151.7	7.5		.49		.03							.03		.36	.10		Tr	1		Tr		sp					md	sp	1	15	10	-			Qtz-Mol vein	65°	Good cc on epx but generally wk on px, few sulfides. fine dis. sulfides with st. cc.
151.7	159.9	8.2		1.05		.04							.04		.86	.15		Tr	≤1	-			-					sp	sp	Tr	15	8						~~few sulfides~~, fresh looking MZ 50% of biotite is unaltered
159.9	168.8	8.9		.55		.06							.06		.34	.15		Tr	1	-			Tr					sp	sp	1	15	8		MZ				md cc coatings but total sulfide content low. wk altn.
168.8	177.3	8.5		.20									.03		.09	.07	.01	Tr	<1	-			Tr					Tr	Tr	1	20	-		Da (?)	MZ-Da contact 168.8	65°-70	Anhedral dacite with few distinct phenos. Resembles aplite
177.3	186.0	8.7		.26									.03		.13	.10		Tr	<1				Tr					sp	Tr	1	20	-			Qtz cpy vein	35°	more closely resembles aplite than above. strong cc on sp. epx
186.0	194.4	8.4		.48		.03							.03		.37	.08		Tr	<1?				Tr					sp	st	-	20?	-						Brecciated and gouger
194.4	203.5	9.1		.30									.03		.21	.06		Tr	<1				-					sp md st	Tr	20						py vein	35°	Gouger to 197.0, then anhedral with indistinct Fspars.
203.5	211.5	8.0		.37									.03		.27	.07		Tr	<1				-					Tr	sp	<1	20	Tr						Aplitic texture with occasional large qtz xxs or Fspar. light green in color
211.5	220.0	8.5		.40		.10								.10	.24	.06		Tr	<1									Tr	sp	<1	20	Tr						As above.
220.0	229.5	9.5		.35									.02	.02	.26	.05		Tr	≤1									Tr	md	1	20	sp	Tr					Cuprite on fractures. 2nd Fspar. Gouge from 226.6-228.0, steep to shallow sulfide veinlets few phenocrysts
229.5	237.5	8.0		.29									.02	.02	.21	.04		Tr	≤1				Tr					Tr	sp	1	20	5	Tr	Da (?)	½" qtz vein	30°	color and bi-chl content lack of qtz xxs indicate MZ, but anhedral with few phenocrysts
237.5	249.9	12.4		.18									.04	.02	.09	.03		Tr	≤1				Tr					Tr	sp	1	20	5	Tr	MZ				grades into recognizable MZ near end of interval. malachite & cuprite, all along fractures. Good cc coatings but low sp-py content.
249.9	258.6	8.7		.20									.03		.09	.08		Tr	<1				Tr					Tr	sp	1	20	md	Tr	MZ / Da	sp + qtz vein	60°	MZ ends about 251.8. Da as above, anhedral, few qtz xxs. Broken
258.6	272.6	14.0		.12									.02		.05	.05		Tr	≤1				Tr					Tr	sp	1	20	sp		Da				Increase thin fracturing, indistinct texture, low sulfide content
	EOH																																					

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
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Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D 272
Page 1 of 1 Pages

Collar Elev 2767.21 Final Depth 178.0
Coords. N 37,934.71 E 16,401.58
Inclination VERTICAL
Logged by RE
Date: Start 10/24/67 Finish 10-25-67

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu N S	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Unknown N S	Cc.	Cpy.	Born. Cov.	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0	10.0	10.0																																			
10.0	19.2	9.2		0.26										0.26				md			Tr								SP	SP	Tr	15	5%		MZ			wkly altd MZ with 10% bi chl, feldspars stained yellow
19.2	27.9	8.7		0.30									0.02	0.28				md			Tr								SP	SP	-	15	2%					Bi altd to chlorite and hydromica near fractures.
27.9	36.6	8.7		0.30										0.30				md			Tr								SP	SP	-	15	2			33.2-33.7 Dike? Qtz-ser veins	65°	0.5' band of darker MZ with larger phenocrysts makes sharp 65° contacts
36.6	45.0	8.4		0.30										0.30				md			-								SP	SP mg	Tr	20	2				85°	Highly broken to 39.7' steep, thin qtz-ser veins.
45.0	53.9	8.9		0.33										0.33				md			-								SP	SP	Tr	20	2					As above, wk alt. Bi in all stages of alt to hydromica
53.9	62.7	8.8		0.26										0.26				md			Tr								SP	SP	Tr	20	2					As above. Tr of hem after mag.
62.7	71.4	8.7		0.46		0.26							01	0.45	(No visible sulfides)			md			-								SP	SP	Tr	20	4			64.0-67.4 Dikes? Veins	65°	Dark, Bi-MZ from 64.0-67.4 makes sharp contacts similar to above
71.4	80.4	9.0		0.33										0.33				wk md			-								md	SP	Tr	20	6				65°	steep limonite filled qtz sericite veins, wk alt, 15% bi, 5% chl
80.4	89.4	9.0		0.13										0.11		01	01	wk	sp		-								md	sp	1%	20	6			Sulfides @ 82.5'	65°	py, cpy, w/cov. occur in vein at 82.5' below which are leached veins. No visible sulfides in this interval
89.4	98.4	9.0		0.11										0.11				wk			-								md	sp	<1	20	4					wk alt steep qtz-ser veins
98.4	107.2	8.8		0.19									010	0.09				wk md			-								md	sp bd	<1	20	4			fault 102.5'	65°	no sulfides, Thin fault zone at 102.5' followed by highly fractured rock
107.2	115.9	8.7		0.33									015	0.18				md											SP	ST	<1	20	3					Gouge and shattered rock from 111.2-115.3 No visible sulfides
115.9	124.3	8.4		0.19										0.16	02	01		wk	4		-				2054				SP	SP	≤1	20	5			sulfides @ 120.7' Qtz ser veins	75°	Dis sulfides include py, cpy w cc, mo?
124.3	132.7	8.4		0.87		0.05								0.05	52	.30		-	1%						0122				SP	Tr	<1	20	5					wk alt, md-st dis sulfides
132.7	141.4	8.7		0.66		0.02								0.02	.34	.30		-	1½						0502				SP	Tr	<1	2[illegible]						As above
141.4	149.5	8.1		0.44		Nil									.24	.20		-	1½						0130				Tr	Tr	1-2	20	5			¼" Qtz Vein 47.5	70°	st sulfides, wk alt., little arg sericite with qtz veins
149.5	158.7	9.2		0.40		Nil									.24	.16		-	1%						Tr				Tr	Tr	2	20	5					As above, wk alt, fewer sulfides
158.7	168.5	9.8		0.19											.07	.12		-	1%						Tr				Tr	Tr	1	20	3					As above, 10% Biotite
168.5	178.0	12.5		0.32											.14	.18			1%						Tr				Tr	Tr	1-2	20	3					wkly altd, hard. spr with thin cc, steep veining
	EOH																																				

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO- SILVER BELL UNIT

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Note (4)
V - Vein
F - Fault
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C - Contact
Ig - Undif igneous

Hole No. D273
Page 1 of 1 Pages
Collar Elev. 2,842 ±2
Final Depth 323.7'
Coords. N 37,904 ±3 E 15,142 ±5
Inclination VERTICAL
Logged by RE
Date: Start 10/30/67 Finish 11-4-67

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Wk. Nam Salt	Cc.	Cpy.	Born + Covellite	Fe (2) Lim.	Py	Mag.	Hem.	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE		(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0	5.3	5.3												0.																							Alluvium
5.3	13.3	8.0		0.02				76	2.11					0.02				md			ST							md	SP	1-2	45	-		AK	Tim filled veins	20°-80	Hem stained AK with live limonite in ⅛" veins, originally 3-4% total sulfides
13.3	22.0	8.7		0.02				96	2.49					0.02				md			ST							md	md	1	45	-			"	80°	md alt, hem stained Fspars, vein spacing 6"-12"
22.0	32.2	10.2		0.01				73	2.44					0.01				wk			ST							sp	md	<1	45	-		AK			As above. Thin Aplite dikes @ 23.5, 28.0, fewer veins, less live lim.
32.2	41.1	8.9		0.02				93	2.31					0.02				md			ST							sp	md ST	<1	50			MZ dike?			stly leached zone of initial high pyrite content from 35.0-39.0 - may be MZ
41.1	49.3	8.2		0.02				96	2.57					0.02				md			ST							md	md	1	45			AK			st hem staining, md-st live limonite
49.3	58.8	9.5		0.02				98	2.44					0.02				md			ST							md	md	15	60			Aplite	Tim filled veins	80°	QTZ and aplite from 56.5-58.8
58.8	67.1	8.3		0.02				90	2.58					0.02				md			md							md	md	20	60			AK			Aplite continues to 60.0; steep thick barren QTZ veins, increase in yellow-brown lim.
67.1	76.1	9.0		0.04				91	2.34					0.04				md			ST							sp	md	20	60						QTZ vein and silicification from 67.6-69.0. Hem, lim as above
76.1	85.0	8.9		0.04				99	2.36					0.04				md			ST							sp	ST	2	45						Broken & gouge: 80.0-81.1. Otherwise as above
85.0	93.9	8.9		0.02				92	2.56					0.02				md			md							md ST	md ST	20	60				leached veins	80°-90°	Near vertical ⅛" veins filled with live lim, sideroxenite, sec, 89.0-93.0
93.9	102.3	8.4		0.17				96	2.53					0.02	.10	.05		wk			wk							sp	md	<1	45			sulfides begin-96.4			Fine dis py c.c.c., Tr of spy. low total sulfides. Plag stly altd.
102.3	111.4	9.1		0.27				92	2.56					0.01	.18	.08		Tr			Tr							sp	md	2	45				QTZ veins	45°	Increased sulfides, good CC coatings. wk-md alt.
111.4	116.6	5.2		0.37				99	2.55					0.01	.28	.08		-			-							sp	md	1	45						As above 3% total sulfides
116.6	126.0	9.4		0.61		.01		96	2.43						.50	.10												sp	md ST	<1	55						md alt, gouge: 121.5-123.5. Below 123.5 alteration, sil obscure texture
126.0	134.9	8.9		0.89				99	2.55						.73	.15												md	md	1-2	55						md-st alt. 3-4% total sulfides in steep veinlets
134.9	143.5	8.6		1.20				95	2.77						.99	.20												md	ST	1	45			AK			Gouge: 138.7-140.1, otherwise as above
143.5	152.2	8.7		.72				88	2.83						.51	.20												md	md ST	3	60			Aplite?			Becomes fine grained-aplitic. vertical QTZ-py veins, gouger. 3-4% Total sulf.
152.2	161.0	8.8		.61				92	2.64						.45	.15												sp	md	3	60			Aplite?			Gouge 156.4-156.6, fine grained as above with slightly less sulfides
161.0	171.0	10.0		.62				79	2.53						.46	.15												sp	md	5?	60			AK			Becomes coarse grained about 166.0'. c.c. on py.
171.0	182.4	11.4		.25				79	2.55 (assay appears low!)						.14	.10												sp	ST	2	50						Broken and gouger. c.c. thinning. app. 2% total sulfides
182.4	189.9	7.5		.42				87	2.54						.36	.05												sp	md	1	50						md. alt, texture less destroyed by alteration.
189.9	199.1	9.2		.25				91	2.57						.14	.05												sp	md	1	60				QTZ-sulf veins	75°	As above
199.1	206.7	7.6		.60		.01		86	2.54					0.01	.44	.15												sp	ST	-	45?						highly altd, broken & gouger.
206.7	217.5	10.8		.61		.03		71	2.75					0.03	.43	.15												md	ST	3	48						As above with intervals of quartz veins and silicified rk
217.6	227.1	9.6		.80		.01		86	2.56					0.01	.69	.10												md	md ST	Tr	45						stly altd, dis py with md c.c, fspars altd to clay & ser.
227.1	235.3	8.2		.45		.01		95	2.60						.10	.10	.24											ST	md ST	2	45				QTZ-sulf veins	70°-90	less alteration, vertical sulfide veinlet 231.6-233.3, covellite on pl
235.3	245.9	10.6		.32				75	2.55						.10	.10	.18											ST	vst	<1	40?			Bx			Breccia, gouge, st. py.: 237.3-245.9. Cov on py.
245.9	255.5	9.6		.29				91	2.52						.06	.10	.12						Tr					md	md	5?	50			AK			Broken with alternating zones of soft, altd rk and hard silicified alternates. Total sulf 5%
255.5	261.0	5.5		.29				80	2.88						.06	.10	.12											md	ST	4	55				py vein ½"	60°	Gouge 256.0-257.4. st. alt between QTZ veins.
261.0	271.8	10.8		.35				49	2.74						.11	.10	.13											md	st	<1	40?						stly altd, broken & gouger
271.8	281.9	10.1		.37				88	2.79						.10	.20	.06						Tr					md	md	4	65				QTZ veins	60-90	st QTZ veining & silicification with 2.5% total sulfides - py, cpy, c.c, and s.
281.9	291.2	9.3		.24				95	2.65						.06	.15	.02						Tr					md	md	6	55						As above, unsilicified rk is md to altd.
291.2	300.4	9.2		.42		.01		79	2.53					0.01	.08	.20	.13											md	md	5	55						white QTZ vein with 50% sulfides from 291.2-292.0, otherwise as above
300.4	311.0	10.6		.21				84	2.56						.02	.15	.04											md	md	5	55				sulf. veins	70°	As above. 5% total sulfides
311.0	323.7	12.7		.17				87%	2.56							.14	.03						Tr					md ST	md ST	3	55			AK	QTZ sulf veins	80°	As above, 4% Total sulfides. Preliminary assay indicates 0.21 Cu.
	EOH						AVG. Cu: 0.87%																														

PRELIMINARY GEOLOGIC LOG

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Note (3)
Tt - Tactite
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Qt - Quartzite
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Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D-274
Page 1 of 1 Pages
Collar Elev 2,767.30
Final Depth 172.2
Coords. N 38,481.07 E 16,559.70
Inclination VERTICAL
Logged by N.R.N
Date: Start 10-31-67 Finish 11-1-67

Depth From	Depth To	Depth Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Un. Known NS	Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem.	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0.0	5.0	5.0																																			Rock B/T
5.0	15.1	10.1		.13										.13				Sp	2%	Tr			-	-	-	-	-	-	Tr	wk	-	3%	5%	Biot-Qtz Mz			wk to alt'd biot. Mz - sp yellow lim on fracts - exotic disseminated mag altered to bom 3% dis cpy, 10% (?) v. f.gr. in grnd mass.
15.1	24.6	9.5		.18										.18				wk Mod	2%	Tr	-		-	-	-	-	-	-	Sp-wk Wk-Mod	wk Mod	0.5%	3%	5%		Flt. 196 - 214	80° (?)	Wk-Mod Alt. Increase in Residual Lim on fracts. Sel. bounding fracts. Mod fracturing
24.6	34.2	9.6		.11										.11				Mod	4%	Tr	-		-	-	-	-	-	-	Tr Sp	wk Mod	-	3%	5%		Flt zone 25.2-40.4	?	Rk stly Bluey gray - Flt Zone Material Mod-st lim staining
34.2	44.0	9.8		.11									.01	.10				Mod	4%	Tr	-		-	-	-	-	-	-	Tr	wk Mod	-	3%	4%				As Above to 40.4. Then rk becomes solid. Lim is mod bronzy -
44.0	53.5	9.5		.13										.13				Mod	Tr	4%	Sp		-	-	-	-	-	-	Tr Sp	wk	Tr	3%	3%				Wk-mod Alt., sp local sil'n. Mod. bro. Lim on fracts possibly some Cu pitch
53.5	67.0	13.5		.17										.17				wk Mod	1-2%	Tr	-		-	-	-	-	-	-	Tr	wk	-	4%	6%		Fracturing (M.A.)	65°	Mod as above - v. min alt. + min fracts
67.0	76.4	9.4		.13										.13				wk Mod	4%	Tr	-		-	-	-	-	-	-	Sp	wk	0.5%	4%	6%				Rk mod. fractd. + bkn. wk Dik Rk lim on fracts
76.4	85.3	8.9		.30										.16	.14			Sp	0.5%	4%	Tr	-	-	-	-	-	-	-	Tr	wk		3%	5%		Sells Cirro 78 - Flt. 91-98		Still some intermed sells + oxides. Sells v. f. gr. disseminated + locally on fracts, v. Tr. Cu
85.3	94.0	8.7		.65		.18								.18	.30	.17		Tr Sp	4%	1%	Tr	-	-	-	-	-	-	-	Tr	Sp wk	Tr	3%	5%			60°	Sells v. f. grained - disseminated v. low Cu content
94.0	102.6	8.6		.25	42.2	.15	42.2							.15	.40	.20		Tr Sp	1% 4%	Tr	-		-	-	-	-	-	-	Tr	Sp wk	-	3%	6%				Increase in total sells. Cu well developed on fracts + less on disseminated grains
102.6	110.9	8.3		.09	0.02	.0095	0.12							.009	.30	.020		Tr	1%	4%	Tr	-	-	-	-	-	-	-	Tr	Sp wk	Tr	3%	6%				Wk Alt. Rk general as above. Tr - Sp 2nd K-Spar on some fracts. Green clay on open fract surfaces
110.9	119.4	8.5		.09		.011								.11	.58	.20		Sp	1% 4%	Tr	-		-	-	0.03	-	-	-	Sp	Sp wk	1%	3%	6%				Still some oxidation of lim. angle fracts. Sells are strongest on fracts
119.4	127.5	8.1		1.22		.009								.09	.78	.35		Sp	3% 4%	Tr	-		-	-	Tr	-	-	-	Sp	Mod St	-	3%	6%		St. Cz. 127 - 128.3		Mod-St Alt. wk Mn - Sell well disseminated and develop. - Rk bkn + gray. Some 2nd K-Spar clay alt. ik mont.
127.5	135.5	8.0		0.35		0.008								.08	.15	.12		Sp	3% 4%	Tr	-		-	-	?	-	-	-	Sp	Tr Mod	-	3%	6%				As Above. Rk still bkn. Cu development decreasing, but still present.
135.5	144.4	8.9		0.36										.08	.16	.12		Tr	1% 2%	Tr	-		-	-	-	-	-	-	-	Sp	-	3%	4%				Sp Alt. Rk becomes unbkn + fresh. Good CPY to PY Ratio, but Cu is greatly diminished
144.4	152.5	8.1		0.55											.10	.45		Sp	1% 2%	Tr	-		-	-	0.02	-	-	-	Sp	wk Mod	4%	3%	3%				Local increase in alt along fract zone w/ assoc. increase in Mn + Cu.
152.5	161.6	9.1		0.25											.05	.20		-	2%	1%	Tr	-	-	-	Tr	-	-	-	-	Sp	-	3%	3%				Rk is quite fresh w/ only Sp Clay - Chlor development. Sell. disseminated along micro fracts. Good CPY to PY ratio - approaches 0.5
161.6	172.2	10.6		0.21											0.02	0.19		-	2%	2%	Tr	-	-	-	Tr	-	-	-	-	Sp	-	3%	3%				As Above
E.O.H.																																					

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D-275
Page 1 of 1 Pages
Collar Elev 2,780 56
Final Depth 205.7
Coords. N 38,488 15
E 16,393 14
Inclination VERTICAL
Logged by N.R.N + R.E.
Date: Start 11-1-67 Finish 11-3-67

Depth From	Depth To	Depth int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Cu (1) Pitch	Cu (1) Black	Cu (1) Blue Green	Cu (1) Var. Mon Sulf	Cu (1) Cc.	Cu (1) Cpy.	Cu (1) Born	Fe (2) Lim.	Fe (2) Py	Fe (2) Mag.	Fe (2) Hem	Fe (2) Spec.	Other (2) Galena	Other (2) Sphal.	Other (2) Molyb	Other (2) Calcite	Other (2) Garnet	Other (2) Silicates	Other (2) Sericite	Other (2) Clay	Other (2) Vn. Qtz.	Other (2) QUARTZ	Other (2) CHLORITE	Other (2) Pa. Sor	(3) Rock Type	Structures (4) Depth	Structures (4) True Dip	Remarks
0.0	7.0	7.0																																				Rock Bit
7.0	11.7	4.7		0.08						0.04				0.04				Mod St	-	-	Sp	-	-	-	-	-	-	-	Sp	Mod	Sp	?3/10%	-	Tr Sp	Mz	Sery-lim stringers	52°	Rk is mod-str altd & weathered. Lim is mod-dk brn. Mz is typical of Area. Apparently there has been mod introduction of silica into grnd mass
11.7	20.6	8.9		0.05						0.04				0.01				Mod	-	-	Wk	-	-	-	-	-	-	-	Wk	Mod	2%	1/10%	-	Tr Sp		Arg + Mik fracts 58°-85° Sp Fr Zone 22'-24.8'		Mod-Stly altd. Lim-Hem staining & wk mod Lim (incl'ed) disp fracts. - Bot grdr to Monzonite
20.6	29.4	8.8		0.07						0.01				0.06				St	-	1% Arg Tr Arg	Sp	-	-	-	-	-	-	-	Wk	Mod	?	10%	-	Tr Sp				Numerous altd. fracts.
29.4	38.6	9.2		0.09										0.09				St	-	1%	Sp	-	-	-	-	-	-	-	St	St	?	15%	-	Tr Sp				V. Stly brkn + granulated, Stly altd + Lim stained.
38.6	47.4	8.8		0.04										0.04				Mod St	-	2% Arg 2%		-	-	-	-	-	-	-	Mod	Mod	?	3/10%	-	Tr Sp				Stly Granulated + altd
47.4	55.8	8.4		0.04										0.04				Mod	-	3%		-	-	-	-	-	-	-	Tr Sp	Wk	?	3/10%	2	Tr Sp		Lim filled fracts i.e. 40°-45°	60°	Effects of flt. dyng and. The 3/10 is the qtz. Chrom steels for 3% qtz eyes and 10% assumed qtz in grnd mass.
55.8	64.4	8.6		0.04										0.04				Wk Mod	-	+ 2%	-	-	-	-	-	-	-	-	Wk Sp	Mod	3%	2/10%	3%	Tr Sp				Wk-Mod Alt. Occasional Ser bounded 60° Limonite filled fracts 1/8" wide
64.4	73.0	8.6		0.06										0.06				Mod	-	+ 2%	-	-	-	-	-	-	-	-	Sp	Wk Mod	2%	2/10%	3%	Tr Sp				Wk Mod Alt. - Decreasing Lim Staining. Bot less altd. Locally bleck.
73.0	82.0	9.0		0.11										0.09	0.02			Wk	-	2%	-	-	-	-	-	-	-	-	Sp	-	-	2/10%	3%	Tr Sp				wk-mod Alt, Mod shattering on v. small scale. Lim (epoxy) on many fracts.
82.0	90.6	8.6		0.23									0.04	0.07	0.12	0.01		Wk Mod	-	3%		-	-	-	-	-	-	-	Tr Sp	-	-	2/10%	3%	Tr Sp				Sp-wkly altd. Bot (8'%) only spty altd. Rapid decrease in Lim - mostly exotic
90.6	99.1	8.5		0.32									0.06	0.08	0.15	0.03		Wk Mod	Sp	3%		-	-	-	-	-	-	-	Sp	Wk	-	2/10%	2%		Salts Creek 74			Wkly altd. Increase in Lim. only occasional fracts w/ residual Lim.
99.1	107.2	8.1		0.57			0.28						0.20	0.08	0.21	0.08		Sp Wk	≤1%	2%		-	-	-	Tr	-	-	-	Sp	Wk	1%	2/10%	3%			Sporadically shattered 106-118.7 shattering 103-112	70°?	Wk Alt, Salts assoc w/ fracts. Lim decreasing. Green Cu Stain also on some fracts
107.2	114.7	7.5		0.62			0.36						0.30	0.06	0.17	0.09		Wk Mod	≤1%	2%		-	-	-	-	-	-	-	Tr	Mod	-	2/10%	2%					Wk Alt, Mod Qtz (tgs) in grd mass. Salt well dissem along more fracts
114.7	122.2	7.5		0.80			0.20						0.18	0.02	0.45	0.15		Tr	1%	2%		-	-	-	Tr	-	-	-	Tr	Wk Mod	-	2/10%	6%			66.-127.5 128.9'		Mod Alt. Tr-sp Concentrations of C.C. on fracts. Tr-sp dissem salts w/ Tr + C.C. coating
122.2	131.0	8.8		0.80	67.3' 0.61		0.10						0.09	0.01	0.52	0.18		Tr	≤1%	2%		-	-	Sp	-	-	-	-	Sp	Tr Wk Mod	Tr	2/10%	6%					Wk Alt. Mod Alt, Salt well dissem w/ C.C. Concentrated on fracts.
131.0	139.1	8.1		0.43			0.04	67.3' 0.06					0.04		0.29	0.10		Tr	≤1%	2%		-	-	-	-	-	-	-	Tr	Wk	-	2/10%	7%					Wk Alt., C.C. + pyrite salts decreasing
139.1	147.6	8.5		0.45			0.04						0.04		0.27	0.14			≤1%	2%		-	-	-	-	-	-	-	Tr	Wk	-	2/10%	6%					Wk Alt. - Stn C.C. on Qtz + on fracts. Total salts low. Grdmass may contain v. f grained orthoclase rather than silica
147.6	156.4	8.8		0.70			0.05						0.05		0.50	0.10		-	1%	?									Tr	md	-	6	7%					Broken, mod alt, fspars altd to green clay, mod dis sulfides
156.4	164.6	8.2		0.60			0.04						0.04		0.41	0.15			≤1					Sp					Tr	md	Tr	5	7					As above. Py & thin C.C. in steep veinlets and fracts. Gouge 158.4-158.9
164.6	173.2	8.6		0.69			0.03						0.03		0.51	0.15			≤1						Tr				Tr	sp	Tr	5	7			salt veinlets	60°	As above.
173.2	182.0	8.8		0.41			0.01						0.01		0.17	0.23			<1										Tr	Tr	<1	10	7					Rk is harder, less altered, possibly silicified, 2nd Kspar. C.C. on pyx along fract.
182.0	194.7	12.7		0.13											Tr	0.13			<1							Tr			Tr	Tr	1	10	7			Qtz veins Tr Qtz veins	10° 20°-40°	As above, 2% fresh looking bi
194.7	205.7	11.0		0.23											0.05	0.18			<1										Tr	md	2	10	7					Gouge 201.5-202.5. Thin cpx veinlets near 203.5' overall wk alt.
E.O.H.																																						

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D276
Page 1 of 1 Pages
Collar Elev. 2,872.07 Final Depth 254.9
Coords. N 38,482.71 E 15,903.45
Inclination VERTICAL
Logged by RE
Date: Start 11-4-67 Finish 11-7-67

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Cu from N.S.	Cc.	Cpy.	Born & Cov	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0	3.0	3.0																																			Fill
3.0	11.3	8.3		.01				99	2.47					.01				md	–		ST								SP	SP	8	55		Da	leached veins	40-50	st live limonite in veins. Initial sulfides ≈ 4%.
11.3	20.9	9.6		.02				85	2.28					.02				md			ST								SP	SP	5	35			"	50-70	live limonite thicker in steep veins. Hem stains all Fespars. highly broken
20.9	29.7	8.8		.03				86	2.58					.03				md			ST								SP	SP	5	40			"	40-80	Intense veining, 5-10 veins per foot. little yellow-brown limonite.
29.7	35.8	6.1		.02				98	2.36					.02				md			ST								SP	SP	10	35			"	40-70	st veining, but thinner veins with less live lim.
35.8	44.4	8.6		.02				91	2.56					.02				md			ST								Tr	SP	3	30			"	40-70	As above
44.4	53.3	8.9		.02				90	2.69					.02	.01			wk	.1		md								SP	SP	4	30		sulfides @ 45.4	"	40-70	sulfides include py w/ c.c., bor & tr. magnetite. bor staining possible
53.3	62.9	9.6		.01				96	2.45					.01				wk	Tr		md								SP	SP	4	30			"	40-70	leached veins w/ live and yellow limonites. Tr of py indicates oxidation
62.9	72.2	9.3		.02				94	2.51					.01	.01	Tr		wk	Tr		md								SP	SP	5	35			"	"	fine dis py & cpy w/ c.c. remain, veins are all leached. 10 veins per ft.
72.2	81.8	9.6		.20				90	2.55				.02	.01	.15	.02	Tr	Tr	≈2%		Tr								SP	SP	5	35			sulfide veins	"	sulfide veins wk'ly oxidized, py w c.c. in veins, dis py, cpy, bor, cc, sp mal.
81.8	91.0	9.2		.15				97	2.51				.02	.01	.11	.01		Tr	≈2%		sp								SP	SP	5	40			"	40-80	Sulfides as above, localized oxidation, overall md alteration
91.0	99.6	8.6		.05				99	2.57					.01	.03	.01		wk	.1		SP								Tr	SP	2	35			leached veins	40-70	Fewer veins, less sulfides. most veins st'ly leached.
99.6	108.9	9.3		.02				98	2.50					.01	.01			Tr	<1		md								Tr	SP	2	35					wk sulfides, wk-md leaching effects, overall md alt.
108.9	118.5	9.6		.02				92	2.50					.02				wk	<1		md								Tr	SP	2	30		Da	leached veins	20-60	veins filled with boxwork's live limonite. Thin closed spaced fractures
118.5	127.0	8.5		.15				98	2.47					.01	.11	.03		wk md	1		wk								Tr	SP	3	10		Mz			lateral veins & fracts penetrate md-st lis sulfides. Mz is md-st'ly altd. contains 1% phenos, 10% hydromica
127.0	136.5	9.5		.02				93	2.49					.02				wk	1		Tr								Tr	ST	3	20		Da & Mz			mostly Da with short intervals of Mz. st. Gouge 135.8-137.5
136.5	146.2	9.7		.23				86	2.61				.01		.19	.03		wk	<2		Tr								Tr	ST	3	20		Da & Mz			Gouge 141.6-142.0 mostly Mz with Dacite beginning at int. st sulfides in Mz
146.2	154.2	8.0		.37				93	2.56				.01		.32	.04		–	<2		–								Tr	ST	1	30		Da			highly broken & gouge with st. sulfides
154.2	163.5	8.5		.43		.01		98	2.57				.01+		.37	.05		–	<2		–								Tr	SP	2	30			sulfide veins	30°-80°	≈2 sulfides in steep veinlets. md on fracts.
163.5	172.1	8.0		.28				88	2.55				.01		.22	.05		–	<2		–								Tr	SP	2	30					3% Total sulfides, wk-md alt. Turquoise (?) on fractures
172.1	180.2	8.1		.37				94	2.56				.03		.29	.05		wk	2		–								Tr	SP	2	30					As above with lim halos around sulfides
180.2	189.1	8.5		.32				95	2.57				.01		.26	.05		wk	2		–			Tr					Tr	SP	2	30					Invasive mineralization grades out from cpx → c.c. → mal. st c.c. adjacent to mal.
189.1	198.2	8.2		.33				95	2.55				.02		.23	.08		Tr	2		–			Tr					Tr	SP	2	30	SP				As above, sp. 2nd bi, sulfides undergoing oxidation
198.2	206.8	8.0		.44	3.4% @ 0.5%	.01	3.4% @ 0.0%	88	2.58				.01+		.33	.10		wk	<2		–			SP					Tr	SP	1	30	SP				decreasing sulfides, md-st green Cu, rust colored lim on fracts.
206.8	215.8	8.3		.59		.04		91	2.60				.04		.43	.12		wk	<2					Tr					Tr	md	1	30	SP				As above. Gouge 205.8-207.8
215.8	224.0	8.2		.69		.03		94	2.60				.03		.51	.15		wk	1					Tr					Tr	md	1	30	SP				As above. Gouge 216.7-218.2. rust colored lim throughout
224.0	232.6	8.3		.62		.08		91	2.58				.08		.39	.15		md	1					Tr					Tr	ST md	1	30	SP				Broken and gouge. c.c. coatings on py, cpy, and lim
232.6	241.7	8.4		.20				86	2.58				.01		.14	.05		wk	1										Tr	md	1	30	SP				Good c.c. but ≈2% Total sulfides
241.7	254.9	13.2		.05				95	2.58						.02	.03		–	1					Tr					Tr	ST md	<1	30	SP	Da			Broken and gouge., pauce c.c. coatings.
E.O.H.						AVG. RECV.		94%																													

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Note (3)
Tt - Tactite
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Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D-277
Page 1 of 1 Pages
Collar Elev. 2,814 43
Final Depth 3179
Coords. N 38,029 16 E 15,045 20
Inclination VERTICAL
Logged by N.R.N.
Date: Start 11-7-67 Finish 11-13-67

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Wk. Non Sup.	Cc-Cpx	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0.0	5.7	5.7																																			DUMP MATERIAL
5.7	14.1	8.4		0.04				93	2.55						0.04			Sp	-	-	Mod	-	-	-	-	-	-	-	wk	wk Mod	6%	48%	-	An	FRT-Brecc Pieces 13.0'	50°	Mod Brkn, Mod-sly altd, sp-pity silic - Hem as stain on fdts. Tr LLM, Tr jar
14.1	24.3	10.2		0.02				83	2.55						0.02			Sp	-	-	Mod St	-	-	-	-	-	-	-	Sp wk	wk Mod	Tr	40%	1%		Auto Frags 5" Sericite	50±60°	Mod Alt - sly controlled by fracts. Sec. develop along fracts, P fdts slightly soft, K fdts slightly bleached
24.3	33.5	9.2		0.04				89	2.50						0.04			Sp wk	-	-	Mod	-	-	-	-	-	-	-	Sp wk	wk Mod	?	6%	4%	Tr	Fer Zone 29'-0.35'	High Rutile	Hem. Staining of fdts mod. sp jar on low angle fracts. ST ALT. Hem STAIN & GHOST. RK SEC-pervasively skeletonized & locally gaggy. INCREASE in JAR
33.5	42.8	9.3		0.04				89	2.60						0.04			wk	-	-	Mod St	-	-	-	-	-	-	-	Mod	wk	5%	45%	Tr	Bx 38.7-40.9 Bx 42.2-42.8	80° 70°	Sly bleached, ST ALT Assoc w/ fdts + fracts. Most residual Lim is JAR. Hem is exotic
42.8	54.8	12.0		0.04				77	2.40						0.02			Sp	-	-	Sp	-	-	-	-	-	-	-	Inter	St	-	?	-	V.St. Fer ZONE	Inter Sup Sp 42.8-48.6		V. St. Fer. ZONE. Inter Sec. gg. develop.
54.8	69.8	15.0		0.03				53	2.46						0.03			Sp	-	-	Mod	-	-	-	-	-	-	-	Tr-Hem	St	-	?	-		Remnant Vn	86°	As Above
69.8	79.5	9.7		0.04				87	2.46						0.04			Sp	-	-	Mod	-	-	-	-	-	-	-	Mod	Sp wk	?	10%		Bx 74.5-78.9	Bx 75-74.5 Bx 78-78.9	25° 60°	St. Alt. Mod-St Moderate skeletonized - Mod exotic Hem, Sp residual Lim
79.5	89.0	9.5		0.02				82	2.43						0.02			Sp	-	-	wk	-	-	-	-	-	-	-	wk	Sp wk	Tr	10%					wk Alt except along few fracts. Rk quite brkn to 86'
89.0	97.4	8.4		0.02				99	2.47						0.02			Sp	-	-	wk	-	-	-	-	-	-	-	Sp	Sp wk	-	35%	1%				Sp-wk Alt. wk exotic Hem, Tr sp residual Sulf. There is no percept alt in 70.8-74
97.4	107.2	9.8		0.02				82	2.51						0.02			Sp	-	-	wk	-	-	-	-	-	-	-	wk	wk	?	30%	Tr		62 99.4-102.8		Oxidation is decreasing rapidly in main part of ck - Lim-Hem mainly on fracs
107.2	118.2	11.0		0.05				69	2.46						0.04	0.10	0.01	Tr-Sp	2%	Sp wk	-	-	-	-	-	-	-	-	wk	wk	37%	35%		Sec Dacite Dike Rock Lk	62.-Stow Zone 72-118'		Rk still mod-sly bkn & locally gaggy. Main sulf is Py, but usually coated w/ CC.
118.2	130.9	12.7		0.08				61	2.47						0.02	0.20	0.06	-	1%	-	-	-	-	-	-	-	-	-	wk	wk	?	35%			0.2. 136-138	65°-75°	Rk is sly altered: Hem other gage or shear-zone minerals tr. -
130.9	139.3	8.4		0.28				95	2.55						0.01	0.27	0.05	-	5%	-	-	-	-	-	0.02	-	-	-	St	wk	?	45%					Mostly Mod. Some St. CC in the gouge zone. Cpy quite sp as is CC.
139.3	147.1	7.8		0.61		0.01		95	2.52						0.01	0.50	0.10	-	5%	-	-	-	-	-	0.02	-	-	-	Mod St	Mod	?	50%			138 G.2. 140.7-147		St. G.G. CC is thick on the sp. Cpy grains
147.1	156.5	9.4		0.28				84	2.58							0.18	0.10	-	2%	-	-	-	-	-	Tr	-	-	-	Mod	wk mod	8%	47%					Rk is mod-sly bleached. The sulfs are somewhat disseminated, but mainly fract controlled. Fair CC.
156.5	165.5	9.0		0.22				90	2.63							0.11	0.11	-	5%	-	-	-	-	-	0.03	-	-	-	V. St	Mod	10%	50%			6" Sec-Py CPY VN	60°	Sec. Sec + Py Vns. - Hem Core of Py w/ sec + Cpy out.
165.5	175.5	10.0		0.33				87	2.59							0.17	0.16	-	2%	-	-	-	-	-	?	-	-	-	V. St	Mod	?	50%					V. St. Qtz-Sec. Alt w/ disseminated py + CPY Throughout - Rk quite Brkn
175.5	184.7	9.2		0.28				91	2.57							0.14	0.18	-	3-4%	-	-	-	-	-	?	-	-	-	Mod St	Mod	42%	50%					Decrease in alt. + Total sulfs. Apparent increase in CPY to Py ratio.
184.7	195.1	10.4		0.20				85	2.58							0.12	0.08	-	3%	-	-	-	-	-	0.10	-	-	-	V. St	wk Mod	20%	55%			St Qtz-Sec Mod-Strong	40°-60°	St varies w/ Tight Py zones. only tr cents of CPY + CC. Rk quite brkn
195.1	203.8	8.7		0.21				93	2.58							0.10	0.11	-	3%	-	-	-	-	-	?	-	-	-	St	wk	15%	58%			Fer @ 195.3 Varies 6" Fer 198.2-20 - 211	10 10-65°	St Alto & Hem zones. Most Py sec assoc w/ thin Qtz vns. CPY is generally disseminated in the St zones outside of Py. Yellow alt. of P. fdts
203.8	213.7	9.9		0.18				80	2.64							0.08	0.10	-	3%	-	-	-	-	-	0.10	-	-	-	Wk	Mod	7%	40%					Mod Alt. K fdts pink P fdts mod-sly altd to yellow-green clay. Sulf l.g.c. + wk disseminated
213.7	224.8	11.1		0.14				69	2.63							0.06	2.08	-	4%	-	-	-	-	-	0.06	-	-	-	V. St	Mod	5%	50%			St. Fer. 66. 218-224.7 Bx 66.2-224.8 Bx 224.8-227.4 229.4-244.2	65°	V. St. Alt. Assoc w/ Fer-Show Sulf. disseminated in gg. Most sulfs are Py, tr sp CPY + Bnt. Tr C.O. (?)
224.8	236.0	11.2		0.10				74	2.45							0.02	0.08	-	5%	-	-	-	-	-	0.03	-	-	-	V. St	Mod	10%	58%					Sly Alto + STEARED. Mod sulfs in veinlets, vns disseminated. Mainly Py.
236.0	247.1	11.1		0.19				78	2.58							0.02	0.17	-	7%	-	-	-	-	-	?	-	-	-	V. St	Mod	-	40%					V. St Fer. gg. w/ Py dissem. Below Fer is solid Rk w/ sulf on mica fracts w/ little alt
247.1	256.0	8.9		0.15				99	2.58							0.01	0.14	-	4%	-	-	-	-	-	0.02	-	-	-	Mod St	wk Mod	10%	48%			Hem 250.8 Sec Sul. Veins	50°-60°	Rk is refilt. + hard. Num. Sulf. sec. veinlets. - Py in center w/ CPY + Py dissem in sec. zone
256.0	264.7	8.7		0.24				94	2.58							0.02	0.22	-	3%	-	-	-	-	-	0.02	-	-	-	Mod	wk	3%	45%					Rk somewhat brkn, but not gaggy. Apparently slight increase in CPY.
264.7	272.5	7.8		0.42	0.51	0.01		94	2.85					0.01		0.04	0.37	-	3%	-	-	-	-	-	?	-	-	-	wk Mod	wk	2%	48%			Fer zone 271.7 Zone	75° 65-75°	Much as Above. CPY is younger Than Py
272.5	281.2	8.7		0.60		0.01		94	2.61					0.01		0.08	0.51	-	7%	-	-	-	-	-	0.06	-	-	-	Mod St	Sp wk	7%	50%			Fer-Sulf Vns	70°	Vns are Approx 6" Apart. Intermediate ck wkly Alto + have minor sulfs on mica fracts + final Carbonate
281.2	290.1	8.9		0.23				97	2.57							0.01	0.22	-	3%	-	-	-	-	-	?	-	-	-	Sp	Sp	4%	40%					Wk Alt. Rk is quite solid w/ only minor fracts Alt. Hem is disseminated, but mainly Py
290.1	298.4	8.3		0.22				93	2.62							0.01	0.21	-	3%	-	-	-	-	-	?	-	-	-	Sp	Sp	1%	40%		Aplite 295.3 - 296.2			As Above. Here and above the CPY is coated w/ a dark green (aquatite) to indicate Blue Min. Seems to be something distinct from CC, Bar., etc.
298.4	312.0	13.6		0.40		0.02		90	2.82					0.02	Tr	0.38		-	4%	-	-	-	-	-	0.06	-	-	-	Mod	Sp	5%	50%					Rk quite brkn + mod-sly Mineralized. High CPY content assoc w/ thick vuggy white qtz vns
312.0	317.9	5.9		0.40		0.01		92	2.58									-	2%	-	-	-	-	-	Tr	-	-	-	Tr Sp	Sp	Tr	40%					Rk somewhat fresh. Less varied & stronger. Good CPY to Py Ratio.
E.O.H.					AVG. REC.			84%																													

PRELIMINARY GEOLOGIC LOG
(Subject to Revised Logging)
ASARCO- SILVER BELL UNIT

Note (3): Tt - Tactite, Hf - Hornfels, Mb - Marble, Qt - Quartzite, Bx - Breccia, Da - Dacite, Mz - Monzonite, An - Andesite

Note (4): V - Vein, F - Fault, D - Dike, C - Contact, Ig - Undif igneous

Hole No. D 278
Page 1 of 1 Pages
Collar Elev 2,810.06 Final Depth 383.0'
Coords. N 38,364.91 E 15,788.63
Inclination VERTICAL
Logged by RE
Date: Start 11-7-67 Finish 11-17-67

Depth From	Depth To	Int'vl	Elev.	% Cu Total	Avg.	NS	Avg	% Core Recov	Sp. Gr.	Chrys.	Pitch	Black	Blue Green	Unknown NS	Cc.	Cpy.	Born	Lim.	Py	Mag.	Hem	Spec.	Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0	9.0	9.0																																			NS For Collar
9.0	17.0	8.0		.04				56	2.47					.04				md	-		ST								md	SP md	1-2	25	SP	Da	leached veins	40-80	Hem stained fspars and groundmass. leached qtz-ser.-sulf veins 1-2 per ft.
17.0	26.8	9.8		.04				91	2.49					.04				md	Tr		md								md	SP	1-2	25	Tr		"	40-70	As above, with less hem staining. Tr of py partially altd to lim.
26.8	35.7	8.9		.02				93	2.48					.02				wk	-		wk								SP md	SP	1	25	Tr				Fewer veins, less hem & lim. md alt.
35.7	45.2	9.5		.02				99	2.45					.02				wk	Tr		wk								ST	SP	1	25	-				Abundant fine sericite between close spaced, thin, leached veins.
45.2	55.0	9.8		.02				93	2.40					.02				wk	-		wk								md ST	SP	1	25	-		leached veins	50°-80	As above
55.0	64.6	9.6		.03				92	2.50					.03				wk	-		wk md								md	SP	<1	25	SP				less intense veining. Becomes more hem stained and chloritic past 63.0
64.6	73.9	9.3		.03				91	2.45					.03				wk	-		wk								md	SP	2	25	SP				Thin leached veins, md alt. 5-10% chlor & hydromica
73.9	84.3	10.4		.55		.09		96	2.46				.09		.36	.10		wk	-		wk								md	md	2	25	SP	sulfides @ 84.3			Da as above, xenolith of sediment from 83.3-83.5 1 fine dis sulf in sed. Sediment is light-dark green, soft, clayey, primary mineralization
84.3	93.0	8.7		.21				99	2.54				.05		.11	.05		wk	1%		Tr								md	SP	2	25	Tr				wk sulfides undergoing oxidation
93.0	100.9	7.9		.64		.04		93	2.54				.04		.40	.10		wk	1-2?		-								md	ST	2?	25	Tr				Broken and mdly gougey. Thick cc on py & cpy. mal on fracts.
100.9	109.4	8.5		.19				90	2.54				.04		.14	.01		Tr	1?		-								md	V ST	<1	20?	-				st gouge from 104.0-109.4
109.4	117.4	8.0		.31				93	2.54				.04		.22	.05		-	1		-				Tr				SP	ST	<1	25	-		sulfide veinlets	50°-80	mdly broken and gougey to 114.0. widely spaced sulfide veinlets
117.4	125.4	8.0		.48		.03		81	3.00				.03		.35	.10		-	2		-								SP	md ST	3	25					mdly broken and gougey. App. 4 sulfide veinlets per ft. (4-6 per ft)
125.4	133.9	8.5		.64		.02		98	2.56				.03		.51	.10		-	2		-				Tr				SP	SP	3-4	25			sulf veinlets	40-80	sulfides mostly in thin steep veinlets & few disseminations
133.9	142.6	8.7		.51		.03		95	2.55				.03		.41	.07		wk	1		-								SP	SP	2	25					Highly fractured, low total sulfide (<2%), Fe SO4 on fracts.
142.6	151.4	8.8		.49		.02		90	2.59				.02		.39	.08		Tr	1		-				Tr				SP	SP	2	25					s.c. coatings thinning. blue-green Cu on fracts.
151.4	160.4	9.0		.41		.02		94	2.51				.02		.29	.10		Tr	1						Tr				SP	SP md	2	25					wk sulfides, wk alt, md-st fracturing
160.4	166.8	6.4		.41		.04		69	3.60				.04		.29	.08		wk	1						Tr				SP	SP	2	25					wk lim. sulfs undergoing oxidation. mal on fractures.
166.8	174.8	8.0		.86		.06		97	2.59				.06		.70	.10		Sp-wk	0.3	-	-	-	-	-	? 0.03	-	-	-	Sp	?	2%	25	Tr				Mod Alt. - Rk bleached w/ wk tex. St orange lim on fracts assoc w/ Mal. Fe & MoS2 on fracts.
174.8	184.0	9.2		.58		.07		93	2.62				.07		.43	.08		wk Sp	0.2	-	-	-	-	-	Tr	-	-	-	wk	?	-	25	Sp				Mod Alt., Still c.c. on the core. Cpy + Py
184.0	193.0	9.0		.30				42	2.61				.02		.20	.08		wk Sp	0.4	-	-	-	-	-	0.01	-	-	-	wk Sp	?	5%	30%	3%		Rk st-qtz-py vns ½"	60°	Mod Alt. Slight increase in sulf. content. Py on fracts assoc w/ dark grn chlor-serp like min. Qtz vn have thin seam of MoS2 on out sides & Py seam down center.
193.0	201.3	8.3		.09				95	2.62						.01	.08		wk Sp	1%	-	-	-	-	-	Tr	-	-	-	wk Sp	?	1%	25%	2%				wk-mod Alt. Sulfs locally unleached. c.c. not present.
201.3	210.0	8.7		.13				87	2.65						.04	.09		wk	1%	-	-	-	-	-	Tr	-	-	-	Mod	?	1%	25%	2%				Mod-St Alt.. Below that grnd mass has high ser content.. Tr-Sp total sulfs
210.0	229.0	19.0		.09				41	2.60						.01	.08		wk	0.3%	-	-	-	-	-	Tr	-	-	-	Mod	?	?	25%	Sp	V.V. thin bedded ... Cavity 234? Pinal Schist ?? to 234.1 Syeno Dacite? 234.1	V. ST. Flt or Contact Zone; Rk Quite Brkn & gougy		Core 215' A cavity was entered - Below the cavity is a highly altd lt-gra rk which could be a brkn v.v. thin bedded slt-st-shale.
229.0	238.1	9.1		0.18				85	2.65					0.01	0.01	0.16		wk	2%	-	-	-	-	-	-	-	-	-	wk Sp	Sp wk	-	?	wk Mod				The Pcal (?) is v. thin bedded & show small scale contortioning. Mod Chlor after v.f. biot. Mt w/ Py along seams. The Syeno Dacite (?) is f. grained w/ Feld Phenos 1/4 x 3 mm. set in v.f.gr. matrix which is dk green from chlorite. It contains approx 3% Py on fracts & sp Cpy.
238.1	249.8	11.7		0.27				72	2.52					0.02	0.10	0.15		wk Mod	1-2%	-	-	-	-	-	-	-	-	-	wk	Sp	-	?	Mod St	Flt Material			As Above. Rk becomes v. st'ly brkn. Area 235.7' Has the appearance of a sediment.
249.8	276.7	26.9		0.24				29	2.67					0.01	0.05	0.06	0.12	Sp	1-2%	-	-	-	-	-	Sp wk	-	-	-	wk	Sp	Tr	?	Mod	Sed. Circa 256			Rk extremely brkn. Interbedded altd sediments - Some Cpy veining - Possibly altd diop-chlor Hf
276.7	279.2	2.3		0.12				60	3.13							0.07	0.05	Tr	2%	-	-	-	-	-	0.02	Mod ST	ST	50%	-	Mod	-	Tr	-				Soft white-grey-green Mottled. Sulfs mainly Py and on fracts. Rk quite brkn.
269.0	279.0	10.0		0.25				86	2.18							0.73	0.02	Tr	1%	-	-	-	-	-	0.04	Mod Sp	60%	-	wk ?	Tr	Tr	Sp					Rk was fine grained. Appears to be altering to clays & chlor after calc. silicates.
279.0	288.4	9.4		0.05				74	2.91							0.05		-	1-2%	-	Tr	-	-	-	-	wk? Tr	?%	-	Mod	2%	2%	Sp					Rk is light grey-cream. Somewhat soft. V. fine grained & chlor-serp bound fracts
288.4	298.1	9.7		0.34				82	2.51							0.34		-	3%	-	Tr	-	-	-	-	wk	15%	40%	-	wk	4%	5%	Mod	Gar-Diop Tt circa 292 - 304.4 Calc grey silicates Hf 304.4 - Mz 310.6			Hf as above becomes highly chloritic. Gar-Diop Tt is coarser grained, more porous & Mod. min. w/ Py & Cpy
298.1	308.5	10.4		0.14				80	2.95							0.14		-	<1%	-	-	-	-	-	-	Sp	Mod?	4%	-	wk Mod	-	-	Sp				Tt becomes f. grained & Sulf content drops. Gradational contact w/ lt gray v.f. grained soft. wkly reactive Hf.
308.5	318.5	10.0		0.25				76	2.90							0.25		-	2%	-	-	-	-	Sp	-	Sp	Tr	50%	-	wk Mod	1%	1%	wk	313.7			Hf generally as above. chlor-serp assoc w/ mny fracts. Mz has v. poor tex. Contacts are brkn.
318.5	330.1	11.6		0.08				99	2.68							0.08		-	1%	-	-	-	-	-	Tr	Tr	-	95%	-	-	-	?	-	V.f.gr. lt. colored silicates; Mz. 337.0			V.f. grained lt. Tan-Green Diop (?) Hf. - Sp. Py on fracts. No Cpy.
330.1	337.0	6.9		0.24				88	2.63							0.24		-	1-2%	-	-	-	-	-	-	Tr	-	Tr	-	Tr	Tr	4%	3%				Alt Sp-wk. Tex vague. Sulfs well dissem.
337.0	347.7	10.7		0.25				85	2.62							0.25		-	2%	-	-	-	-	-	-	Tr	-	Tr	-	Tr	Tr	4%	3%				As Above
347.7	351.4	3.7		0.38				47	2.95							0.38		-	2%	-	-	-	-	-	-	Mod ST	10%	70%	-	Tr	Sp	1%	4%	Actn. Hf 347.7-351.4 Mz. 351.4	Hf. Cont 65° ?? Cont	65° 90°	Hf is Bounded by garnet near contact w/ Mz. Hf is f.gr. & med soft. Actin. xls large along qtz-sulf. vns.
351.4	364.3	12.9		0.53				88	2.62							0.53		-	2%	-	-	-	-	-	0.01	Tr	-	Tr	-	Tr	Tr	4%	2%				Sp'ly altd. Locally xnggy. Sulfs well dissem. Cpy to Py ratio ≈ 1.
364.3	373.5	9.2		0.11				69	2.60							0.11		-	2%	-	-	-	-	-	0.02	Tr	-	Tr	-	Tr	1%	20%	1%	Dp 367			Rk is locally silicified. Sulf well dissem, but also fract controlled. Textureless zone 367-373' looks like Dp., but may be silicified Dp.
373.5	383.0	9.5		0.03				76	2.55							0.03		-	2%	-	-	-	-	-	0.01	Tr	-	-	Tr	Tr	1%	20%	Tr				Dense Dp w/ fine grained tex.
					AVG. RECV.			83%																													

Drilled off cement (margin note at 276.7)

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D 279
Page 1 of 1 Pages
Collar Elev. 2,799 ±2
Final Depth 381.8
Coords. N 38,185 ±2 E 15,136 ±5
Inclination VERTICAL
Logged by RE
Date: Start 11/5/67 Finish 11-22-67

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Unknown NS	Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0	6.0	6.0																																			Rock bit
6.0	14.8	8.8		.02				90	2.55					.02				md			md							Tr	sp	<1	45	Tr	AK	Lim. filled veins	70°	wk'y altd with few leached veins, hem stained fspars
14.8	23.7	8.9		.03				89	2.56				.01	.02				md			md							Tr	sp	<1	45	Tr				Vertical fracturing, Cu staining, otherwise as above
23.7	33.0	9.3		.05				90	2.53					.05				md	Tr		md							Tr	sp	<1	45	Tr				wk'y altd, md leaching effects
33.0	42.4	9.4		.10				91	2.52				.02	.08				md			md							-	sp	-	45	Tr				As above
42.4	52.2	9.8		.09				92	2.50				.03	.06				md			md							-	sp	-	45	Tr		Joints	60°-90°	As above, sp Cu staining, hem stained fspars
52.2	61.2	9.0		.03				89	2.48					.03				md			md							Tr	sp	3	45	Tr				Increase in alt., QTZ veins begin @ 60.0' w/ large sulfide cavities
61.2	70.6	9.4		.03				94	2.50					.02	.01			wk	sp		md st							sp	st	5	50	Tr	sulfides	QTZ-sulf veins	80°	leached QTZ veins w/remnant AK. Silicification has preserved some py w. c.c. coatings, hem stronger than above. Gouge: 65.5-70.6
70.6	82.0	11.4		.17				80	2.58					.02	.13	.02		md	sp		md							sp	st	1	50	Tr				Gouge to 75.0, followed by 5' dis sulfides in silicified AK @ 77.0 a sharp contact between c.stly altd AK and wk'y altd AK. No mineral sulfides
82.0	90.0	8.0		.05				92	2.62					.01	.04			wk	sh		md st							sp	md	5-10	55	Tr		leached veins	70°-90°	Original sulfides app. alt. Veins have been leached while dis sulfides in silicified AK remain
90.0	100.5	10.5		.02				81	2.53					.02				wk	Tr		st							sp	sp md	2	45	Tr		"	55°-70°	less silicification, fewer sulfides, st hem staining of fspars. Gouge: 100.0-103.0
100.5	113.5	13.0		.05				97	2.41					.02	.03			wk	sp		md							sp	md	3	45	Tr	AK			As above, leached veins w/minor remnant sulfides
113.5	117.9	4.4		1.07		.89(?)		98	2.45				1.07					Tr	-		-							-	-	-	?	md	An 113.5			Dark Aphanitic An with app 2% mal.
117.9	126.0	7.1		.04				86	2.56					.02	.02			Tr	Tr		wk md							sp md	sp	3	45	Tr	An 117.9 AK	leached veins	70°	md alt, decreasing hem. Base of st oxidation @ 125.0'
125.0	136.1	11.1		.07				89	2.56					.02	0.5			Tr	2		-							sp	sp	3	45					Sed c.c. on px, weak-md oxidation, wk alt.
136.1	144.6	8.5		.37				95	2.55					.02	.28	.07		sp	2		-							sp	sp	2	50	Tr				Lim to 138.6. From 138.6-144.6 texture has been lost, 3.3% total sulf.
144.6	153.7	9.1		.11				99	2.54					.02	.06	.03		Tr	1-2		-							sp	sp	<1	45	sp				wk to md alt, dis mineralization
153.7	163.3	9.6		.12				92	2.72					.02	.11	.04		Tr	1-2		-							Tr	sp	-	45	md				As above, Tr of Torbernite
163.3	172.3	9.0		.36				91	2.60					.02	.24	.10		Tr	1-2		-							Tr	Tr	-	45	md				wk'ly altd AK w/minor dis sulfides, fruit colored lim on fracts
172.3	182.4	10.1		.23				89	2.60						.15	.08		Tr	1-2									Tr	Tr	<1	45	md		QTZ-py vein	60°	As above
182.4	192.0	9.4		.07				83	2.51						.04	.03		wk md	1-2									Tr	Tr	-	45	md				MnO stain on all joints & fractures wk-md dis py & c.c.
192.0	201.4	9.4		.06				85	2.52						.04	.02		wk	1-2									Tr	Tr	-	45	md				st MnO on fractures wk alt, minor sulfides
201.4	210.5	9.1		.05				87	2.57						.04	.01		wk md	1-2									Tr	md st	-	45	md	AK			Feldspars altd to clay, AK is soft & crumbly. AK contains abundant green alt minerals near contact (actin, serp, etc?)
210.5	218.8	8.3		.07				98	2.59						.05	.02		Tr	<1		Tr						20	10	60	-	-	-	-	sp	Hf 216.8 Diopside		Hf is dk green w/ diopside, calcite veinlets, hem stn. neg, little mineralization
218.8	227.3	8.5		.15				89	2.63							15		Tr	<1	-	Tr	-	-	-	Tr	15	20	45	-	-	-	-	?	Hf 227.3			Fine dis cpx, As above st'ly reactive
227.3	236.3	9.0		.07				99	2.66					.07				Tr	-	-	-	-	-	-	-	-	5	-	?	-	-	-	10	An 230.2			light to md green An w/ 10% altd phenocrysts, calcite veins
236.3	245.7	9.4		.05				93	2.74							.05		-	<1	-	Tr	-	-	-	Tr	15	20	50	-	-	3			Hf 241.2		Hf from 239.0-241.3 with cpx in stringers. An @ 241.2 contact ≈ 70°-90°
245.7	250.1	4.4		.02				94	2.72					.02				-	-	-	-	-	-	-	-	-	3	-	-	-	-	-	10	Hf 245.7 An 250.1 Diop			An similar to An above, Hf from 244.0-245.0
250.1	259.4	9.3		.14				90	2.71							.14		-	sp	-	Tr	-	-	-	-	15	30	40	-	-	-	-		Hf			Gar.-Diop Hf with steep irregular calcite veins, sp. mineralization
259.4	271.9	12.5		.33				98	2.86							.33		-	sp	-	Tr	-	-	-	Tr	15	25	40	-	-	2	2	-	Hf	QTZ-CPY vein	30°	cpx in QTZ veins, short intervals of +10% garnet, open calcite veins. S.G. 2.86
271.9	283.5	11.6		.09				84	3.37							.09		-	sp	Tr	-	-	-	-	Tr	15	40	30	-	-	<1	-		Tr			light gra-tan, higher garnet content, spec. gravity: 3.37
283.5	292.9	9.4		.10				92	2.99							.10		-	sp	Tr	-	-	-	-	Tr	5	40	40	-	-	<1	-		Hf			Garnet plus very f.g., light tan calc silicate(?) Hz 4. S.G. (RX) = 2.99
292.9	301.8	8.9		.12				88	3.08							.12		-	sp	sp	-	-	-	-	-	5	45	35	-	-	<1	-		Hf or Tr	Bedding(?)	50°	S.G. 3.08. As above. Banding of garnets and diop(?) may represent bedding
301.8	311.3	9.5		.19				79	3.84							.19		-	sp	sp	-	-	-	-	Tr	10	45	30	-	-	<1	-		Hf or Tr			S.G. 3.84. cpx restricted to thin steep cpx veinlets cut by p.m. calcite veinlets
311.3	320.8	9.5		.15				83	3.38							.15		-	Tr	-	Tr	-	-	Tr	Tr	5	45	45	-	-	<1	-		Hf or Tr	Bedding?	60°	S.G. 3.38 Brown garnet and light-dark green diopside with cpx in thin QTZ veins
320.8	329.7	8.9		.09				94	2.96							.09			Tr	-	-		-	-	Tr	5	45	45	-	-	-	-		Hf or Tr			S.G. 2.96 As above fine dis. molyb. sp. cpx
329.7	342.5	12.8		.51	.05	.01	0.01	65	3.09					.01		.50			Tr	-	-	-	-	2	Tr	10	30	50	-	-	<1	-		Hf	CPY vein	55°	S.G. 3.09 light tan, f.g. incrossed cpx veining, sphal ass. w/ wispy calcite veins
342.5	350.9	8.4		1.40		.02		92	3.22					.02		1.38			Tr	Tr	-	-	-	1	Tr	10	30	50	-	-	<1	-		Hf	calcite sulf veins	70-85	S.G. 3.22 sphal dis along steep stringers. cpx in irregular veins and dis between veins.
350.9	360.1	9.2		.15				93	2.80							.15			-	-	Tr	-	-	-	Tr	5	15	30	50	-	-	-	-				cpx, molyb, sphal along wide spaced calcite veins. Bedding(?) 60°
360.1	369.5	9.4		.04				98	2.76							.04			Tr	-	-	-	-	-	Tr	15	30	50	-	-	-	-			Bedding	60°	mineralized calcite veinlets, patchy light-dark green banding (bedding?) wk mineralization. Garnet st from 362.0'-362.0'
369.5	378.5	9.0		.20				94	2.74							.20			sp	-	-	-	-	-	Tr	15	25	50	-	-	<1	-			veins	50°	Brecciation and QTZ-calcite-px-cpx veining from 375.6-376.5. Bedding(?) 60°
378.5	381.8	3.3		.06				96	2.82							.06			Tr	-	-	-	-	-	-	10	30	50	-	-	-	-			Bedding	55°	Dense and very weakly mineralized

(Subject to Revised Logging)

ASARCO- SILVER BELL UNIT

Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

 D-280

Collar Elev 2,871.19 Final Depth 415.8
Coords. N 38,538.46 E 15,750.47
Inclination Vertical
Logged by N.R.N.
Date: Start 11-18-67 Finish 11-27-67

Depth From	Depth To	Int'vl	Elev.	% Cu Total	Avg.	NS	Avg	% Core Recov	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Wad Mn Sulf.	Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0.0	10.0	10.0																																			Alluvium
10.0	18.6	8.6		0.02				90	2.45		0.02							sp wk	-	-	Mid	-	-	-	-	-	-	-	ST	sp wk	20%	40%	-	Dp (?) Aplite (?)	Alt + Leached Fracts	50°	Stly Alt'd & Qtz-Ser veined (silicified) Num. Hem-Lim Box work lined fracts surrounded w/ qtz ser. Wk L.L.M. Spacing of fracts ≈ 3". Rk stly brkn 16'-19'
18.6	27.0	8.4		0.02				85	2.53		0.02							sp wk	-	-	wk Mid	-	-	-	-	-	-	-	ST	sp wk	20%	40%		"		+ and - 30°-70°	St-Intensely Cross veined - St Alt. Tex. Aplitic - Fracturing Oppose. All have remanent box work
27.0	34.6	7.6		0.03				84	2.41		0.03							Sp	-	-	wk	-	-	-	-	-	-	-	Md St	wk	15%	20%					Much as above. Not as much box works
34.6	43.5	8.9		0.05				90	2.41		0.05							Tr Sp	-	-	wk	-	-	-	-	-	-	-	ST	St Inten	1%	5%		Syeno Dior. W/ interbanded (?) Dp(?)	5" Fxt Over 38.7	?	Inten Alt / F. to med grained Feld.-Biot Porphyry. Felds lath like. Biot. Alt to Hydromica Orig % 15% or more. Dp is complexly intermixed. St Frct. Over 38.7
43.5	52.9	9.4		0.05				84	2.42		0.03		0.02					Tr	-	Tr	sp wk	-	-	-	-	-	-	-	St- Inten	St Inten	-	5%		Dp to 45' Sp to 48 Dp to 50.6 Sp ?			Inten Alt. of Both Rk Types Sp L.M. less vein'g. Dp Alts to qtz-ser. Sp to clays. Rk is stly brkn in intervals 46.4-48' & 51.4-52.4, wk CuO
52.9	62.9	10.0		0.06				84	2.20		0.02		0.04					Sp	-	1%		-	-	-	-	-	-	-	?	St Inten	1%	2%					Sp(?) Intensly Alt'd. 1% dissem Pyr. Mag Altering to Hem. wk-mod Fract, but no qtz-ser vein'g
62.9	67.2	6.3		0.89	15.3' @ 0.61	0.08	15.3' @ 0.08	83	2.31				0.06	0.02	0.61	0.20		sp wk	2%	1%		-	-	-	-	-	-	-	Sp	St Inten	1%	2%			Sulfs @ 62.9' / 1% @ 68' / Fxt 68-76'	70°	St-Inten Alt. to clay minerals. Sulf Cont. Sharp, but Oxidation sporatic below. St. C.C. on Py+CPy along unaltd fracts. Fracts. numerous. wk green CuO assoc. Rk brkn 65'-69
69.2	78.2	9.0		0.42		0.07		95	2.42				0.05	0.02	0.20	0.15		wk	2%	1%		-	-	-	-	-	-	-	Mod	St	3%	20%	?			?	Rk is stly slicked 66.2'-71.5'. + Appears to have Aplite. Oxidation stops below Flt @ 76'. Wk CuO Assoc w/ accom Py+CPy. Rk had orig biot. content of 20% now alt'd to lt. brn talc-like mica.
78.2	84.5	11.3		0.23				65	2.36		0.03		0.03	0.03	0.10	0.04		wk	0.2%	1%		-	-	-	-	-	-	-	?	ST	Tr	Tr	?				Stly alt'd, sulfs leached. Mag-Hem stands out. Rk stly brkn 85.0-86.0
84.5	100.7	11.2		0.20				84	2.46		0.02		0.04	0.14				wk Mod	-	1.2%		-	-	-	-	-	-	-	wk	wk	-	?	wk Mod		Fxt 90.6' → 95.6' / 97.5 → 98.2		Rk which is not altered is dark from wkly alt'd Biot. Lim from box Alt. No sulfs seen.
100.7	108.2	7.5		0.04				88	2.53		0.02			0.02				wk	0.5%	Tr	Tr	-	-	-	-	-	-	-	wk Mod	wk	1%	45%		Aplite @ 100.7 / Sp (?) 111.1-111.6		Horizontal	Mod Alt, Few ser-qtz fracts. Sp lim hem after sulfs. Rk well leached.
108.2	118.1	9.9		0.05				75	2.53		0.01			0.01	0.03			wk	0.5%	Tr		-	-	-	-	-	-	-	wk Mod	wk	?	40%	Tr Sp	Sp(?) 114.5-119.7 / Ap 119.7-123.3	119.7 Low Cont.	20°	Aplite As Above. Sp(?) is dark in interval 111.1-111.6 & light & lost interval due to washing. There are sulfs in last interval.
118.1	125.9	7.8		0.49		0.06		89	2.54		0.02			0.04	0.35	0.08		wk	2%	1%		-	-	-	-	-	-	-	wk	wk	Tr	40%	wk	Sp(?) 123.3-125.2 / Dp(?) 125.2	125.2 Up Cont + Sulf Seams	30° / 40°-60°	Ap As Above. Sulfs beginning to remain, but still some Lim on fracts. Sp(?) is dark grey-black from high biot. content. Biot pheno's 10%, Biot (v.v.f.) in groundmass 15%. Good C.C. on Py + CPy in Sp(?)
125.9	135.0	9.1		0.44		0.01		92	2.57				0.01		0.31	0.12		Tr	2%	-	-	-	-	Tr Sp	-	-	-	-	?	ST	Tr	10%	1%		Bx 131.5-135		St-Inten Alt. Sulfs on fracts w/ no ser-qtz banding. Sp green CuO assoc.
135.0	140.2	5.2		0.44	18.8' @ 0.77	0.01	18.8' @ 0.08	86	2.57				0.01		0.31	0.12		Sp	2%	-	-	-	-	?	-	-	-	-	? wk	Md St	2%	15%	3%		V. St. Fxt C.G. 140.2 → 157		Tex not distinct. Oxidation showing of Orange-brown Lim & lt green clay on fracts. Tr's C.C. on Py + CPy
140.2	156.5	16.3		1.19		0.18		87	2.47		0.03		0.03	0.13	1.01	?		ST	-	-	-	-	-	-	-	-	-	-	?	?	?	?	?			?	V. St. Gauge. Squeezes easy. Much Orange Limonite + MnO present. Attitude Not Determined
156.5	162.9	6.4		1.10		0.09		96	2.39		0.02		0.03	0.04	1.01	?		Mod	1%	-	-	-	-	-	?	-	-	-	wk Mod	Sp	1%	?	3%				Rk Continues to be strongly broken, sheared & locally gougy, mod MnO (MnO must be C.C.
162.9	172.1	9.2		1.18		0.16		84	2.54		0.02		0.03	0.11	1.02	?		Mod	Tr	-	-	-	-	-	-	-	-	-	?	Sp	-	?	Sp				As Above.
172.1	179.9	9.8		0.56		0.05		93	2.61				0.01	0.04	0.45	0.06		wk Mod	0.4%	-	-	-	-	-	0.03	-	-	-	?	wk	1%	?	Sp		Fxt Zone During Cut Over 137		Rk becomes More coherent. Has Lt. Med Green Color w/ lt. streaks of orange lim. Still some C.C. Total sulfs low.
179.9	188.8	8.9		0.58		0.03		81	2.57				0.02	0.01	0.50	0.05		wk	0.7%	-	-	-	-	-	0.02	-	-	-	Tr	Sp	Tr	?	Sp				Rk is Brkn by Close spaced 20°-65° Cross joints which are lim stained & have some Py, C.C., CuO + MnO. Rk itself is impermeable
188.8	196.9	8.1		0.45		0.01		90	2.60					0.01	0.41	0.03		wk	0.3%	-	-	-	-	-	0.02	-	-	-	? Tr	? Tr	Tr	35%	Tr				As Above. This Rock almost no tex. It is extremely dense (non porous). Still with C.C. on Py on fracts
196.9	205.6	8.7		0.29		0.03		83	2.57		0.01			0.02	0.25	0.01		Sp	Tr	-	-	-	-	-	0.01	-	-	-	? Tr	? Tr	Tr	35%	Tr				As Above. Lim decreasing, Green Chlor-Serp remains on fracts. Rk quite hard
205.6	215.0	9.4		0.26				91	2.60				Tr	0.02	0.19	0.08		Tr	0.2%	Tr	-	-	-	-	-	-	-	-	? Tr	? Tr	-	30%	Tr				Very hard impermeable dacite broken by close spaced joints. Occassional Py w/ thin C.C.
215.0	223.4	8.4		0.08				100	2.37						0.04	0.04		-	0.4%	-	-	-	-	Tr	-	-	-	-	Sp	Tr	-	35%	-		2" G.G. Zone @ 226'	50°	Much as Above. There is a yellow clay(?) alt. along fracts + is assoc. w/ sulfs. CPy ≈ Py > 1
223.4	233.2	9.8		0.05				88	2.62						0.02	0.03		-	0.4%	-	-	-	-	-	0.01	-	-	-	Tr Sp	Tr Sp	-	35%					As Above.
233.2	241.8	8.6		0.04				91	2.63						0.02	0.02		-	0.4%	-	-	-	-	Tr	-	-	-	-	Tr	Tr	-	35%	-				As Above. Py to CPy ratio ≈ 1
241.8	250.0	8.2		0.03				95	2.61						0.01	0.02		-	1%	-	-	-	-	-	0.01	-	-	-	Tr Sp	Tr Sp	-	35%	Tr				Yellow Clay(?) Stain still present. Slightly more color in the rock. Clumps of Tourmaline(?) Present
250.0	257.5	7.5		0.02				99	2.57						0.01	0.01		-	1.5%	-	-	-	-	-	0.02	-	-	-	Sp	Sp	-	35%	Sp				Yellow Stain becoming stronger
257.5	268.0	10.5		0.03				74	2.61						0.01	0.02		-	1%	-	-	-	-	-	0.01	-	-	-	Sp	Tr	Tr	35%	Sp				Rk begins to be mod. brkn near 265'. Not much CPy assoc.
268.0	274.7	6.7		0.06				69	2.59						0.02	0.04		-	<1%	-	-	-	-	Tr	SP	-	-	Tr	SP	-	35	SP		Da 274.7 Drop Core			Alternately brecciated and silicified, wk sulfides, calcite veins
274.7	278.8	4.1		1.08		N.I.		96	2.57						0.33	0.75		-	3%	SP Mid.	-	-	Tr Sp	Tr	Tr	25	60	-	SP	-	-	20%		Hf 278.8			Dense, unreactive Hf 4-5% total sulfides, Green-brown, silty. (High core loss)
278.8	297.3	18.5		0.22				73	2.60						0.06	0.16		-	<1	-	-	-	-	Tr Sp	-	-	-	-	md	-	35	SP		Da 297.3			Flt gouge 285-289; 294-295; 296-297. Texture destroyed, zones of silicification
297.3	308.7	11.4		0.14				96	2.58						0.04	0.10			1	-	-	-	-	Tr	Tr	4	10	-	sP	-	30	SP		Hf 298.8 Da			Hf to 298.8, dk green, soft, wk min, mag., Da is brkn, silic as above w/ short zones of aplite
308.7	318.8	10.1		0.05				83	2.61						0.01	0.03			<1	-	-	-	-	Tr	Tr	-	-	-	sP md	-	35	SP		Da			Gouge 318.5-319.7, silicified, low sulfides
318.8	327.4	8.6		0.06				88	2.56						0.01	0.05			<1	-	-	-	-	Tr	Tr	-	-	-	Tr	-	35	SP					As above
327.4	331.9	4.5		0.06				90	2.59							0.06			<1	-	-	-	-	Tr	Tr	-	-	-	Tr	Tr	35	SP			open qtz mol vein	70°	As above
331.9	340.8	8.9		0.03				88	2.59							0.03			<1	-	-	-	-	Tr	Tr	-	-	-	Tr	-	Tr 35	SP					Aplite: 332.2-332.3, md-st silicification, few sulfides, no C.C.
340.8	349.2	8.4		0.04				89	2.65							0.09			<1	-	-	-	-	Tr	Tr	-	-	-	Tr	-	Tr 35	SP					As above 1-2% altd. bi.
349.2	357.8	8.6		0.02				89	2.62							0.02			<1	-	-	-	-	Tr	Tr	-	-	-	Tr	-	Tr 35	SP			sulfide veinlet	60°	As above
357.8	366.6	8.8		0.01				98	2.61							0.01			<1	-	-	-	-	SP	Sp	-	-	-	Tr	-	<1% 35	SP			qtz moly	60-70	moly in Qtz veins up to 1/4" thick, little spy, no C.C.
366.6	374.4	7.8		0.02				95	2.61							0.02			<1	-	-	-	-	SP	Tr Sp	-	-	-	Tr	-	1% 35	SP					Da is fresh looking, mdly silicified.
374.4	380.6	6.2		0.03				95	2.62							0.03		-	<1%	-	-	-	-	-	0.01 Sp	-	-	-	Tr	Tr	2%	30%	Tr		Qtz-moly vns	30 & 70°	Dacite actually has a bleached greenish white color. Py in dissem cubes. Calcite on fracts. Qtz moly veinlets w.d. spaced
380.6	390.9	10.3		0.20				79	2.66							0.20		-	2%	Tr	-	-	-	?	Tr Sp	-	-	-	Tr	Tr Sp	1% 1%	15%		Sp(?) 380.6	Contact Broken		wk-Med Alt'd Sp. Biot 90% to Chlor. Substantial increase in total sulfs. CPy ≈ Py & ?? + both fract controlled + dissem.
390.9	397.1	6.2		0.13				98	2.70									-	2%	Tr Sp	-	-	-	Tr	Sp	-	-	-	Tr	1%	1%	15%		Dp. 397.1	Intrusive Contact Good	60°	Much as above. The felds are both sheared + show Carls bad twinning. Only v. weakly altd.
397.1	406.1	9.0		0.18				83	2.88									-	2%	Tr	-	-	-	Tr	Tr	-	-	-	Tr	?	35% / 1%	Tr / 15%		Sp 399.5 → 403.9			Sp As above Cuts Dp which is quite silic & impermeable. Mo is mainly in Sp.
406.1	415.8	9.7		0.02				73	2.61									-	Tr	-	-	-	-	-	0.01 Sp	-	-	-	Tr	Tr	-	40%	Tr	Dp 403.9			Dp. as Above. Presence of Calcite on fracts probably indicates proximity of Seds below.

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D-201
Page 1 of 1 Pages
Collar Elev 2710 41
Final Depth 252.1
Coords. N 36,194 66 E 15,187
Inclination VERTICAL
Logged by N.R.N.
Date: Start 11-25-67 Finish 12-4-67

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Var. Nav Sulf	Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem Spec.	Other (2) Galena	Sphal.	Molyb.	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	Structures (4) True Dip	Remarks
0.0	10.0	10.0		n					2																								Ax			Med-ST Alt.; ST non stainly of Felds, sp-wk boxwork gossan on fracts.
10.0	20.1	10.1		0.03				71	2.53		0.02			0.01				wk	-	-	Non E.T.	-	-	-	-	-	wk	Mod	Mod	-	35%	Tr				As Above - possibly some unassoc. Cu present.
20.1	30.9	10.8		0.03				77	2.54		0.01			0.01	0.01			wk	-	-	Sp wk Mod.	-	-	-	-	-	Sp wk	Mod	Mod	-	35%					As Above
30.9	37.4	6.5		0.02				82	2.54					0.02	Tr																					
37.4	46.0	8.6		0.02				88	2.57					0.02				Sp	-	-	Sp	-	-	-	-	-	Tr Sp	Sp	-	-	35%					Sp alt., sp Hem staining, thin lim. gossans on fracts
46.0	55.0	9.0		0.03				90	2.57					0.01			Non 0.02	Sp	0.2%	-	wk	-	-	-	-	-	Sp	Sp wk	-	-	35%		Suit Pr. Area 54' Blood Red Zone 62.5-63.5' Fat. Material	40°	wk alt., wk Hem only w. few Ax related fracts. Thin CPY on Py
55.0	64.0	9.0		0.16				96	2.57					0.03	0.03		0.10	Sp	25%	-	Sp	-	-	-	-	-	Mod	Sp wk	-	-	40%					Sr. Ser. developed ground frac zone. Sulfs. abundant mixed w/ Hem-Lim. TAA C.P.
64.0	72.1	8.1		0.36				98	2.57					0.01	0.20	0.05	0.10	-	12%	-	-	-	-	-	-	-	Sp wk	Mod	-	-	38%			85-92.75	7	Fk is Mod-Str alld. throughout, but intensity increases towards Flt zone. Sulf pretty well disseminated. TAA C.P. Gn most.
72.1	81.4	9.3		0.19				95	2.57						0.16	0.03		-	2%	-	-	-	-	-	-	-	Wk Sp	Mod	-	-	30%					Mock as above. Rk Str alt. Felds altering to lt greenish clay. Mod. C.P.
81.4	89.7	8.3		0.28		N.I		96	2.57						0.18	0.10		-	2%	-	-	-	-	-	-	-	Mod ST	Wk Mod	-	-	65%		89.7-92.7 Mod altered zone	7	Mod S.Str w/ assoc. Ser. alteration. Alt. Becomes wk-Mod. Occur 89' Intermittent gg. zones
89.7	98.5	8.8		0.20				97	2.56						0.16	0.04		Tr	2%	-	-	-	-	-	-	-	Tr Sp	Sp wk	-	-	35%		92.7-98.5	70-85°	Alt. wk. Sulfs well disseminated present as TAA. Rock. TAA Aplite dike at 98'.
98.5	107.2	8.7		0.33				98	2.59					0.03	0.27	0.03		Tr	12%	-	-	-	-	-	-	-	Tr Sp	Sp wk	-	-	35%					Str. sp-wk. Mock as above. Some Lim & CuO on fracts - some Bar. present with sparsely alld.
107.2	116.1	8.9		0.22				93	2.59					0.01	0.18	0.03		Tr	1%	-	-	-	-	-	-	-	Tr Sp	Sp	-	-	35%					Brka zone. Moderately alld. Sp Lim & CuO on fracts
116.1	125.4	9.3		0.13				93	2.56				Tr.		0.11	0.02		Tr	<1%	-	-	-	-	-	-	-	Tr Sp	Sp wk	-	-	35		116-123 Tr. Sp. 123.2-125.4	50°	wk alt. slightly mod. Brka. Still Sp. on CPY.
125.4	134.7	9.3		0.21				93	2.53				Tr		0.19	0.02		Tr	<1%									Tr	Sp	-	-	35				wk alt., wk-mod dis sulfides. Good CC coatings.
134.7	144.1	9.4		0.44		0.01		91	2.57					0.01	0.38	0.05			<1%									Tr	ST	-	-	35				Broken and gouged with mod chrys. on fractures.
144.1	153.0	8.9		0.34				95	2.54				0.01		0.30	0.03		Tr	1%									Tr	ST	-	-	35				Flt gouge from 138.7-139.7. Massive px occur. 143'. Green Cu on fracts
153.0	163.9	10.4		0.34				83	2.52				0.03		0.28	0.03		Tr	<1%									Tr?	ST	-	-	30?				ST alt & gouge, may have high sulfide content
163.4	172.6	9.2		0.28				95	2.52				0.02		0.18	0.08		Tr	2%	-	-	-	-	-	-	-	wk Mod	Mod	2%	40%			Sp 159-163'			Str Alt. Assoc. w. Flt. grg. Sulfs dissem & Assoc w/ Track qtz Va. TAA CP coatings, sp CuO
172.6	182.0	9.4		0.28				90	2.56				0.03		0.17	0.08		Tr	2%	-	-	-	-	-	-	-	wk	Mod	2%	50%	Tr Sp					Mod Alt. less gouge. ST. Str. assoc w/ 1" track qtz-ser Vein. Sulfs in Va.
182.0	194.6	12.6		0.33				82	2.56				0.03		0.22	0.08		Sp	2%	-	-	-	-	-	-	-	Sp wk	wk Mod	-	30%	Sp					Mod Alt. Sulfs well dissem. Grad. CP coating & replacement. Occur-bra & in Assoc.
194.6	203.9	9.3		0.21				95	2.53				0.01		0.14	0.06		Tr Sp	2%	-	-	-	-	-	-	-	Sp	wk Mod	-	35%						Mod Alt. P felds alt to yellow-green Clay (?). Sulfs well dissem. Lim still present on fracts
203.9	213.0	9.1		0.42	26.6 g 0.47		0.01	93	2.58				0.01		0.36	0.05		Tr Sp	2%	-	-	-	-	-	-	-	wk Mod	wk Mod	5%	42%	Sp		Vein? Gr. 2 Blk Vn	70-75	45 28°	Alt. Strong assoc. veining. Some barite assoc w/ qtz Copper staining
213.0	221.6	8.6		0.50		0.01	26.6 g 0.01	98	2.56				0.01		0.41	0.08		Sp wk	2%	-	-	-	-	-	-	-	wk	wk Mod	-	40%	Sp					Sp to wk local silic. Sp-wk diseng. lim. + sp. Grn. Cu stain on fracts. CP still on 172.6-182
221.6	230.5	8.9		0.50		0.01		94	2.56				0.01		0.41	0.08		Tr Sp	2%	-	-	-	-	-	-	-	Sp	wk Mod	10%	45%	Tr		2" Grn Vn 222	Near Vertical		Mod-St Alt. P felds gone to green clay. Sulfs assoc. w/ qtz Va. + well dissem. Sp. assoc.
230.5	239.7	9.2		0.31				96	2.56						0.23	0.08		-	<1%	-	-	-	-	-	-	-	Tr Sp	wk Mod	-	35%	Sp					Rk equivalent less alld, but felds still alld to green clay. Sulfs disseminated. Still CP.
239.7	252.1	12.4		0.24				98	2.55						0.10	0.14		Tr	2%	-	-	-	-	-	-	-	Tr Sp	Mod	2%	30%	Sp		Grn. Sm. Sulf. Vn 247-247.8'	55°		As Above. reappearance of lim on some fracts.
T.D.H.																																				

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO- SILVER BELL UNIT

Note (3)
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Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D282
Page 1 of 1 Pages
Collar Elev 2,781.22 Final Depth 202.6
Coords. N 38,670.23 E 16,306.01
Inclination VERTICAL
Logged by RE
Date: Start 11-27-67 Finish 11-28-67

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Unknown N.S.	Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb.	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0	20.0	20.0																																			Fill
20.0	32.3	12.3		.01				67	2.57					.01				ST	-	-	-	-	-	-	-	-	-	SP	SP	1	10	5		MZ	QTZ-ser veins	30-75	wkly altd. white fspars in light gray aphanitic groundmass
32.3	40.3	8.0		.03				93	2.57					.03				ST md										SP	md	<1	10	5-10					str broken, mdly quartz, bi in all phases of alt to hydromica
40.3	48.4	8.1		.05				98	2.52				.01	.04				ST md										Tr	SP md	<1	10	5-10					Fspars vary in size from minute to 0.3" highly fractured, wk alt.
48.4	56.8	8.4		.05				91	2.52					.05	Tr			ST md	Tr									SP	SP	<1	10	10					As above. Tr of remnant sulfides
56.8	65.6	8.8		.09				102	2.55					.04	.05			ST md	Tr									Tr	SP	<1	10	10			ser veinlet	30	large book of wkly altd bi., abundant small lim filled fractures
65.6	74.0	8.4		.07				92	2.53					.03	.04			ST	Tr									SP	SP	<1	10	10					As above. (small grains of c.c. missed when first logged)
74.0	83.0	9.0		.10				92	2.55					.03	.07			ST md	Tr									SP	SP	<1	10	3					Bi altd to hydromica, plag altd to clay. Tr of remnant sulfides
83.0	92.8	9.8		.14				93	2.50					.03				ST	SP									SP	SP	<1	10	5			QTZ-ser vein	20°	pyr cc being oxidized ser veinlet., wk c.c. on dis pyr, st lim on fractures
92.8	101.5	8.7		.31				94	2.60					.06	.18	.08		md wk	.25	Tr								SP	SP	<1	10	10					sulfides gradually increasing, Tr of hem after mag
101.5	110.6	9.1		.26				92	2.56					.07	.15	.04		md										SP	md	<1	10	10					sp dis sulfides est. c.c. to 105'. Broken with st lim & Cu oxides from 105-111.
110.6	120.1	9.5		.48		.09		95	2.60				.06	.03	.30	.09		Tr	2-3									SP	SP	<1	10	10		(base of oxidation (112'))			3-5% Total sulfides, md alt, mod
120.1	129.8	9.7		.30				96	2.63					.02	.22	.06		Tr	2									SP	Tr	<1	15	5-10					possibly freeze sulfides, md silicification
129.8	138.8	9.0		.12				98	2.61						.06	.06			2									Tr	Tr	<1	15	5					silicification begins to obscure texture. occasional large QTZ eyes. md sulfides
138.8	148.6	9.8		.14				93	2.63						.08	.06			2									SP	Tr	<1	15	5			sulf veinlets	30	Green alt minerals, red fspar, large sec. grains in thin veins.
148.6	157.0	8.4		.13				97	2.66						.06	.07			1-2									SP	Tr	<1	15	10	MZ	sulf veinlet	85°	cpy, cpy dis and in thin steep stringers with wk c.c.
157.0	165.7	8.7		.06				96	2.64						.02	.05			2									SP	SP	?	<1	20	10	(Da?)			mod-st alt & silicification, loss of texture, ≈10% green alt products. 2-3% sulfides
165.7	174.2	8.5		.08				98	2.54						.03	.05			2									SP	SP	?	20	5	(Da?)				has general appearance of Da with some QTZ eyes but could be altd MZ
174.2	183.0	8.8		.07				93	2.65						.02	.05			1-2					Tr				SP	SP	?	15	10	MZ				wit sulfides with occasional zone of st c.c. alt & sil. obscures crystal outlines but appears to have been MZ.
183.0	192.1	9.1		.14				93	2.68						.05	.09			1					Tr				SP	md	<1	15	10	S				≈ 10% green alt minerals (mont) in large round patches, (larger than fspars)
192.1	202.6	10.5		.11				97	2.66						.03	.08			1-2									SP	md	<1	15	10	MZ				green alt products, QTZ eyes, 2nd fspar. 2-3% dis sulfides with little un c.c.

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

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Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
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Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D-283
Page 1 of 1 Pages
Collar Elev 2,809 82
Final Depth 268.3
Coords. N 38,666 28
E 16,142 27
Inclination VERTICAL
Logged by N.RN & R.E
Date: Start 11-27-67 Finish 12-2-67

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu N S	% Cu Avg	% Core Recov.	Sp Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Cu-Fe N S	Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb.	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0	10.0	10.0																																			
10.0	19.2	9.2		.06				85	2.48					.06				ST -											sp md <1	10	3		MZ	reached vein	20°	30% white altd phenocrysts in a light grey ground mass. 5% hydromica. Rk is highly broken from 14.6-20.6 and hides MZ-Da contact
19.2	28.9	9.7		.06				84	2.53					.06				S.T. ind	- -	Tr									sp md <1	20	1		Da				weakly altd Da. Flat lying veinlets, barn after mag. Dis py preserved
28.9	37.4	8.5		.04				100	2.52					.03	.01			md	sp -	sp									sp wk	1	20	1			leached veinlets	35°	leached veins sp + per ft, barn shearing along fracts, barn after mag.
37.4	46.0	8.6		.08				95	2.54					.04	.04			md	Tr -	SP									sp wk	tr	20	1			PTS-SCT veins	40°	As above, fewer remnant sulfides
46.0	54.4	8.4		.06				96	2.57					.04	.02			md	Tr -	SP									sp wk	tr	20	1			veins	30°	Cu work filling in as veins, CC on px in QTZ
54.4	62.4	9.0		.07				94	2.50					.03	.04			md	Tr	SP									sp wk	tr	25	M					like lim, boxwork, remnant sulfides, malc lim on fractures
62.4	72.5	9.1		.06				89	2.50					.03	.03			md	sp	SP									sp wk	tr	25	1					incomplete leaching of veins w/ px. ice wk, short intervals of st px CC
72.5	81.5	9.0		.06				93	2.58				.01	.02	.03			md	0.5%	SP									sp wk	tr	22	5	1		veins	30°	increasing CC and py but generally oxidized, leached
81.5	90.4	8.9		.09				95	2.56					.02	.02			md	0.5%	Tr									sp wk	tr	25	1					As above, sulfides gradually increasing, oxidation decreasing
90.4	101.3	10.9		.09				77	2.58					.03	.06			wk	0.5%	Tr									sp wk	2%	25	Tr			1" seam for QTZ veins	20° 30°	Bp altered Dp. Coated on fracs w/ wk lim. New Mex Spard fracs w/ alt
101.3	110.6	9.3		.04				91	2.53				.01		.03			wk	0.7%	Tr									sp wk	1%	25	Tr					As above. some CC reappearing. Coarse cpy of Bm. Granite Silva Rio Grande
110.6	119.6	9.0		.10				96	2.55				.02		.08			sp wk	1%	Tr									sp wk	1%	25	Tr					As Above. Majority of Sulfs confined to fracts. Intermixed Sulfs + Bm. Gr.
119.6	128.6	9.0		.11				97	2.58				.03		.08			sp wk	1%	Tr									sp wk	1%	25	50			Tr zone 120.5-121.8	50°	Much as above. Sulfs sparse w/ min CC on fracs.
128.6	137.0	8.4		.21				96	2.58				.03		.18			Tr	1%	-									sp wk		15%	5					Lim. Dis Bm. Granite. Area 132.+ CC on fracs (but scattered) some med intermixed Bn is assoc. w/ grn clay on fracs. Sp x Sper / radiate
137.0	146.0	9.0		.21				90	2.60				.01		.16	.04			2%	- -									sp		20%	5%					Partly altd. Shown by in grnd mass. CC content nf. Rk origins to appear Mz two pieces of 3rd & grnd altd & regrowth & fracs.
146.0	154.6	8.6		.33				92	2.57				.01		.29	.03			2%										sp sp	1	20	3	1	MZ 137.5-149 Da 160.5	sulfvns	15-45	2nd Kspar, CC on px, cpy in QTZ-Sec veins, wk ind dis sulfides, mzdike
154.6	164.3	9.7		.45			.02	85	2.57				.02		.39	.04		Tr	2%										sp st	1%	10	5	1	MZ 166.3			Gouge from 158.0-160.0 followed by indiv altd, mineralized MZ to 164.3
164.3	171.8	7.5		.42	505' @ 0.47		.14	93	2.60				.14		.26	.03			1%										sp sp	1%	20	3-5		Da			Texture destroyed by alt & sil, green sil over. CC on fracts and in veins,
171.8	180.7	8.9		.41			.03	86	2.60				.20		.17	.03	.01		1%										sp sp	1%	20	3-5					Eq, accels splitic texture, bright green mineral (epidote?) on fractures. 2nd Kspar
180.7	190.6	9.9		.31			.06	94	2.61				.06		.20	.05			1%	Tr									Tr sp	<1	20	3-5					As above, wk dis sulfides. Abundant epidote on fractures.
190.6	205.1	14.5		.65			.31	49	2.64				31		.23	.06			1%										Tr sp	<1	20	3-5					Good CC coatings but low total sulfides. Texture less altered
205.1	217.9	12.8		.13				62	2.58						.10	.03			1%										Tr sp	1	20	3-5					Rock is broken but not gouge, wk alt, 5-2% total sulfides
217.9	226.0	8.1		.07				99	2.60						.05	.02			1%										Tr Tr	<1	20	3-5					Texture remains largely obliterated by alt & sil. CC thinning
226.0	234.3	8.3		.06				96	2.58						.04	.02			1			Tr							Tr Tr	<1	20	3-5					As above, mainly along fracture
234.3	243.4	9.1		.05				88	2.60						.04	.01			1			0.1%							Tr Tr	<1	20	3-5			Strong veinlet	20°	As above, mainly dis in alt, wk CC
243.4	251.1	7.7		.08				93	2.61						.05	.03			1			-							Tr Tr	<1	20	<10					wk alt & sil, chlorite give rk green color
251.1	258.5	7.4		.05				85	2.60						.03	.02			Tr			-							Tr Tr	<1	20	1-0					As above, no significant CC
258.5	268.3	9.8		.04				89	2.63						.02	.02			<1%										Tr	<1	20	1-0					fresh in appearance, minor px
						AVG. Recov.		80%																													

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

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Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
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Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D-284
Page 1 of 1 Pages

Collar Elev 2,749.44
Coords. N 38,677.40 E 16,505.16
Inclination VERTICAL
Logged by RE
Date: Start 12-4-67 Finish 12-8-67
Final Depth 167.6

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov	Sp. Gr.	Cu (1) Chrys.	Cu (1) Pitch	Cu (1) Black	Cu (1) Blue Green	Cu (1) Unknown NS	Cu (1) Cc.	Cu (1) Cpy.	Cu (1) Born	Fe (2) Lim.	Fe (2) Py	Fe (2) Mag.	Fe (2) Hem	Fe (2) Spec.	Other (2) Galena	Other (2) Sphal.	Other (2) Molyb	Other (2) Calcite	Other (2) Garnet	Other (2) Silicates	Other (2) Sericite	Other (2) Clay	Other (2) Vn. Qtz	Other (2) QUARTZ	Other (2) CHLORITE	(3) Rock Type	Structures (4) Depth	Structures (4) True Dip	Remarks
0	10.0	10.0																																			Alluvium
10.0	18.4	8.4		0.18				88	2.52					.18				ST											sp wk mod	Tr	10	8		MZ			Broken, mod alt, yellow-brwn limonite, lim staining of altd fspars
18.4	27.7	9.3		0.08				85	2.39					.08				ST											wk pst	-	?	4					V.ST. alt. f gouge. stronger gouge from 25'-26'
27.7	36.0	8.3		0.14				87	2.49					.14				ST											mod ST	-	10	8					ST alt, broken and gouger. green alt products, (serpentine?)
36.0	45.1	9.1		0.12				95	2.38					.12				ST											mod ST	-	10	10					slightly less broken, fspar app. 0.2"-0.1" in size. ST alt. is probably supergene
45.1	53.8	8.7		0.10				95	2.56					.10				ST											mod ST	-	10	10					As above, no indication of transient Cu, RK is soft-crumbles in hand
53.8	63.0	9.2		0.14				84	2.59					.14				ST											mod ST	-	10	10			fracture w/gouge	50°	As above
63.0	72.2	9.2		0.20				90	2.57					.14	.05	.01		wk											wk wk	-	10	10		see oxidation 68'			RK is much harder, less broken, c.c. on dis sulfides and fractures-begins @ 3680'
72.2	80.9	8.7		0.42		.04		96	2.61					.04	.28	.10		-	1/2	Tr									sp sp	-	10	10-15					c.c. on wk-mod dis. sulfides, Mag partially altd to hem.
80.9	90.3	9.4		0.35				96	2.63						.20	.15		-	1/2										wk sp	-	10	15					generally low sulfide content with occasional stc.c. on prim fractures
90.3	99.3	9.0		0.20				93	2.63						.10	.10		-	1/2										wk sp	-	10	15			sulfide stringers	45°	wk alt, very thin stringers of cpy w/c.c., coarse grained
99.3	108.6	9.3		0.15				98	2.62						.06	.09		-	1/2	Tr									wk Tr	-	10	10					As above, some fresh bi.
108.6	117.2	8.6		0.33				99	2.56						.21	.12		-	1/2						Tr				wk sp	1	10	10					Open QTZ vein with st c.c. on cpy from 108'-110'. increase in alt.
117.2	126.0	8.8		0.34				93	2.63						.20	.14		-	1/2	Tr									wk sp	2	10	10			QTZ-cpy vein	≈30°	QTZ-cpy vein from 122-124, nil-weak c.c. on cpy/cpl.
126.0	134.7	8.7		0.20				93	2.65						.10	.10		-	1/2	Tr					Tr				Tr Tr	<1	10	15%			"	45	wk alt, small dis. of mag. 2nd Kspar in veins
134.7	144.0	9.3		0.20				93	2.64						.10	.10		-	1						Tr				wk Tr	<1	10	15%			"	55°	wk alt, small coatings of c.c. on cpy
144.0	152.5	8.5		0.12				92	2.65						.03	.09			1/2						Tr				wk Tr	-	10	15					As above
152.5	161.1	8.6		0.18				96	2.63						.08	.10			1/2	Tr									wk Tr	Tr	10	15					Rk appears to have had less primary sulfides at surface than at 150'. primary sulfides app. 2% cpy/pr: 3/4:1 c.c. w/tr bornite
161.1	167.6	6.5		0.21				97	2.65						.35	.16			1/2	Tr									wk Tr	Tr	10	15					slightly stronger alt. of fspars but no c.c.

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D-285
Page 1 of ___ Pages
Collar Elev. 2,743 13 Final Depth 397.9'
Coords. N 36,337 09 E 15,274 85
Inclination VERTICAL
Logged by N.R.N, RE
Date: Start 12-6-67 Finish 12-13-67

Depth From	Depth To	Int'vl	Elev.	% Cu Total	Avg.	NS	Avg	% Core Recov.	Sp. Gr.	Chrys.	Pitch	Black.	Blue Green	Unid. Non Sulfs.	Cc.	Cpy.	Born
0.0	5.0	5.0															
5.0	14.2	9.2		0.02				74	2.51					0.02			
14.2	32.1	17.9		0.01				74	2.49					0.01			
32.1	39.6	7.5		0.03				76	2.99					0.03			
39.6	46.6	7.0		0.02				96	2.51					0.02			
46.6	55.3	8.7		0.02				97	2.47					0.02			
55.3	62.2	6.9		0.02				95	2.41					0.02			
62.2	70.0	7.8		0.18				80	2.53						0.17	0.01	
70.0	78.6	8.6		0.22				99	2.58						0.20	0.02	
78.6	88.0	9.4		0.17				99	2.58						0.15	0.02	
88.0	96.5	8.5		0.59		0.02		99	2.58					0.02	0.53	0.04	
96.5	105.8	9.3		0.19				96	2.55						0.17	0.02	
105.8	114.7	8.9		0.24				99	2.59						0.20	0.04	
114.7	123.9	9.2		0.29				96	2.61						0.27	0.02	
123.9	132.4	8.5		0.21				96	2.59						0.19	0.02	
132.4	141.4	9.0		0.29				97	2.57						0.27	0.02	
141.4	149.8	8.4		0.27				99	2.54						0.25	0.02	
149.8	159.1	9.3		0.33				99	2.34						0.27	0.06	
159.1	167.6	8.5		0.14				100	2.59						0.12	0.02	
167.6	177.0	9.4		0.34				89	2.57					0.02	0.30	0.02	
177.0	186.2	9.2		0.26				97	2.58					0.01	0.23	0.02	
186.2	195.8	9.6		0.73	27.9' @ 0.52	0.02	27.9' @ 0.01	93	2.54					0.02	0.67	0.04	
195.8	204.5	8.7		0.44		0.01		92	2.26					0.01	0.39	0.04	
204.5	214.1	9.6		0.39		0.01		99	2.58					0.01	0.28	0.10	
214.1	223.8	9.7		0.29				85	2.82						0.18	0.11	
223.8	233.1	9.3		0.16				96	2.52						0.08	0.08	
233.1	241.7	8.6		0.54		Nil		97	2.60						0.35	0.19	
241.7	254.9	13.2		0.24				93	2.58						0.12	0.12	
254.9	264.0	9.1		0.28		x		97	2.58						0.08	0.20	
264.0	273.6	9.6		0.17		x		97	2.61						0.09	0.08	
273.6	282.4	8.8		0.16		x		99	2.63						0.06	0.10	
282.4	291.0	8.6		0.54		0.21		95	2.56					0.21	0.28	0.05	
291.0	299.4	8.4		0.04		x		96	2.60						Tr	0.04	
299.4	308.8	9.4		0.04		x		96	2.57						Tr	0.04	
308.8	317.7	8.9		0.21				81	2.66						0.17	0.04	
317.7	330.0	12.3		0.18				100	2.52						0.12	0.06	
330.0	338.9	8.9		0.18				93	2.60						0.03	0.15	
338.9	348.3	9.4		0.11				90	2.56						0.02	0.08	
348.3	357.5	9.2		0.05				93	2.55						Tr	0.05	
357.5	366.5	9.0		0.06				99	2.60						Tr	0.06	
366.5	375.8	9.3		0.05				99	2.61						Tr	0.05	
375.8	384.4	8.6		0.04				91	2.59							0.04	
384.4	393.1	8.7		0.08				100	2.62							0.08	
393.1	397.9	4.8		0.09				99	2.63							0.09	
E.O.H.																	

Depth From	Lim.	Py	Mag.	Hem	Spec.	Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE
0.0																
5.0	Wk	Tr	-	Mod	-	-	-	-	-	-	-	Wk Mod	Mod	15%	55%	-
14.2	Sp	-	-	Md	-	-	-	-	-	-	-	Wk	Mod	2%	45%	
32.1	Sp Wk	2%	?	St	-	-	-	-	-	-	-	St	Mod	-	2%	-
39.6	Sp	-	-	Md	-	-	-	-	-	-	-	Sp Wk	Mod	-	35%	
46.6	Wk	2%	-	Md St	-	-	-	-	-	-	-	Mod St	Mod	-	35%	
55.3	Wk	Tr	-	St	-	-	-	-	-	-	-	St Mod	Mod	-	35%	
62.2	-	1%	-	Tr	-	-	-	-	-	-	-	Tr Sp	St Wk	-	30%	-
70.0	-	<1%	Tr	Tr	-	-	-	-	-	-	-	Tr	Sp	-	20-30%	3%
78.6	-	1%	Tr	Tr	-	-	-	-	-	-	-	-	Sp	-	33%	3%
88.0	-	3%	-	-	-	-	-	-	-	-	-	Mod	Mod	2%	45%	1%
96.5	-	<1%	-	-	-	-	-	-	-	-	-	Tr	Sp	-	35%	4%
105.8	-	<1%	Tr	Tr	-							Tr	Sp	-	30%	4%
114.7	-	0.5%	Tr	Tr								Tr	Sp	-	25%	4%
123.9	-	<1%	Tr	Tr	-	-	-					Tr	Sp	-	28%	4%
132.4	-	<1%	Tr	Tr								Sp	Sp	2%	35%	4%
141.4	-	4%	-	-	-							Sp Wk	Sp	3%	38%	3%
149.8	-	1%	Tr									SP	[illegible]	<1	40	[illegible]
159.1	Tr	<1	-									SP	SP	<	40	
167.6	Wk Md	1	-									SP	SP Md	<	40	5
177.0	Wk	1	Tr									SP	SP	<1	40	5
186.2	-	3	-									V.ST	Md	5?	50	-
195.8		1-5	-									V.ST	Md	5-10	55	-
204.5		2										ST	Md	2?	50	
214.1		3-5										V.ST	Md	5-10	50	
223.8		1-2										SP	SP	<1	50	5
233.1		2										Wk ST	Md	3	50	1
241.7		2										SP	SP	1	50	<1
254.9		1-2										SP	SP	Tr	50	-
264.0		1-2										SP	SP	1	50	
273.6		1										SP	SP	3	50	
282.4		2										SP	SP	1	56	5
291.0		1										SP	SP	<1	50	
299.4		1										SP	SP	<1	50	3
308.8	-	1%	-	-	-	-	-	-	Tr	-	-	Sp	Sp	-	40%	3%
317.7	-	3%	-	-	-	-	-	-	-	-	-	Sp Wk	Sp	-	40%	-
330.0	-	1-3%	-	-	-	-	-	-	Tr	-	-	Tr Sp	Wk	2%	50%	-
338.9	-	1%	-	-	-	-	-	-	-	-	-	Tr	Wk Mod	-	48%	1%
348.3	-	2%	-	-	-	-	-	-	-	-	-	Tr	Mod	-	35%	-
357.5	-	2%	-	-	-	-	-	-	-	-	-	Tr	Sp Wk	2%	38%	1%
366.5	-	1-2%	-	-	-	-	-	-	Tr	-	-	Tr Sp	Sp Wk	1%	48%	1%
375.8	-	2%	-	-	-	-	-	-	Tr	-	-	Sp	Sp	4%	45%	1%
384.4	-	3%	-	-	-	-	-	-	Tr	-	-	Tr	Sp Wk	1%	40%	2%
393.1	-	1-2%	-	-	-	-	-	-	-	-	-	Tr	Sp	-	40%	1%

Depth From	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0.0	Ak			Rock Bit Core Not Recovered
5.0	Ak	Flt Zone 13.6 → 19.9	?	Mod - Stly Altd, Mod Silif. w/ assoc Ser. Hem staining Felds + on fracts. Rk Locally sheared
14.2				Flt. Zone gougy. Remainder of rk As Above. Sulf Cavities rare.
32.1	Hornblende Mz @ 32.1, Ak 35.4	Flt Zone 35.4 →		Mz is Mod altd (bleached) only along fracts. Sulf (Py) Dissem + on fracts. Hornblend altd. to Biot. Stly Brxd Ak (Granulated) 35.9 → 39.6'. This zone only altd + Hem stained
39.6				Lim-Hem decreasing, Rk appearing somewhat fresher except for local St. Alt.
46.6	Sulfide Patches resemble Ak			Rk is Mod-Stly altd. ser throughout. Rk has been shattered on small scale. Sulfs well dissem where present
55.3		Flt. Zone 58.7 Clay Seams	? 70°	Rk still shows shattering. Well leached. Some Clay-Alunite Seams present
62.2				Rk wkly altd. Oxidation ended abruptly below Flt zone. Mod C.C. coating on Py + Cpy
70.0				Fresh Ak. 3% original Biot altering to Chlor. Some Green CuO on fracts. Not Typical Ak
78.6		5" Qtz Sulfide @ 92.5' ↓ St Flt Zone 92 → 97	?	Py well dissem. Has Thin C.C. coating. Rk fresh
88.0			20°	Pre Min fault w/ Thick Qtz-Sulf Vein at top. Sugar core stly altd. Sulf wk-mod in zone
96.5				Rk is quite fresh below flt. Sulfs quite sparse Mainly Py w/ less Cpy + Tr C.C.
105.8				Rk fresh. C.C. on 50° fracts. v. low total Sulfs
114.7				As Above. Possibly Sp K-feldspathization
123.9				As Above. More C.C. on fracts. Apparently not coating either Py or Cpy.
132.4		Flt Vn zone		Slightly more alt. Some ser.-sulf veining. Still some C.C.
141.4		142.487	20°	St Alt assoc w/ Vn-Flt. Thick Py Vn in Qtz-Ser. g.g. Good C.C. Coatings
149.8				Flt gouge at 153.6, occasional st cc zone, green alt. products (serp.?)
159.1	165 aplite 167			generally wk sulfides with md C.C. coatings, grn alt prod. as above
167.6				Flt gouge 170-171, Cuprite, Torbernite, red lim but wk alt of fspars. md C.C.
177.0				C.C. on fractures, good coatings, Torbernite; sulfides undergoing oxidation
186.2		Qtz-ser-sulf veins	80°	Strong qtz-ser-sulf veining begins @ 192' (Veins show up much better after core is split)
195.8		"	"	v. st sericitic alt continues, md-v. thick C.C.
204.5				less alteration, C.C. continues good on dis py & cpy (Note: Preliminary examination on unsplit core led to underestimation of sulfides. core was logged after splitting.)
214.1		1" Q-S-S vein @ 215.5	78°	alteration again becomes intense, falling off towards end of interval
223.8				sharp decline in sericite away from veins, wk alt, slight oxidation of sulfides ^ chlor after bi
233.1		Qss veins ≈ 237	65°	st alt from 234.5 - 238.6, mal on some fractures.
241.7		Qtz-py veins	75°	widely spaced, thin, steep veinlets. md C.C. coatings, occasional mal, trace torbernite
254.9				C.C. varies from nil to md on dis py & cpy. generally wk alt ^
264.0				Fresh surfaces show that much of 2nd Cu is actually covellite (CuS)
273.6		1" Qtz py vein 281'	85°	Thick near vertical & vertical Qtz veins, wk C.C. or cov.
282.4				Qtz veining & sil from 282.4-287.4 with md-st C.C. & cov on py, cpy
291.0				C.C. continues in stringers on cpy
299.4				very wk C.C., wk-md alt.
308.8				Wk-Mod Alt + Bleaching. Thin Born on Cpy. Py is Gleam. Structurally Affected Rk 320.3 - 330.0 - many g.g. Seams.
317.7		C.G. 320.2 321.3 ½" white Qtz vn w/ MoS_2 + Py		Mod Alt. - Ser developed, but assoc w/ faulting. Increase in Total Sulfs also Assoc w/ flt.
330.0			70°	Wk-Mod Alt. Good Sulf. Development (well Dissem). Thin CC. on Cpy + Py.
338.9		Q.Q. 348.3 - 350	? 45°	Wk Alt, sp min, wk yellow-grn Clay on fracts. Tr. C.C.
348.3				Mod Alt. of P. felds to yellow-green Clay
357.5				Sp-wkly altd. Few fracts Controlling most of min. No C.C. seen. Tr Cpy.
366.5				Rk appears only sparsely altd. Some fresh biot present. Py found replacing Biot. V.St. Biot 50% Py 370.6 - 371.0
375.8		Qtz-ser-Py-MoS_2 vn	85°	Sp-wk alt except for the vn. No C.C.
384.4				As Above. Sulfs well distributed along irreg. micro fracts. Some Dark grn Chlor on fracts w/ Py.
393.1				Sp Alt. No C.C.

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D286
Page 1 of 1 Pages
Collar Elev 2,764.78
Final Depth 183.6
Coords. N 38,046.18 E 16,504.31
Inclination VERTICAL
Logged by RE
Date: Start 12-9-67 Finish 12-12-67

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr	Cu (1) Chrys.	Pitch	Black	Blue Green	Cu (1) Unk. Non Sulf.	Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb.	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0	10.0	10.0																																			
10.0	18.5	8.5		0.29				96	2.52				Tr	0.29	Tr			md		3%l.								SP	SP	<1	10	15	MZ	leached veins	65°	Fgrs arenitic, up to 0.2". groundmass varies from light to dark, mag altering to biot.
18.5	28.4	9.9		0.14				79	2.51					0.14				md		0.5%								SP	SP	<1	10	10				Bleached, bi alt'd to chlorite and hydromica or completely destroyed.
28.4	35.9	7.5		0.14				100	2.47					0.14				md		Tr								md	SP	1.2	10	10		leached veins	65°	As above, sericite along veins, lim stains fspar.
35.9	44.9	9.0		0.22				91	2.54				Tr	0.22				md		0.5%								SP	SP	<1	10	10				highly broken, wk to md alt as above
44.9	53.4	8.5		0.05				98	2.50				Tr	0.05				md		Tr								md	SP	1.2	10	10		ore set veins	70°	mal on fractures, wk hem staining of some fspars
53.4	61.4	8.0		0.07				91	2.48					0.07				md		Tr								md	md	1	10	10				Thin gouged fractures dipping 70°, broken, bleached, silt'd, as above
61.4	70.5	9.1		0.07				90	2.49				Tr	0.07				wk md		—								md	SP	1	10	10				Probably "sericitized" sulfide coatings, SP mal on fractures
70.5	78.5	8.0		0.09				92	2.53				Tr	0.09				wk	Tr	Tr								SP	SP	<1	10	10				As above
78.5	88.2	9.7		0.11				94	2.54					0.05	0.06			wk	Tr	1%l.								SP	SP	<1	10	10				Trace Bn cpy cc near end of interval
88.2	99.7	11.5		0.26				94	2.57					0.06	0.10	0.10		SP	<1%	1%								SP	SP	<1	10	15	Base of oxidation	±86.0		Highly broken to 83.4, Groundmass is dark (lime bi-silic) more alt'd mag.
99.7	107.7	8.0		0.48	33.7 ? 0.50	0.01	33.7 ? 0.02	88	2.89					0.01	0.31	0.16		Tr	≤1%									SP	SP	<1	10	15				Lt. sulfides ≥ 1%. Thick cc on cpy but wk to absent on pl., wk alt
107.7	116.6	8.9		0.49		0.02		84	2.87					0.02	0.27	0.20		Tr	<1%									SP	SP	<1	10	15		Barren QTZ vein	70	As above, thick cc on dis cpx, wk-md alt
116.6	125.8	9.2		0.61		0.03	0.02	76	2.82					0.03	0.46	0.18		—	<1									md	SP	<1	10	15		Py-cpy Vein 123.70°		large blebs of dis cpx, no QTZ-sulf veining, mag appears absent
125.8	133.4	7.6		0.31		x		89	2.56						0.16	0.15			<1									SP	SP	<1	10	15				md alt., locally at formation of green alteration products.
133.4	142.0	8.6		0.26		x		88	2.61						0.15	0.10	nil		<1									SP	SP	<1	10	15		cpy veinlet	60°	CC thinning, secondary kspar
142.0	150.8	8.8		0.22				83	2.61						0.12	0.10			<1									SP	SP	<1	10	15				As above
150.8	158.7	7.9		0.17				93	2.55						0.08	0.09			<1									SP	SP	<1	10	15				CC out to nil, wk alt
158.7	166.8	8.1		0.19		x		82	2.77						0.09	0.10			<1									SP	SP	~1	10	15				Bad kspar, occasional large blebs of cpx, little or no cc
166.8	176.2	9.4		0.26				78	2.57						0.16	0.10			1									SP md	SP	0	10	5		QTZ-SP veins	55°	As above
176.2	183.6	7.4		0.30				77	2.60						0.13	0.17			1									md	SP	1	10	5			55°	As above, dis and veined cpx w/ little cc
	EOH																																				

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D 287
Page 1 of 1 Pages
Collar Elev 2,851 15
Final Depth 287.3
Coords. N 35,335 21 1 E 16,846 64
Inclination VERTICAL
Logged by RE
Date: Start 12-13-67 Finish 12-18-67

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Cu (1) Carbonate N.S.	Cc.	Cpy.	Born	Fe (2) Lim. Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb.	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0	10.0	10.0																																		Alluvium
10.0	20.6	10.6		.09				80	2.47				.01	.08				md ST	-	-	md							SP	SP	4	10	5	MZ			leached, barren QTZ veins dipping at all angles, lim, then staining of Fspars
20.6	30.1	9.5		.05				84	2.48					.05				ST	-	-	SP							md	md	10	20	5		QTZ set sulf veins 15, 35, 60, 90	60, 90	veins indicate high pre-leaching sulfide content
30.1	38.9	8.8		.04				90	2.50					.04				ST	-	-	Tr							SP	ST	2	15	5		"	75	highly broken and gouge.
38.9	48.3	9.4		.05				85	2.54					.05				ST			Tr							md	md	5	20	5		"	60-85	steep QSS veins with set extending about ½" out from vein. irregular spacing
48.3	56.9	8.6		.10				92	2.56					.10				ST	-	-	-							md	md	3	20	5		"	70-90	leached veinlets are thinner, steeper, 3 or 4 per ft, yellow-brown limonite
56.9	66.4	9.5		.06				95	2.49					.06				md ST	Tr		-							SP md	md	1	15	5		"	"	slightly less veining, occasional mal. on fractures, Tr of remnant py
66.4	75.2	8.8		.08				92	2.54				.01	.06	.01			ST	Tr	Tr?	-							SP	md	1	15	5		"	"	less sericite along thin veinlets. wk-md carbon coatings wk pyrite.
75.2	84.7	9.5		.09				80	2.49					.09				ST	Tr	-	-							SP	md	1	15	5		"	60-90	As above, stly leached with trace remnant sulfides
84.7	93.9	9.2		.11				95	2.53				.01	.08	.01			ST	Tr	Tr	-							SP md	SP	1	15	10		"	50-90	Thin lim filled veinlets w/ little QTZ but ¼" - ½" of sericite. mal on some fractures.
93.9	102.2	8.3		.08				96	2.54					.08				ST	-	-	SP							SP	SP	3	15	5		"	"	Thick irregular QTZ veins and lim, then staining of altd Fspars
102.2	111.5	9.3		.13				82	2.55				.01	.12				ST	-	-	Tr							SP	ST	1	10?	1		"	"	ST alt, ¼" gouge from 102.6-108.6. Continuation of QTZ veining from 102.2-108
111.5	120.3	8.8		.11				97	2.49				.01	.09	.01			md ½	Tr	Tr	Tr							SP	SP md	1	10	7		"	90-90	111.5-113.0 less lim staining of Fspars. Thin gouge ¼" pal. on joints & shears - STRIKE dips 30° N.
120.3	129.1	8.8		.29				95	2.60				.01	.02	.18	.08		wk 2%	-	-								md	SP	1-2	10	10	(sulfides 121.5)	QTZ set sulf veins	70-90	Some veins are unoxidized while some steep ones are only oxidized
129.1	137.5	8.4		.46		.01		98	2.59				.01		.30	.15		Tr 2-3										md	SP	3	15	10		"	45-90	mod-ST py begins @ 121.5. most py in thin set veinlets with wk c.c. increasing c.c. content. high pyrite/pyrrhotite ratio wk alt - away from veins
137.5	146.8	9.3		.51		.02		95	2.56				.02		.34	.15		Tr 3										md	SP	2	10	10		"	"	ST chlor-serp alt 141.5-150, ST c.c., 2nd Kspar(?), wk mal.
146.8	155.3	8.5		.55	49.8' @	.02	49.8' @	94	2.60				.02		.38	.15		Tr 3										md	SP	2	10	10		"	"	ST c.c. on px, cpx, best sulfides on veins over 60°, 2nd Kspar
155.3	164.6	9.3		.48	0.47	.02	0.02	94	2.62				.02		.31	.15		Tr 2-3										md	SP	2	10	10				ST chlor-serp alt 162.1-162.8, ST c.c. as above
164.6	170.1	5.5		.47		.01		78	2.58				.01		.31	.15		Tr 3										md	SP	1	10	10				As above, chlor-serp alt, v. ST c.c.
170.1	178.9	8.8		.36				94	2.63						.26	.10		Tr 3										md	SP	2	10	10		QTZ set sulf veins	65°	2nd Kspar, ST c.c.
178.9	187.6	8.7		.25 .22				99	2.61						.15	.10		wk 3										SP	SP	<1	10	10				chlor-serp alt, decrease in thickness of ST c.c. coatings
187.6	196.7	9.1		.27				80	2.61						.17	.10		Tr 2										SP	SP	<1	10	10				broken, md-st alt, mod c.c. - The least oxidized cpx
196.7	204.2	7.5		.32				98	2.50						.22	.10		- 2						Tr				SP mod	SP	2	10	10		QTZ-set sulf veins	55-90	mal, in QTZ veins. wk-st c.c.
204.2	213.7	9.5		.91				81	2.55						.71	.20		- 1-2						Tr				md	SP	1	10	10				cc varies from nil to md in thickness on py, cpy. wk-md alt
213.7	225.9	12.2		.64	58.3' @		58.3' @	81	2.54						.49	.15		3						-				ST md	SP	<1	10	10				md-st alt, disp sulfides, good c.c.
225.9	235.7	9.8		.77				92	2.55						.62	.15		3						-				ST md	SP	<1	10	5				As above, irregular vertical fractures
235.7	244.6	8.9		.61	0.68		Nil	97	2.52						.51	.10		2										ST md	md	<1	10	10				ST chlor-serp alt, broken
244.6	251.4	6.8		.90				98	2.70						.90													? ST	-	5?	ST				Green gouge with sulfides 246.4-251.4
251.4	262.5	11.1		.39		.01		45	2.57					.01	.35	.03		1-2										md ST	md	-	5	ST				highly broken, v.ST serp-chlor alt, good c.c.
262.5	271.7	9.2		.18				74	2.64						.08	.10		2										md	md	-	8	ST				2nd Kspar in thin bands dipping ≈ 90°, serp., wk-md c.c.
271.7	280.4	8.7		.10				96	2.60						.02	.08		2										SP	SP	-	8	5-10				As above, wk c.c.
280.4	287.3	6.9		.12				96	2.58						.03	.09		2										md	SP	-	8	5-10				vertical QTZ-PY veining, wk-nil c.c., 2nd Kspar

PRELIMINARY GEOLOGIC LOG
(Subject to Revised Logging)
ASARCO - SILVER BELL UNIT

Note (3): Tt - Tactite; Hf - Hornfels; Mb - Marble; Qt - Quartzite; Bx - Breccia; Da - Dacite; Mz - Monzonite; An - Andesite

Note (4): V - Vein; F - Fault; D - Dike; C - Contact; Ig - Undif igneous

Hole No. D-288
Page 1 of 1 Pages
Collar Elev. 2,861.90 Final Depth 398.5
Coords. N 36,575.04 E 15,046.99
Inclination VERTICAL
Logged by NRN, RE
Date: Start 12-19-67 Finish 12-27-67

From	To	Int'vl	*2ND ASSAY (~~Elev.~~)	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov	Sp. Gr.	Cu (1) Chrys.	Cu (1) Pitch	Cu (1) Black	Cu (1) Blue Green	Cu (1) Unknown NS	Cu (1) Cc.	Cu (1) Cpy	Cu (1) Born/Covellite	Fe (2) Lim.	Fe (2) Py	Fe (2) Mag.	Fe (2) Hem	Fe (2) Spec.	Other (2) Galena	Other (2) Sphal.	Other (2) Molyb	Other (2) Calcite	Other (2) Garnet	Other (2) Silicates	Other (2) Sericite	Other (2) Clay	Other (2) Vn. Qtz	Other (2) QUARTZ	Other (2) CHLORITE	Other (2) TORBERNITE	(3) Rock Type	Structures (4) Depth	Structures (4) True Dip	Remarks
0.0	9.5	9.5																																				Rock Bit
9.5	21.7	12.2		.02				89	2.54					.02				Mod			Mod								Tr Sp	wk		30%	Tr		Ak	Contacts	40°	wkly altd. Typical Ak. Tr-sp sulf cavities. Lim is yellow-orange
21.7	30.4	8.7		.03				98	2.47					.03				wk			wk Mod								Sp	Mod	2%	28%	Tr		Ap 26.0-26.3, Ak 26.3-32.6, Ap 32.6-33.8'	St. Fracts; Ap. Dip; Flt. 35.8'	60° + 80°; 35°; ?	Alt. becomes Mod-St at end of run. Minor Min fracts + Tr-sp sulf cavities
30.4	40.4	10.0		.03				82	2.52					.03				wk	Tr		Mod								Mod	St		28%						Ak Becomes Stly A'ld + ggy below aplite. Sp. v.f. gr. Torbernite on Fracts
40.4	48.8	8.4		.02				91	2.53					.02				wk			Sp wk								Mod St	Sp		28%			Ak 35.8-			St Alt. slick pale green Clay on numerous fract planes. Rk mod-stly structurally affected
48.8	58.3	9.5		.02				89	2.53					.02				wk	0.2%		Sp wk								wk Mod	Mod wk	3%	35%			Ap 52.7-54	Ser-Qtz Fract Zone	40°	Mod alt. Most Lim exotic. Alto Fracts localized. CC + Py in zone 57.2 + 58.3
58.3	67.6	9.3		.01				95	2.49					.01				Tr Sp	Tr		Mod St								Tr Sp	wk Mod		38%	Tr					wk Alt. Hem Staining Almost all felds
67.6	77.2	9.6		.02				96	2.54					.01	.01			Tr Sp	Tr		Mod St								Tr Sp	[illegible]		35%	Tr			Alto Fract + Flt 72.8-73.2	55°	Alt wk except in Fract-Flt zone. Most Lim & Hem Appear to be exotic
77.2	86.8	9.6		.01				90	2.55					.01					[illegible]		Mod								Sp wk	Sp		35%				Alto Fract	85°	Alt Sp-wk. Alto Fracts are wide spaced
86.8	96.7	9.9		.02				90	2.52					.01	.01			Tr	2%		Mod								Mod	Sp	7%	45%				St Qtz-Ser Sulf zone 89.3-90.1	45°	Zone of St ser-qtz-sulf alt. bounded by sply alt'd rks
96.7	107.2	10.5		.01				99	2.53					.01				Tr	Tr		Mod								Tr	Sp		38%	Tr					Sp-wk Alt, Mod Hem staining of felds. Minor sulf cavites on fracts
107.2	113.5	6.3	.17	~~.17~~				99	2.56						.17			Tr	2%		Tr								Tr Sp	wk		35%			Sulf. Cr. 107.2			Abrupt Sulf-leach zone Contact. CC + Py on most fracts + some dissem.
113.5	122.5	9.0	.17	~~.12~~				97	2.45						.17	.02			2%										Tr	wk		38%						wk Alt. Sulfs on fracts while min'l altd.
122.5	131.1	8.6	.12	~~.10~~				95	2.56						.08	.03			2%										Tr	wk Mod		38%						As Above
131.1	139.8	8.7	.10	.04				97	2.37						.08	.02			2%										Tr	wk Mod		38%						wk-Mod Alt. Still good C.C. on py + cpy - Generally as above
139.8	148.7	8.9	.09	~~.05~~				93	2.49						.08	.01			2%										Sp	wk Mod		38%				Possible Flt Zone 144.6 →		As Above to 144.6 then rock becomes mod bkn, + somewhat gougy
148.7	157.5	8.8	.13	~~.06~~				99	2.53						.11	.02			2%						Tr				Tr	wk Mod		30%						wk-Mod Alt., Sp dissem sulfs, but majority on healed fracts
157.5	167.4	9.9	.16	~~.05~~				92	2.36						.14	.02			2%										Sp	wk		[illegible]				Flt 159.5-160'	30° (?)	wk Alt except in Flt zone. 85° cc lined, but unaltered fracts common. Sp Torbernite
167.4	176.1	8.7	.53/A	~~.30~~				100	2.56						.48	.05			5%										Mod	wk		50%		1-2%		V St. Ser-Qtz-Py Vn 174→176	80°	As Above except for Thick Qtz-Ser-Sulf vn. 1-2% Torbernite on fracts
176.1	185.0	8.4	.60/A	~~.38~~				96	2.56						.50	.10			3-4%										Mod St	wk		50%		1-2%		178→180	85°	As Above. Sulfs along numerous micro fracts and in thin ser-qtz vns.
185.0	194.9	9.9	.20	~~.08~~				96	2.55						.15	.05			1%		Tr								Tr	Sp		35%	[illegible]	1%				Sp Alt, Sp dissem sulfs, Tr C.C., as hem after mag
194.9	203.7	8.8	.11	~~.03~~				84	2.57						.09	.02			1%		Tr-Sp								Sp	Sp		30%	1%	[illegible]				Sp Alt, 2% Biot present. Tex. ne equigranular
203.7	212.8	9.1	.16	~~.06~~				98	2.54						.12	.04			1%		Sp								Tr	Sp		33%	Tr	Sp				Sp Alt, + some bleaching. Py on micro fracts have v. Thin c.c.
212.8	221.2	8.4	.10	~~.07~~				99	2.57						.07	.03			1-2%		Tr								Sp	Sp		30%	[illegible]	Sp				wk Alt. slightly more C.C. present. Also vns rare
221.2	229.9	8.7	.26	~~.24~~				95	2.52						.20	.06			1%										Tr	Sp wk		35%		Sp	A 226.3-227.3'		Flat lying	wk Alt, sp sulfs, but C.C. still present
229.9	239.0	9.1	.28	~~.25~~				93	2.56						.22	.06			2-3%										Sp wk	wk		30%		1%		Shear zone 236.2-238.0	40°	As Above except in shear zone where alt + min is much stronger. Good C.C. assoc.
239.0	248.2	9.2	.11	~~.10~~				91	2.58						.09	.02			2-3%										Sp wk	wk		35%		Sp				Mod alt + bleaching. Increase in number of sulf. seams.
248.2	257.2	9.0	.07	~~.08~~				93	2.56						.04	.02	.01		1-2%										Sp	wk		35%		Sp				wk-Mod Alt, Mod Bleaching. Sp sulfs along healed fracts
257.2	270.8	13.6	.08	~~.08~~				97	2.54						.06	.02			1%										Tr	wk		30%		[illegible]		Shears	60°	wk Alt, Sulfs quite rare
270.8	276.8	6.0	.22	~~.23~~				97	2.48						.18	.04			1%										Sp	wk		50%		Tr			40°	Slight increase in alt. Rk is becoming more bkn.
276.8	284.8	8.0	.30	~~.30~~				96	2.77						.25	.25			5%										Intense	wk		60%				Stly Alto + Min Flt Zone 276.8	?	Rk is extremely altd. + well mineralized. Some C.C. present
284.8	293.7	8.9		.29				100	2.53						.24	.05			5%										Intense	md		50						As above, stly altd w/sulfides dis in clayey matrix
293.7	302.4	8.7		.19				90	2.60						.15	.04			5%										"	md		50				300'		As above, Flt Zone(?) ends ≈300'
302.4	312.2	9.8		.08				94	2.56						.08			Tr	2%										md	md		50		Tr				c.c on py and in gouge along numerous small fractures
312.2	322.2	10.0		.25				87	2.57						.20	.05			5										vst	md		50						Gouge 316.5-317.5; stly alt'd & mineralized as above in flt zone
322.2	334.1	11.9		.24				69	2.54						.20	.04			1-2										md	md	<1	50		Tr		Qtz veins	≈90°	md alt, c.c. on fractures w/ Cu SO4 (≈0.5%)
334.1	343.8	9.7		.13				80	2.58						.10	.03			1-2										md	ST md	2	50	Tr			"	"	Gouge 334.1-333.5; Qtz veins w/ low sulfides to 342.0, 5% w/ cpy, c.c. from 342.0-343.8
343.8	352.2	8.4		.27				98	2.60						.21	.06			5										md	wk	2?	60				sulfide veins	50-70	silicified with high sulfide content
352.2	361.0	8.8		.33				93	2.64						.27	.26			3										md	wk	2	60						Silicification in bands dipping 20°, md c.c., with Cu SO4
361.0	366.2	5.2		.24				98	2.61						.18	.06		Tr	1-2										wk	wk	1	50						wkly altd, c.c. on py, cpy, Cu SO4 & green Cu staining, lim
366.2	376.8	10.6		.46		.004		85	2.60					Tr	.36	.10		Tr	2										wk	md	<1	50				sulfide veinlet	85°	highly fractured to 372.0. wk-md alt, yellow lim on fractures.
376.8	385.7	8.9		.31				100	2.55						.25	.06		wk	1										wk	wk	<1	55	1%			sulfide vein	60°	md-st alt, chlor-serp silicification along py veins, oxidation of sulfides wk lim
385.7	394.5	8.8		.12				94	2.63						.06	.06		Tr	1-2										wk	wk	Tr	50	1%					alteration decreasing, little c.c., <2% Total sulfides
394.5	398.5	4.0		.14				99	2.60						.08	.06			1-2										wk	wk	Tr	50	wk					wk alt, wk c.c. on py, chlor-serp on fractures
	EOH																																					

PRELIMINARY GEOLOGIC LOG
(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D289
Page 1 of 1 Pages
Collar Elev 2832.09 Final Depth 231.3'
Coords. N 36,516.19 E 15,161.35
Inclination VERTICAL
Logged by RE
Date: Start 12-26-67 Finish 1-2-67

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Unknown NS	Cc.	Cpy.	Born.	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0	10.0	10.0																																			Rotbit (rock appears to have been fractured by blasting)
10.0	19.7	9.7		.03										.03				ST	-	-	ST							wk	wk	-	45	-	AK	leached veinlets	65°	st hem, clin staining of feprus. few leached veins
19.7	29.1	9.4		.03										.03				ST	-	-	ST							wk	wk md	1	45	-		QTZ vein	60°	As above, QTZ vein with initial few sulfide contact @ 22.4'
29.1	38.6	9.5		.02										.02				ST	-	-	ST								md	wk	1	45	-	Leached	QTZ-SER sulf vein	65°	sulfide cavities, leached QTZ-ser-sulf veins, less hem, clin staining
38.6	47.1	8.5		.02										.02				ST	Tr	-	ST								md	wk	2	50			"	60°-80	live limonite, bowlwork in veins, py and trace CC near end of interval
47.1	56.7	9.6		.04										.04				md	Tr	-	ST								md	wk	3	50		sulfides @ 56.7			oxidation varies from wk-st but ends abruptly @ 56.7
56.7	65.7	9.0		.20											.15	.04	.01	wk	3-4	-	-								ST	wk	3?60						st/altd, silicified w/ 5% total sulfides
65.7	69.5	3.8		.07											.07			md	1-2	-	wk							wk	wk	<1	50					wk-md oxidation, wk alt, dis py, trace of CC
69.5	78.5	9.0		.05											.05			wk	<1	-	wk md							wk	wk	Tr	50					Unoxidized from 110-113, w/ stain CC on py. otherwise hem staining. yellow lim on fracts. ST oxi. from 86.7-88.5
78.5	88.5	10.0		.05											.05			wk	1	-	md							wk	md	Tr	50					continued alternating zones of leached, sulfide bearing rock.
88.5	97.6	9.1		.11											.08	.01	.02	wk	<1		md							wk	wk st	Tr	50					Gouge, st alt, lim, clin from 88.5-94.4, followed by wk alt, few sulfides
97.6	107.0	9.4		.09											.07	.02		Tr	<1		-							Tr	wk	-	50					wk-md alt, CC on py along fractures
107.0	116.4	9.4		.06											.05	.01		-	<1		-							Tr	wk	-	50					As above
116.4	126.0	9.6		.20											0.14	0.06		-	<1									Tr	wk	-	50					As above. Thin CC on dis py, mostly on py in stringers or fract.
126.0	135.7	9.7		.21											0.17	0.04			<1									Tr	wk	-	45					No QTZ veining; mal, CuSO4, Torbernite on fractures
135.7	144.2	8.5		.18											0.16	0.02			<1									Tr	wk	-	45					wk-md alt, wk min., mal & brko.
144.2	153.2	9.0		.20											0.18	0.02			1									Tr	wk	-	45					wk alt, CC on fractures and dis py, spy. Brochantite, gypsum to 147.2
153.2	162.4	9.2		.12									Tr		0.10	0.02			1									wk	wk	<1	45			QTZ-SER sulf vein	50°	Torbernite, CuSO4 on fracts, few thin py veinlets with CC.
162.4	170.8	8.4		.13									Tr		0.11	0.02			1									Tr	wk	-	45					CC coatings thick - but little py or spy. Otherwise As above
170.8	179.7	8.9		.10									Tr		0.08	0.02			1									Tr	wk	-	45	md				md alt, chlor-ser coating.
179.7	188.6	8.9		.16											0.14	0.02			1									Tr	wk	-	45	md		Aplite 187.7-188.3	Ap contact	55°	lim staining of feprus 184.0-188.6, chlor-serp alt.
188.6	197.7	9.1		.07									Tr	Wk-st 0.01	0.05	0.01			1									Tr	wk	-	45	md					no true Ca, sulfate on fractures about 192' md alt.
197.7	206.7	9.0		.02											Tr	0.02			<1									Tr	md st	-	45	md					mostly altd, gouge from 197.7-204.2.
206.7	215.8	9.1		.09											0.02	0.07			<1									Tr	md	-	45	md					Gouge 207.7-208.0 md alt, wk min.
215.8	224.9	9.1		.33											0.08	0.25			<1									Tr	md	-	45	wk					steep irregular fractures, gouge. mod alt.
224.9	231.3	6.4		.22											0.03	0.19		-	1%	-	-	-	-	0.02	-	-	-	wk	wk mod	-	50	1%		Shear zone 229.2-?	47°	Quite Brecciated. Ak. low total sulfs content except in st altd & mb zones. 229.2-?
	EOH																																				

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D 290
Page 1 of 1 Pages

Collar Elev 2,862.85 Final Depth 256.7'
Coords. N 38,060.21 E 16,191.64
Inclination VERTICAL
Logged by RE
Date: Start 12-29-67 Finish 12-30-67

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Cu (1) Pitch	Cu (1) Black	Cu (1) Blue Green	Cu (1) Unidentified Non cuprous	Cu (1) Cc.	Cu (1) Cpy.	Cu (1) Born	Fe (2) Lim.	Fe (2) Py.	Fe (2) Mag.	Fe (2) Hem.	Fe (2) Spec.	Other (2) Galena	Other (2) Sphal.	Other (2) Molyb.	Other (2) Calcite	Other (2) Garnet	Other (2) Silicates	Other (2) Sericite	Other (2) Clay	Other (2) Vn. Qtz	Other (2) QUARTZ	Other (2) CHLORITE	(3) Rock Type	Structures (4) Depth	Structures (4) True Dip	Remarks
0	10.0	10.0																																			Rockbit
10.0	20.7	10.7		.10							0.02			0.08				wk	-	-	wk								wk	wk	-	2	15	Aplite & SP(?)			Sericite Porphyry with short intervals of Aplite. SP(?) has small
20.7	29.2	8.5		.08							0.03			0.05				md	-	-	-								wk	wk	tr	2	15	"	leached veins	20°-90°	elongate feldspar, fresh looking, in a dark groundmass with high biotite content.
29.2	38.0	8.8		.16							0.03			0.13				st	-	-	-								wk	md	-	2	15	SP			Aplite 22.0-25.0, SP(?) is wk-md/p alted. Broken: average length - 1"
38.0	48.6	10.6		.13							0.03		0.01	0.09				st	-	-	-								wk	st	-	2?	v st.	Aplite s.P(?)	leached veins	65°	FIT zone? Rock is broken and strongly alted but not gouge.
48.6	58.5	9.9		.33							0.08		0.06	0.17	0.02			st	-	-	-								wk	md st	-	-	v st	SP			Aplite: 38.0-41.8; followed by broken and gouge. S.P(?)
58.5	66.9	8.4		.33							0.01		0.08	0.16	0.08 ??			st	-	-	-								wk	md st	-	-	15				Broken, ½' gouge w/abundant chlorite, ½' lim.
66.9	75.5	8.6		.58		.37					Tr		0.15	0.22	0.21			md	-	-	-								wk	md	-	-	15	Aplite S.P.			As above, st. gouge from 69.9-66.9.
75.5	84.2	8.7		1.12		.89							1.12	(no visible sulfides)				st	-	-	-								wk	md	-	-	20				2" zones of aplite beginning at 67.2, ½' 69.7, Rock becomes solid @ 72.0, wk-md alt
84.2	93.4	9.2		.86		.60							.86	"	"	"		md	-	-	-								wk	wk	-	-	20				st alt. To 82.0'. Texture remains same - small feldspars, dark groundmass, no Qtz
93.4	101.7	8.3		.20									.20					wk	-	-	-								wk	md md	Tr	-	20	S.P. 93.4	leached vein	80°	Few leached veins, md alted, no live lim or other favorable indications.
101.7	110.1	8.4		.06									.06					st	-	-	-								wk	md st	-	-	15	Da			Gouge, ½' alt near contact. S.P from 94.8-95.8.
110.1	119.0	8.9		.12									.12					st	-	-	-								wk	md	1	15	Tr	Da	QTZ-sulf veins (leached)	65°	Texture varies from typical Da to Aplite.
119.0	126.1	7.1		.06									.06					md st	Tr	-	Tr								wk	wk	<1	15	-	Da			mdly broken, remnant py, ½' c.c.
126.1	135.2	9.1		.09									.09					md	Tr	-	-								wk	wk	<1	15	Tr	Da 126.1			lim stained, wk hydromica, broken near contact
135.2	141.4	6.2		.10									.08		.02			st	-	-	-								md	md	2	10	1	MZ	leached QTZ sulf veins	≥90°	st lim staining, md alt, ¼" bands of sericite along veins.
141.4	152.4	11.0		.60		.10							.10		.35	.15		st	-	-	-								md	md	2	10	3	sulfide	2 sets 1" @ 141.4 QTZ-sulf veins	90°	sulfides gradually increasing as lim decreases. steep veinlets arabou
152.4	164.0	11.6		.72		.06							.06		.46	.20		wk	-	-	-			Tr					md	md	2	10	4				c.c. varies from wk-md, lim on fracts, 10% original bi, wk-md alt.
164.0	173.2	9.2		.68		.06							.06		.47	.15		md	-	-	-			Tr					wk	md	<1	10	2				wk alt, moly and cpy in thin veinlets, 2-3% Total sulfides
173.2	181.4	8.2		.81		.09							.09		.52	.20		Tr						Tr Assayed					wk	wk	2	10	4		QTZ sulf veins	≥90°	Broken but not gouge. occasional large bleb of cpy.
181.4	190.3	8.9		.82		.08							.08		.54	.20		Tr						.1308					wk	wk	2	10	4			20-80	2nd ksper along veins and as large xtals.; soft, green alt mineral.
190.3	198.7	8.4		1.27	102.6 @ 0.74	.06	102.8 @ 0.06						.06		.88	.30		wk						.1172					wk	wk md	<1	10	4				moly veinlets generally displace the others. wk alt, mdcc.
198.7	207.2	8.5		1.07		.08							.08		.74	.25		wk						.0184					wk	md	<1	10	4				MZ has porphyritic texture, fspars up to 0.3", 50% phenos., md alt.
207.2	215.4	8.2		.60		.04							.04		.36	.20		-						.0144					wk	wk	<1	10	4		¾" QTZ V. with sp sulfides	30°	Broken and gouge to 201.4, followed by md alt, sulfides, carbonate veinlets, c.c. in sulfides, c.c. in spl.
215.4	224.0	8.6		.58		.03							.03		.35	.20		-						.0148					wk	wk	<1	10	2				moly may be higher than average, but total sulfs are low. wk alt
224.0	235.2	11.2		.54		.03							.03		.33	.18								.0106					md	wk	1	10	3		QTZ sulf	≥90°	md alt, moly on fracts, 3% green alt products.
235.2	244.0	8.8		.63		.01							.01		.42	.20								.0148					md	wk	1	10	4				Barren QTZ veins, near vertical - sulf. ser. veinlets, wk-md alt.
244.0	256.7	12.7		.22											.07	.15								.0232					md	st	1	10	4				As above, thick moly on fractures. wk c.c., 2nd. ksper
	EOH																																				as above, very thin cc on cpy. no c.c. on py.

PRELIMINARY GEOLOGIC LOG
(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Note (3)
Tt - Tactite
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Note (4)
V - Vein
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C - Contact
Ig - Undif igneous

Hole No. D291
Page 1 of 1 Pages
Collar Elev. 2849 10
Final Depth 379.0
Coords. N 38,174 66 E 15,286 63
Inclination VERTICAL
Logged by RE
Date: Start 1-2-68 Finish 1-9-68

Depth From	Depth To	Int'vl	Elev.	% Cu Total	Avg	NS	Avg	% Core Recov	Sp. Gr.	Chrys.	Pitch	Black	Blue Green	Unknown NS	Cc.	Cpy.	Born
0	10.0							[illegible]									
10.0	19.1	9.1		.02				88	2.54					.02			
19.2	29.2	10.1		.04				75	2.60					.04			
29.2	46.9	17.7		.04				84	2.37					.04			
46.9	56.5	9.6		.02				85	2.63					.02			
56.5	66.1	9.6		.02				87	2.53					.02			
66.1	75.3	9.2		.03				90	2.54					.03			
75.3	84.4	9.1		.03				[illegible]3	2.53					.03			
84.4	93.2	8.8		.02				[illegible]7	2.50					.02			
93.2	102.0	8.8		.04				97	2.34					.04			
102.0	111.5	9.5		.02				87	2.53					.02			
111.5	120.5	9.0		.03				93	2.53					.03			
120.5	128.8	8.3		.02				94	2.54					.02			
128.8	139.2	10.4		.12				87	2.52					.02	.10		
139.2	147.8	8.6		.11				95	2.54					.02	.09		
147.8	156.9	9.1		.02				93	2.53					.02			
156.9	166.1	9.2		.14				88	2.64				.12	.02			
166.1	174.3	8.2		.05				90	2.58					.05			
174.3	190.0	15.7		.03				88	2.53					.03			
190.0	195.4	5.4		1.44		0.12		57	2.49				0.12		1.32		
195.4	204.6	9.2		0.23				91	2.66					.02	.18	.03	
204.6	214.0	9.4		0.13				89	2.50						.12	.01	
214.0	218.6	4.6		0.01				96	2.68					.01			
218.6	226.1	8.1		0.12				94	2.71						.03	.09	
226.1	236.5	9.8		0.11				91	3.26							.11	
236.5	245.3	8.8		0.20				77	3.49							.20	
245.3	247.9	2.6		0.11				91	2.39					.11			
247.9	254.9	7.0		3.02				85	2.84							3.02	
254.9	262.6	7.7		1.89				87	2.82							1.89	
262.6	272.8	10.2		1.14				80	2.73							1.14	
272.8	279.5	6.7		0.92				87	2.81							0.92	
279.5	286.8	7.3		0.14				86	2.51							0.4	
286.8	293.8	7.0		0.43				87	3.06							0.43	
293.8	299.4	5.6		0.14				100	2.69							0.4	
299.4	302.1	2.7		0.20				97	2.83							0.20	
302.1	307.6	5.5		0.05				81	2.70							0.05	
307.6	317.6	10.0		0.25				83	2.72							0.25	
317.6	326.6	9.0		0.12				84	2.63							0.12	
326.6	335.2	8.6		0.31				93	2.75							0.31	
335.2	347.7	12.5		0.12				75	3.17							0.12	
347.7	356.6	8.9		0.12				98	2.95							0.12	
356.6	365.8	9.2		0.24				83	3.07							0.24	
365.8	379.0	13.2		0.24				99	99							0.24	
E.C.H.					Avg. Recov.			86%									

Depth From	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE
10.0	md ST	-		md								wk	wk	3	45	Tr
19.2	ST			md								wk	wk	2	45	-
29.2	ST			md								wk	wk	<1	45	-
46.9	ST	-	-	ST	-	-	-	-	-	-	-	wk Mod	wk	4%	40	-
56.5	Mod ST	-	-	ST	-	-	-	-	-	-	-	wk Mod	wk	5%	45%	-
66.1	wk Mod	-	-	wk Mod	-	-	-	-	-	-	-	Sp wk	Sp	1%	38%	Tr
75.3	Sp wk	-	-	Sp wk	-	-	-	-	-	-	-	Sp	Sp	Tr	35%	Tr
84.4	wk Mod	-	-	wk Mod	-	-	-	-	-	-	-	wk	Sp wk	2%	39%	Tr
93.2	Mod ST	-	-	wk Mod	-	-	-	-	-	-	-	wk Mod	Mod	1%	35%	-
102.0	wk Mod	-	-	wk Mod	-	-	-	-	-	-	-	Sp	wk	-	35%	
111.5	wk	-	-	wk	-	-	-	-	-	-	-	Mod	wk	<1%	35%	
120.5	wk	Tr	-	wk	-	-	-	-	-	-	-	Mod	wk		35	
128.8	wk	Tr	-	wk Mod	-	-	-	-	-	-	-	wk	wk Mod	1%	49%	
139.2	wk	1%	-	Sp wk	-	-	-	-	-	-	-	wk	wk	Tr	40%	
147.8	wk	Tr	-	wk Mod	-	-	-	-	-	-	-	wk Mod	wk	2%	43%	
156.9	wk Mod	Tr	-	wk	-	-	-	-	-	-	-	wk Mod	Mod		35%	
166.1	Mod	-	-	Mod	-	-	-	-	-	-	-	Mod ST	Mod	2%	38%	
174.3	wk	-	-	Mod	-	-	-	-	-	-	-	wk Mod	wk	3%	47%	
190.0	wk	4%	-	-	-	-	-	-	-	-	-	?	Mod ST	-	15%	
195.4	wk	2%	-	-	-	-	-	-	-	-	-	Tr	wk	2%	25%	
204.6	wk	1%	-	-	-	-	-	-	-	-	-	?	wk	-	10%	
214.0	wk	-	-	-	-	-	-	-	-	-	-	-	wk	-	10%	md
218.6	md	1%	-	-		-	-	-	3%	Tr	20%	-	md	-	5%	md
226.1	wk	1%	-	Tr					5	35	40	-	md	-	-	wk
236.5	wk			3.5					5	50	30	-	-	-	-	-
245.3	-	-	-	-		Ag (oz/ton)			5	-	-	-	-	-	Tr	md
247.9	-	1%	-	2%	1.11	5.31 7.95	.055		10	5	30	-	-	-	-	5%
254.9	-	<1%	-	1%	0.76	5.75 4.7	.014		20	5	30	-	-	-	-	10%
262.6	-	<1%	-	3%	0.84	2.38 4.81	.076		10	15	30	-	-	-	-	5%
272.8	-	<1	-	5					5	15	30	-		-	-	10%
279.5	-	<1%		4						20	70					
286.8	-	<1%	-	Tr	-	-	4%	-	Sp	-	35% wollast	-	-	Tr	Tr	Tr
293.8	Tr	0.02	-	Tr					Tr Sp	-	45%	-		Tr	Tr	3%
299.4	-	1%	-	Tr	-		Tr	-	Sp	-	85%	-	-	Tr	Tr	2%
302.1			1%	Tr	-			-	4%	-	-		wk	-	-	Mod ST
307.6		2%		Tr	-		Tr	-	Sp	-	90%	-	-	-	?	3%
317.6	-	3%	-	Tr	-		Tr	-	Sp wk	-	85%	-	-	Tr	?	3%
326.6	-	3%	-	Sp	-		Tr		Sp	?	85%	-	-	1%	?	3%
335.2	-	<1%		Tr	-				Tr Sp	?	85%	-	-	2%	?	3%
347.7	-	0.02	-	Sp	-	-	-		Tr	3%	85%	-	-	1%	?	Sp
356.6	-	0.2	-	wk	-	-	-	-	Sp wk	5%	80%	-	-	4%	?	wk
365.8	-	0.3	-	Tr Sp	-	-	-	-	Sp wk	Tr	85%	-	-	2%	?	wk

Depth From	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0				Rockbit
10.0	AK-140 Aplite?	QTZ veins	60°-90°	AK is wkly altd, leached QTZ-sulf veins in aplite
19.2	AK			highly sheared, broken. Abundant yellow lim. (Jarosite?)
29.2				Joints & shears - 80°-90°, stly bkn, wk-md alt, (high core loss)
46.9		Qtz-ser-lim fracts 1/2" spacing	70°	wk-Mod Alt, Sp Jar + Tr-Sp Hem. Numerous Altd fracts. w/ sulf. cavities.
56.5		Altd Fracts	75°	Mod Alt, St Hem staining + Mod residual lim on fracts. Rk wkly shattered + re healed. 1% Boxwork
66.1				wk Alt, v. few fracts., Rk shows some micro shattering
75.3				Sp-wkly Altd., v few Altd Fracts, Tr jar. Numerous small scale healed dislocations
84.4		Altd Fracts 70°-85°	70°-85°	wk-Mod Alt controlled by high angled fracts. Bx. lim has Bright yellow soft min. assoc.
93.2		Shear zone 95-100'	75°	St. Alt + Lim development through shear zone
102.0				Rk Continues to be "granulated" but healed due to shear zone to 105'. Lim is mainly exotic
111.5		Altd Fracts	5° 60°	Rk shows micro shattering + displacements. Rk is more bleached + has more residual Lim
120.5				Numerous Alt Fract zones. Some remnant py. but no C.C.
128.8				Mod Alt, wk sil'n. Mod Lim development. Alt is somewhat unusual - wx waxey Green Clay
139.2				Local zones of Mod py w/ assoc CC. Alt still Mod. The waxey clay is translucent
147.8		Altd Fracts	65°-80°	wk-Mod Alt. Rk is still strongly leached. Numerous sulf. cavities
156.9	Post Min ANDE	160.5-166.6 Altd Fracts	70° 50°-75°	Mod Alt, ANDE Dike apparently following shear zone.
166.1		Flt Zone 173.4-173.5		St Alt. Numerous Altd fracts.
174.3		Flt Zone 182.7'-183.6		Mod St Alt. Rk Continues to show structural shattering throughout And Hem-Lim, but poor
190.0	Post Min ANDE 190.0-190.6			No distinct, but apparently structural contact of Ak + SED. ANDE intruded along Ct. later. Sed(?) are non reactive, dense clay like. Mod-St 6 gr. Py coated w/ C.C.
195.4	SED (?) 190.6-			Rk Must be an igneous rock w/ numerous small qtz grains. Almost no text.
204.6	Post Min ANDE 209.5-213			Intermixed ANDE + v.f. grained igneous (?) Rk. still somewhat leached. Tr-Sp CC.
214.0	P.M. And			P.M. And, dark, fine grained, small white phenocrysts
218.6	Sed?	218.6 contact	≈75°	Gouge 223.3-223.6 MnO on fractures. Sed, igneous rk. May be Dacite with high percentage of sed. xenos; has features of both
226.1	garnet diopside Hf			high garnet content to 232.3. Argillaceous from 229.5-236.5
236.5	Tt			pale red-brown, calcite on fractures, veins, rock is weakly reactive; mineralized (cpy) near bottom
245.3	P.M. And			Andesite similar to that above. Rock is broken, vuggy, grades to lower contact
247.9	chloritic Hf			Intensely mineralized. 10-20% sulfides - cpy, galena, sphalerite. rk is porous, vuggy; Intense but irregular vertical fractures, mineralization, especially cpy, favors near vertical braids. RK is a chloritic Hf
254.9	"			As above. RK is soft, light green, argillaceous
262.6	"	cpy veins	65°	soft, light green, argillaceous to 267.5; hard, well mineralized to 272.8
272.8	mixed sed.			varies from tactite to marble to chloritic hf. Best mineralization in Tactite
279.5	Diop? Hf			mostly yellow green Hf. H 2.5, luster adamantine on fresh surface. weakly mineralized
286.8	Woll. Hf 286.8-293.8 Dp 293.8-297	Grn Gar wall contact @ 286.8	50°	Wollastonite Hf (f.gr.) Cut by one main Cpy-Sph. Vn which is bounded by diop + some Chlor.
293.8				Diop Hf following the dacite dike. Min in Hf is primarily along thin veinlets
299.4				Fine grained, dull lt gray-tan color. Min is controlled by very thin fracts.
302.1	Post Min ANDE 302.1-307.6	upper contact	75°	E-Med porphyry. Med-dk gray color. Cut by irregular calcite vns.
307.6	V. Dense Diop Hf 307.6	Sulf. seams	65°	V.f. grained Hf. Looks quite dense + unfavorable is sp'y reactive. Is cut by v. thin sulfs seams. Rk is rehealed Bx
317.6		Cavity 317-319		Hf as above. Rk has been stly shattered + re healed by calcite + sulfides. Bx. Min. ANDE Also grade.
326.6				Rk Continues to be as above. Some sulfs assoc. w/ thin qtz vns, others on broken fracts and others in [illegible]
335.2		Bedding (?T)	35°	V. f.gr + hard Hf. Thinly laminated (bedding?). Rk becomes more porous last few feet of run
347.7				V.f.gr + hard Hf. Much as above. Laminated. Rk is med brn-gry color + mottled on a small scale
356.6				As Above. Rk Continues to be broken + rehealed. Rk is v.v. hard. Silica (qtz) Content questionable. Sulfs primarily Qtz vn. controlled, but also dissem. assoc. w/ chlor + gar (?).
365.8				As Above. Rk is now + has been cut by numerous Calcite vns. Most sulfs are fract. controlled, but are sparse. The hole is being stopped here not because there is no more potential, but because it will be necessary to have more width on this zone before it could be presently economic.

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Note (3)
Tt - Tactite
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Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D292
Page 1 of 1 Pages
Collar Elev 2,803.85
Final Depth 231.0
Coords. N 35,935.30 E 15,614.18
Inclination VERTICAL
Logged by R.E.
Date: Start 1-8-67 Finish 1-11-67

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Unknown N.S.	Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb.	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0	5.1	5.1																																			
5.1	14.5	9.4		[illegible]				87	2.27					.03				ST	-	-	Tr							Tr	ST	<1	45	-		AK	leached		Gouge 12.5-14.5, ST & leached/weathered.
14.5	23.5	9.0		[illegible]				86	2.51					.03				ST	-	-	ST							wk	ST	<1	40	-			qtz stv	.80°	Broken and gouge. Hem stained fspars. leached suff veinlets
23.5	32.4	8.9		[illegible]				99	2.44					.03				ST	-	-	ST							md	wk	1	45	-			"	65-75	widely spaced veinlets.
32.4	41.8	9.4		[illegible]				95	2.49					.04				ST	-	-	ST							md	wk	1	45						As above. Gouge 39.5-39.5, ST hem staining at fspars
41.8	50.5	8.7		[illegible]				82	2.20					.03				ST	-	-	ST							md	wk	1	45	-			leached veins	80°	1" bands of silicification, sericitization along thin sulfide veinlets
50.5	59.6	9.1		[illegible]				88	2.50					.03				md	Tr	-	wk							md	wk	1	45	-			"	"	Alunite (?) filling fractures, less oxidation
59.6	68.3	8.7		[illegible]				98	2.43					.03				ST	-		md							md	wk	1	45	-			"	70-90	Increased oxidation, mod high initial sulfide content
68.3	79.7	11.4		[illegible]				94	2.48					.03				ST	-	-	ST							md	wk	<1	45	-			"	"	As above, st oxidation
79.7	89.0	9.3		[illegible]				90	2.43					.04				ST	Tr	-	ST							md	wk	<1	45	-			"	80°	leached veins up to 2" but widely spaced, short zones of remnant dis. py.
89.0	98.0	9.0		[illegible]				100	2.30					.03				ST			ST							md	wk	2	45	-			"	65-80	Vast hem/jum staining, leached veins becoming closer spaced
98.0	110.8	12.8		[illegible]				88	2.45					.05				ST	Tr	-	ST							md ST	md	1-2	45	-		AK 110.8	"	65-90	ST alt, st hem/jim staining, Remnant sulfides in qtz-ser zone from 106.7-109.7
110.8	120.0	9.2		[illegible]				92	2.40				.25	.05				ST	<1	-	Tr							ST	ST	<1	3	Tr		Mz 2 120.0 AK	contact 25.0° sulfides @ 118°		ST & tld porphyry with about 30° phenos in dark groundmass. Cu/Sa
120.0	139.4	9.4		[illegible]				90	2.43						.24	.02			1-2	-	-							wk	md	<1	40						Gouge obscures contact. py, c.c. dis and on fractures, wk-md alt.
139.4	139.0	9.6		[illegible]				96	2.47						.14	.04		-	2	-	-							wk	md	<1	40						As above, lack of veining
139.0	152.7	13.7		[illegible]				97	2.60						.20	.08		-	2	-	-							wk	md	<1	40						Small near vertical fault or shear with striations parallel to slip from 139.5/51.2
152.7	162.4	9.7		[illegible]				95	2.58				.01		.27	.08		-	2	-	-							wk	md	<1	40				veinlets	270°	As above, py, c.c. dis and in thin veinlets
162.4	171.2	8.8		[illegible]				97	2.58					.02	.80	.0		-	4	-	-							md	md	3	45				qtz-ser-sulf vein	55-70	st qtz-ser-sulf alt near top of interval, otherwise wk alt
171.2	180.3	9.1		[illegible]				94	2.63						.15	.05			1-2									wk	md	<1	45				"	80	wk alt, dis sulfides., Tr 2nd bi.
180.3	189.4	9.1		[illegible]				98	2.51						.28	.05			1-2									wk	wk	1	45				"	65	Gouge 181.5-181.8, sulfides mostly dis., some thin veinlets
189.4	198.4	9.0		[illegible]				97	2.57						.26	.08			2									md	wk	2	45				3/4" qtz vein	75	qtz vein with wk sulfides., wk-md alt.
198.4	204.5	6.1		[illegible]				86	2.57						.18	.07			1-2									wk	md	Tr	45						st Gouge: 202.2-203.2, wk mineralization
204.5	213.1	8.6		[illegible]				71	2.57						.15	.05			1-2									wk	wk	1	45				2/3 Tom Suff vein	60°	occasionally st c.c. in sulf veins
213.1	221.8	8.7		[illegible]				94	2.55						.30	.08			1-2									wk	md	wk	1	45			"	50°	Gouge 217.0-218.0. Aplite 218.8-219.2. wk c.c.
221.8	231.0	9.2		[illegible]				81	3.04						.18	.04			2-3									md	md	2	45				" "	60°	increase in qtz-ser veining but no significant increase in c.c.
						AVG. RECOV.		90%																													

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Note (3)
Tt - Tactite
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Qt - Quartzite
Bx - Breccia
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Mz - Monzonite
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Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D-293
Page 1 of 1 Pages
Collar Elev 2,900 72
Final Depth 249.5'
Coords. N 35,353 44
E 16,615 8
Inclination VERTICAL
Logged by N.R.N.
Date: Start 1-4-68 Finish 1-12-68

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu N S	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Var. non Sulf.	Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb.	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
Rk. B.T																																					
0.0	9.0	9.0																															Qtz Biot Mz				
9.0	18.6	9.6		0.11				89	2.52		0.06		0.02	0.03				Wk Wk	Tr									Tr Sp	Sp	2%	A%	Tr				Sparsely altd Biot. Mz. Tr Py. Biot is unaltd. Orig Biot. Pr. 5%. Not very 1/8" qtz-ser halos fract
18.6	28.8	10.2		0.05				85	2.52				0.01	0.04				Mod										Tr Sp	Wk	Tr	8%	Tr				Rx is variable. Rx is Mod weathered. P fields become stly altd to white waxy clay towards end of run
28.8	39.2	10.4		0.05				75	2.59				0.02	0.03				Wk										Tr	Wk		5%	Tr		Remarked Cu 39 Zone 31.3-32.6 Qtz-ser halos fracts		Many fo'ds. Contains du. 31.3 zone rather a granular rubble (Fgt?) similar to 1st slope granite Soil
39.2	48.3	9.1		0.06				92	2.52		0.01		0.01	0.04				Sp Wk										Tr Sp	Sp	Tr	8%	Tr Sp			70°	Rx is only stly altd on the whole, but is cut by the halos fracts w/ bn Lim borders
48.3	57.5	9.2		0.07				92	2.54		0.07		0.03	0.07				Wk Mod										Tr Sp	Sp Wk	Tr	2%					Rx is again variably altd. Lim & some limonite now thicker. Rx may be somewhat silicified
57.5	66.5	9.0		0.15				96	2.52					0.04	0.01			Wk	0.7%									Sp Wk	Mod St	3%	6%					St Alt + Mod qtz-ser variably Sp Py assoc. w/ qtz-ser valets. Only Tr C.P. Biotite Sudden, complete Alt. Also Fracts & Vns. High unaltd
66.5	71.6	5.1		0.02				95	2.46		0.01			0.01				Wk	Tr									Tr	St	2%	6%			Mod Fr. 736-74 Altered fracts 70° 74-76" w/ Lim. 70° 80° Qtz-ser halos fracts		St Alt Continues. Lim is very sparse end of Lt. yellow bro. color
71.6	84.4	12.8		0.10				91	2.49		0.06		0.02		0.02			Sp Wk	1%	Tr								Sp	Wk	4%	5%					Alt. Wk. Intermixed sulfides & Oxides. Halos fracts close spaced (inches). Tr sp C.P. assoc.
84.4	93.9	9.5		0.06				97	2.52		0.04			0.01	0.01			Wk	2%	Sp								Wk	Wk	12%	15%				85°	Mod Alt. St. Alt. Assoc. w/ close spaced 4th angled veins. Rx is still 60° leached
93.9	103.1	9.2		0.27				99	2.43		0.07			0.05	0.18	0.02		Sp Wk	3%									Wk Mod	Wk	3%	12%	Tr				As Above. Sulfs less leached. C.P. & Bnv. are now common on dissem Py. than Vn.
103.1	112.5	9.4		0.57			0.02	93	2.64		0.01		0.01		0.40	0.15		Sp	3%									Mod	Wk	12%	16%				90°	Very St qtz-ser. Halos of pyrite hard fracts. Halos 1/8" to 1" Thick
112.5	121.1	8.6		0.43			0.02	95	2.55		0.01			0.01	0.34	0.12		Sp	3%									Wk Mod	Wk	8%	12%				85°	As Above. Apparently CPY was dissem + not assoc. w/ Py vns
121.1	129.9	8.8		0.23				92	2.71		0.02			0.02	0.11	0.08		Wk	2%									Wk	Wk	5%	8%				90°	Decrease in intensity of Min fracts. CPY was v.f. gr. + well dissem, but v. sparse also
129.9	139.5	9.6		0.34				95	2.58		0.01		0.01		0.20	0.12		Sp	2%									Sp Wk	Wk	3%	6%					RK is still somewhat leached. Total Sulf. Ct. is low. still some C.P., but not as
139.5	148.2	8.7		0.30				97	2.56					0.01	0.19	0.10		Sp Wk	2%									Sp	Wk	1%	4%					As Above
148.2	158.0	9.8		0.24				93	2.54		0.02			0.01	0.15	0.06		Sp	1%									Sp	Wk		8%					As Above. Rather Wk altd Qtz Mz w/ an apparent high qtz. grad. Mass. Sulfs. v.f. gr. + well dissem.
158.0	167.2	9.2		0.13				91	2.47		0.03				0.08	0.02		Wk	3%	Sp								Sp Wk	Mod St	1%	8%					Mod-Stly. Alt'd. Goethite + some Jar. still present on fracts w/some well developed Bervsite
167.2	176.1	8.9		0.40		0.01		100	2.51		0.01				0.30	0.09		Wk	2%									Sp Wk	Mod	1%	6%	2%		Min Fracts	85° 90°	Mod-St. Alt. + as SS above. Mat (value) sulfs. Controlled by fracts + Fairly good C.P. locally
176.1	184.9	8.8		0.22	34.1 0.45	0.02	0.0	86	2.59		0.02				0.16	0.04		Wk Mod	1%									Sp	Sp	Tr	5%	2%				Wk Alt. sulfs. v.f. gr and + well dissem, but quite sparse. Min. lim still on fracts
184.9	193.4	8.5		0.76		0.01		74	2.76		0.01				0.50	0.25		Sp Wk	1%									Sp	Sp		5%	1%				Wk Alt, sp Lim, f.G. better developed on fracts + in dissem CPY, but not on Py.
193.4	202.3	8.9		0.42		0.01		100	2.59		0.01				0.21	0.20		Sp Wk	1%		Tr				Tr			Sp	Sp		3%	4%				Sp Alt. No significant wood v. Min fracts. Sp Sa. alt + wk Chlor Alt
202.3	211.0	8.7		0.29				96	2.63						0.15	0.14		Tr	0.2%									Tr Sp	Tr Sp		3%	3%				Rx is quite fresh appearing w/ minor oxides + Tr 2nd Orthoclase
211.0	219.7	8.7		0.20				95	2.63						0.08	0.12		Sp	0.8%						Tr			Tr Sp	Tr		3%	1%				Rx is quite fresh appearing, but may be somewhat altered. Sulfs. dissem. Increase in Lim
219.7	228.4	8.7		0.17				94	2.65						0.09	0.08			2%						Tr			Wk Sp	Sp Tr		5%	3%				Wk Alt. Increase in Py on fracts of varied dips. No CPY assoc + only Tr-Sp Sec
228.4	237.4	9.0		0.15				90	2.65						0.06	0.09			4%						Tr			Wk Wk	Wk		3%	4%				Mod Alt. wk-mod Min. in the grad mass. Alt is giving Rx a fuzzy Tex + Appears as though there is sp 2nd Orthoclase
237.4	245.0	7.6		0.20				93	2.66						0.10	0.10			3%						Tr			Wk Mod	Mod		3%	4%				Mod-St Alt. Tr-Sp C.P. still present, but skances for assay below Mill.
245.0	249.5	4.5		0.26				97	2.63						0.18	0.08			2%									Wk	Sp		4%					Wk Alt. Tr Sp C.P.
T.D.							Avg Recov.	92%																												

PRELIMINARY GEOLOGIC LOG

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ASARCO - SILVER BELL UNIT

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Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D294
Page 1 of 1 Pages
Collar Elev 2,863 40 Final Depth 366.3'
Coords. N 35,761 77 E 15,744 67
Inclination VERTICAL
Logged by RE
Date: Start 1-16-68 Finish 1-24-68

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Unknown N.S.	Cc.	Cpy.	Covell. Born	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0	10.0	10.0																																			Rockbit
10.0	21.0	11.0		.02				80	2.19					.02				ST	-	-	ST	-						wk	md	2	40	-	AK	cracked QTZ-SCR SULF vein	≈90°	ST alt., ST hem/lim staining, Gouge @ 180-18.5 otherwise ST hem staining
21.0	31.8	10.8		.03				77	2.58					.03				ST	-	-	ST	-						wk	wk	3	45	-		"	290°	Vertical leached vein w ½" lim bonded by QTZ-SCR from 290-35.0. A
31.8	41.7	9.9		.03				91	2.51					.03				md	-	-	ST	-						md	ST	wk	3	45	-		"	"	ST sericite along thin vertical veinlets
41.7	51.0	9.3		.02				95	2.40					.02				md	-	-	ST	-						ST	ST	<1	45	-				Aplite 44.5-44.6. Broken & Gouger, ST alt, ST sericite
51.0	60.0	9.0		.01				87	2.53					.01				ST	-	-	ST	-						VST	ST	1	45			leached veins	75-90	V.ST. Alt vertical veins filled with exotic limonite
60.0	69.3	9.3		.01				97	2.37					.01				md	-	-	ST	-						ST	mod ST	<1	45			"	≈90	Aplite 63.6-63.8. near vertical veining, ST hem staining
69.3	78.2	8.9		.02				90	2.32					.02				md	-	-	ST	-						md	VST	-	40			fractures(?)	40	vertical fractures filled with ¼" compact white gouge.
78.2	88.0	9.8		.01				96	2.53					.01				wk	05	-	wk							wk	md	Tr	45					wk oxidation with remnant dis. sulfides, wk alt.
88.0	96.6	8.6		.02				99	2.40					.02				md	-	-	ST	-						md	ST	Tr	45			fractures	80°	As above last interval, ½"-¾" gouge on steep fracture, ST hem staining
96.6	105.4	8.8		.01				92	2.33					.01				md	-	-	ST							wk	md	Tr	45			"	80	As above, less alt but stronger hem staining, fracs colored brick red
105.4	119.2	13.8		.01				98	2.43					.01				md	-	-	ST							wk	ST	Tr	45		AK 119.2-Aplite 119.9 AK	"	55-90	Hard dense gouge (¼") in fractures. Aplite separates oxides from sulfides
119.2	123.5	4.3		.09				84	2.49						.08	.01		-	1%	-								wk	wk	-	45			sulfides		ind alt, dis py & C.C.
123.5	132.4	8.9		.07				99	2.49						.06	.01		-	1%	-	-	-	-	-	-	-	-	sp	wk	-	35			V.Thin Halo'd Frac.	90°	wk Alt, sp total sulfs. Py some what disseminated, but C.C. mainly along fracs.
132.4	141.1	8.7		.06				77	2.48						.05	.01		-	3%	-	-	-	-	-	-	-	-	sp	wk Mod ZZ		35			Halo'd Frac.	80°	As Above. Increase in total sulf. + C.C. Content towards end of interval
141.1	150.2	9.1		.08				97	2.48						.07	.01		-	2%	-	-	-	-	-	-	-	-	sp	wk	Tr	35?					wk Alt. Low total sulfs sp C.C. on Py.
150.2	158.3	8.1		.50				86	2.41						.45	.05		-	4%	-	-	-	-	-	-	-	-	sp	wk	-	35?			S.G. 152-154' 157.2-158.3		Mod Alt, Increase in total sulfides and in C.C. around gouge zones
158.3	167.2	8.9		.34				95	2.54						.30	.04		-	3-4%	-	-	-	-	-	-	-	-	Mod ST	Mod	-	35?					ST. Alt Assoc w/ FLT zone continues to 160'. Total sulfs + copper content then decreases again
167.2	176.0	8.8		.53				83	2.42						.49	.04			2%										md	wk	-	40			Py vein ½"	80°	Gouge 170.5-171.1, mod-ST alt.,
176.0	185.6	9.6		.40				98	2.82						.35	.05			2%										md	wk	-	40			Scr-sulf veins	50°	C.C along scr-sulfide veins.
185.6	194.6	9.0		.54	873' @ 0.58			90	2.40						.49	.05			2										wk	wk	-	40			"	80°	As above - wk-mod alt & mineralization 199.5-201.0
194.6	203.3	8.7		1.03	Nil	.004		92	2.40					Tr	.93	.10			4										md	ST	-	40					Stly altd, brecciated & gouger. ST sulfides in breccia
203.3	211.4	8.1		.72				95	2.68						.64	.08			2										md	md	-	40			Scr-sulf veins	50°	broken and gouger, mod-ST alt
211.4	220.0	8.6		.59				89	2.40						.53	.05			3										ST	ST	2	40			QTZ-sulf veins	75	Stly altd & gouger. ST ser alt along QTZ veins
220.0	228.9	8.9		.70				99	2.47						.62	.08			2										md	ST	-	40					ST gouge to 227'. From 227-228.9 rock is mod stly altd, intact
228.9	237.5	8.6		.54				95	2.43						.49	.05			2										wk	wk	Tr	40			sulf veins	65°	wk alt. no gouge. sulfide veins near bottom of interval
237.5	246.8	9.3		.27				88	2.48						.17	.10			1										wk	wk	Tr	45			"	70°	wk alt, wk dis sulfides
246.8	260.5	13.7		.33				97	2.53						.23	.10			1										wk	md	1	45			QTZ sulf vein	70	Broken and gouger 256.0-260.5, otherwise wk alt
260.5	269.5	9.0		.36				98	2.51						.24	.12			1										wk	md	Tr	45			sulf vein	70°	wk-md alt, C.C. on dis py
269.5	278.3	8.8		.55				89	2.50						.40	.15			1-2										wk	wk	1	45			QTZ-sulf veins	70-75	As above, mod C.C on py, cpy in vertical stringers
278.3	287.8	9.5		.46	372' @ 0.41			88	2.54						.36	.10			2										wk	md	1	45			"	60	Broken & gouger 282.0-287.8. ST sulfides in broken rock
287.8	297.0	9.2		.44		.008		90	2.41					.01	.34	.09			2										md	ST	<1	45					Broken & gouger, sulfides in gouge
297.0	306.7	9.7		.45	0.02	.01		76	2.44					.01	.39	.05			1-2										md	VST	-	35?					gouge & ST alt
306.7	318.0	11.3		.36				98	2.42							.10	.26		1-2										wk	md	-	40					gouge ends @ 311.0, followed by wk alt, dis sulfides, mod C.C.
318.0	329.7	11.7		.37				99	2.44							.10	.27		2										wk	wk	1	45			QTZ Py vein	70°	alteration varies from wk-ST, ind thickness of C.C on dis py & cpy
329.7	339.2	9.5		.28				95	2.43							.08	.20		1										wk	wk	-	45			Py vein	75°	wk-mod alt, dis sulfides, thin C.C or covellite
339.2	347.6	8.4		.31				96	2.45							.08	.23		1										wk	wk	Tr	45			QTZ Py vein	30°	As above
347.6	356.1	8.5		.19				100	2.52							.09	.10		1										wk	wk	-	45					C.C. persists as thin coating on dis sulfides
356.1	366.3	10.2		.10				93	2.53							.03	.07		2										wk	wk	1	55					Vein QTZ & silicification 360.9-361.6, dis sulfides, wk C.C and/or cov.

PRELIMINARY GEOLOGIC LOG
(Subject to Revised Logging)

ASARCO- SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D-295
Page 1 of 1 Pages
Collar Elev. 2,923.95
Final Depth 450.0
Coords. N 35,678.67 E 18,112.71
Inclination VERTICAL
Logged by N.R.N.
Date: Start 1-12-68 Finish 1-24-68

Depth				% Cu				%		Cu (1)								Fe (2)					Other (2)											(3)	Structures (4)		
From	To	Int'vl	Elev.	Total	Avg.	NS	Avg	Core Recov	Sp. Gr.	Chrys.	Pitch	Black	Blue Green	Unknown N.S.	Cc.	Cpy.	Born	Lim.	Py	Mag.	Hem	Spec.	Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	Rock Type	Depth	True Dip	Remarks
0.0	7.0	7.0																ST	—	-	Inte	-	-	-	-	-	-	-	ST Inten	ST	Tr	25%	-				Rock Bit
7.0	20.3	13.3		.04				62	2.24					.04				ST	-	-	Int	-	-	-	-	-	-	-	ST Inten	ST	Tr	25%	-	Dp			Abundant, live limonite. INTENSE Alt. Rk is soft, highly sericitic and Hem stained. Identification of Rk only locally possible
20.3	50.0	29.7		.02				19	2.42					.02				Mod	-	-	ST	-	-	-	-	-	-	-	ST Inten	Mod	Tr	25%		Dp(?)			As Above. V.V. Poor Recovery. All that recovered are Marbel sized pebbles.
50.0	60.2	10.2		.45		.40		70	3.00				.45	(No visible sulfides)				Sp-wk	-	-	Tr	-	-	-	-	-	?	? 90%	wk	wk	Tr	25%		Tt @ 55.1	Sheared Contact @ 55.1'	35°	To 55.1' The rk is either an Intensely sericitized dp or quartzite. Rk is "sheared" to that point at which Tt appears. The Tt. is f. grained lt. Root Beer brown w/ MnO staining, Sp Tenorite + Malachite.
60.2	69.0	8.8		.97		.85		99	2.88				.20	.77?				Sp	-	-	-	-	-	-	-	Tr Sp	?	? 60%	-	Mod	-	Tr	Tr		MnO Cemented Bx 60.2-61.5		The GAR-Diop. of the Tt. is stly altd to "soft" dull + earthy rk which is still heavy. MnO + Chrys. still present
69.0	79.1	10.1		.56		.42		87	3.02		.20		.36					Sp	-	-	-	-	-	-	-	Wk	?	90%	-	Sp	-	Tr		Rk is Probably a Diop Hf Rather Than Tt			The rk is somewhat less softened and seems to be composed mainly of diopside. Sp Tenorite, Mal + MnO present
79.1	88.4	9.3		.29		.21		88	2.94		.10		.19					-	-	-	-	-	-	-	-	Sp	?	90%	-	-	-	2%	-		Brkn Zone 84-86.1'		Quite uniform Diop Hf. Speckled w/ MnO + has occasional vnlets of $MnCO_3$. Generally As Above
88.4	98.0	10.6		.87		.81		89	2.85		.20		.67					Sp	-	-	-	-	-	-	-	Sp	? 20%	60%	-	wk Mod	-	Sp			Tenorite vns 1/4-1/2" spacing	75°	Rk is structurally + chemically affected from 88.4-95.8. From 95.8' on rk is cut by close spaced Tenorite vns
99.0	108.5	9.5		1.00		.86		71	3.08		.10		.90					Tr	-	-	-	-	-	-	-	Sp wk	5%	10%	-	-	1%	? 50%		Dirty Qtzite (?) Hf			This interval looks like a dirty, high qtz hornfels + Gar + Diop intermixed w/ qtz. Cu Stained
108.5	118.5	10.0		.62	126.4' @ 0.73	.33	126.1' @ 0.50	79	3.00		.05		.47		.10	.05		-	Tr	-	-	-	-	-	-	wk	5%	70%	-	Sp	2%	5%		Diop Hf (Mottled)	Qtz-Sulf vn	85°	Rk is somewhat soft, but is composed primarily of diop woll Hf. Tr-Sp Cpy w/ Tr Py, Tr-Sp Py. MnO Sp.
118.5	127.9	9.4		.56		.18		92	3.12					Native 0.18	0.12	0.26		Tr	0.4%	-	Sp	-	-	-	-	Sp	1%	80%	-	Sp	4%	5%	3%	Woll-Diop Hf	End of Oxidation 122'		Rk is somewhat soft, but now is composed mainly of v.f.gr woll w/ sp Diop. Sulf seams bounded by Chlor.
127.9	137.1	9.2		.86		.08		97	2.88					Native 0.08	0.15	0.63		-	0.5%	-	Sp	-	-	-	-	Sp wk	Tr	90%	-	Tr	5%	6%	4%				Med. grained Xaline Woll-Trem Hf. Cut by frequent vns high + low angle qtz vns. Cpy mainly dissem [illegible]
137.1	146.8	9.7		.75		.18		82	2.95		0.08		0.02		0.35	0.36		Tr	0.8%	-	-	-	-	-	-	wk	4%	80%	-	Tr	1%	10%	5%	Silic-Diop GAR Hf; Woll Hf 146-151			Coarse Woll-Trem w/ mod assoc Chlor gives way to f. grained Hf @ 141'. Some Native Cu, but copper sulfides rare.
146.8	156.2	9.4		.62		.39		98	2.74		0.05		0.20	0.14	Tr	0.23		Tr	Tr	-	-	-	-	-	-	wk Mod	Tr	85%	-	Tr	-	-	6%	Woll-Diop Hf 154.8→	1" spaced 1/2" Qtz vns		F. to Med. woll Hf w/ v. sp sulfs to 146 Then rk becomes stly chloritic to 154.8 then f. gr. Lt. Tan Diop Hf.
156.2	165.9	9.7		1.06		.86		85	2.44		0.40		0.40	0.06		0.20		Sp	Tr	-	-	-	-	-	-	Mod	-	70%	-	-	2%	15%	4%	Dacite? 164-165.3		50°	F. grained Hf., mod hrdy. locally stly chlor. + locally stly MnO stained
165.9	176.4	10.5		1.12		.85		77	2.63		0.40		0.40	0.05		1.27		Sp wk	-	-	-	-	-	-	-	Tr	-	?	-	-	-	?	Sp	Silic Hf (?)	St. Bx. Zone 165.9-176.4; Bx 173.6	? 88°	Rk is stly Brkn + shattered. Rk is no reactive v.f. grained, v. Hard lt. grey-green. was probably a silic. silt. st.
176.4	186.1	9.7		.05				84	2.62		0.05							Tr	-	-	-	-	-	-	-	Tr	-	?	-	-	-	?	Sp				Rk remains stly Brkn + gougy. Rk is as above. looks v. much like a slightly felsic v.f.gr qtzite, but may be mainly Calc silicates
186.1	196.2	10.1		.04				84	2.59		0.04							-	-	-	-	-	-	-	-	Tr	-	?	-	-	-	?	wk		Bx zones	50°	As Above. Rk is Still Stly brkn + brecciated. Sp MnO Still present.
196.2	205.0	8.8		.06				92	2.63		0.01			0.02		0.03		-	-	-	-	-	-	-	-	Sp	-	? 80%	-	-	-	? Sp	wk				Rk is somewhat softer and more of an apple green color. It seems to be composed of calc silicates
205.0	216.0	11.0		.06				62	2.62					0.06				-	-	-	-	-	-	-	-	Tr Sp	-	? 80%	-	-	-	?	wk		1/2" Qtz vns	50°	Rk Continues to be stly shattered. Is As Above either v.f.gr qtzite or hornfels.
216.0	224.1	8.1		.06				98	2.60					0.06				-	-	-	-	-	-	-	-	Tr	-	?	-	-	-	?	wk				As Above
224.1	232.4	8.3		.07				93	2.64		0.03			0.04				-	-	-	-	-	-	-	-	Sp	-	? 8%	-	-	5%	?	wk Mod				Somewhat Chloritic Hf. Shows high angle somewhat contorted qtz + calcite stringers
232.4	247.1	14.7		.04				53	2.32					0.04				-	-	-	-	-	-	-	-	wk Mod	-	? 80%	-	-	5%	? 6%	wk				Rk is extremely Brkn + Granulated. High Core loss. Sp MnO, + No sulfs visible as above
247.1	257.2	10.1		.04				80	2.24					0.04				-	-	-	-	-	-	-	-	Sp wk	-	60%	-	?	-	-	? wk				Med. Grn Hf. somewhat soft, Extremely granulated flt. material
257.2	271.8	14.6		.02				56	2.33					0.02				-	-	-	-	-	-	-	-	Sp	-	? 30%	-	Mod	-	-	Sp wk				As Above. At 268' The material becomes more clayey (sticky) and of a pale yellow grn. Color
271.8	291.5	10.7		.08				42	2.17		0.02			0.06				-	-	-	-	-	-	-	-	Sp	-	?	-	Mod ST	-	-	Mod				There has been a rk change at 269'. The rk now although brecciated + granulated is a v.f. grained drk grey-green. May be similar to what we called biotized rx in [illegible] pit. Possibly intrusive
291.5	300.5	9.0		.04				85	2.55					0.04												SP	Tr	?	-	ST	-	-	md	Bx			breccia c̄ gouge, wkly acid reactive.
300.5	309.8	9.3		.07				83	2.59					0.07												md	Tr	?	-	ST	-	-	md	Bx-Hf			Gouge with short intervals of lim stained recrystallized Hornfels.
309.8	319.2	9.4		.06				88	2.31					0.06												md	-	-	-	ST	-	-	md	Bx			Breccia and gouge
319.2	332.1	12.9		.05				70	2.38					0.05				-	-	-	-	-	-	-	-	Sp wk	-	-	-	ST	-	?	Mod				Angular f.gr. chlor frags suspended in white gouge.
332.1	341.6	9.5		.04				78	2.41					0.04				-	-	-	-	-	-	-	-	wk	-	?	-	ST	-	?	Sp				ST Gouge + Bx Lt yellow-cream color
341.6	351.9	10.3		.06				91	2.30					0.06				Tr	-	-	-	-	-	-	-	wk Mod	-	-	-	ST	-	4%	Sp				Bx Continues, sp Copper pitch
351.9	361.7	9.8		.14				86	2.68					0.02		.12		Tr	-	-	-	-	-	-	-	Tr	-	?	-	Sp	1%	? 15%	Sp	Drk Non Lmy Hf @ 351.9			Rk is v.f. grained, drk grey-black, seems to have either drk calcium silicates or biotite w/ qtz
361.7	370.9	9.2		.10				87	2.67					0.02		.08		wk	-	-	Tr	-	-	-	-	-	-	?	-	Sp	Tr	?	Mod				As Above. Rk is brkn, but not a breccia
370.9	383.2	12.3		.47		.11		79	2.58					0.11		.36		Sp	0.2%	-	-	-	-	-	-	Mod	Tr	wk	Sp	Mod	1%	?	wk Mod	Bx			Bx + Gouge composed of Calc. Silicate Hf, siltstones + blk. gr. Rk. Mod grn CuO Stain
883.2	391.8	8.6		.30		.05		96	2.54					0.05		.25		Tr	Tr	Tr	-	-	-	-	-	wk	-	60%	-	Sp	Tr	?	Sp	Calc Silicate Hf			Lt grey-tan somewhat limy Hf. becomes mainly diopside towards end of interval.
391.8	399.6	7.8		1.04		.03		85	2.93					0.03	0.20	.31			4%	4%	-	-	-	-	-	wk	-	60%	-	gouge	-	-	Sp				Gd min. Best sulfs seen in hole. Mag assoc w/ Cpy + Py. Concentrated close to Da contact
399.6	412.0	12.4		.07				81	2.61							.01		Tr	Tr	0.6%	-	-	-	-	-	Tr	-	-	-	-	-	12%	Sp	Da @ 399.6			The dacite has 8% Bio-Chlor. Some of the biot. appears to be secondary. Mag is dissem
412.0	420.8	8.8		.08				95	2.62							.08		Tr	-	-	-	-	-	-	-	Tr	-	-	-	-	1%	18%	-				The Dacite shows numerous Xenoliths. Has a high Bio. Content. Mz may be present @ 419.5'
420.8	430.0	9.2		.10				96	2.65							.10		Tr	-	0.6%	-	-	-	-	-	Tr	-	-	-	Tr	1%	20%	Tr	Mz @ 435.3'			Transition to Mz is quick, but difficult to pin down. Mz is similar to the Recent Mz Stock by Union Hill
430.0	439.0	9.0		.06				95	2.61							.06		Tr	-	0.2%	-	-	-	-	-	-	-	-	-	Tr	Tr	18%	Sp	Dp @ 433.9'; Mz @ 442			Return to Dp which is unaltered. Sp MnO on fracts + sp green Cu staining
439.0	450.0	11.0		.07				71	2.61							.07		-	Tr	Tr	-	-	-	-	-	Tr	-	5%	-	-	-	15%	Tr	Hf @ 446.			Rks. wkly Altd. Hf. stly brecciated. No Ore

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D-296
Page 1 of 1 Pages
Collar Elev. 2,903 37
Final Depth 92.7'
Coords. N 39,429 32 E 18,936
Inclination VERTICAL
Logged by N.R.N.
Date: Start 1-24-68 Finish 1-25-68

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Un known	NS	Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE		(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0.0	7.0	7.0																	MW ST N.I	Tr	Tr	Sp	-	-	-	-	-	-	Tr Sp	Tr Sp	2%	25%	Tr					Rock Bit. - NOT RECOVERED
7.0	17.9	10.9		.03				79%	2.53						.03				ST	Tr	Tr	Sp	-	-	-	-	-	-	Tr Sp	Tr Sp	3%	25%	Tr	Gyp Tr	Da			Dacite is laden with xenoliths. Gnd mass is fresh appearing w/all mainly along numerous fracts
17.9	28.0	10.1		.07				87	2.58						.07				Wk	Tr	-	Tr	-	-	-	-	-	-	Tr Sp	Tr Sp	6%	20%	Tr	Gyp Tr				Sp Alt except along fracts. Gnd mass black. Fracts are hair line, but have thin lim + bounded by v. thin halo of silic. + bleaching. Lim mainly Goethite.
28.0	37.9	9.9		.02				78	2.55						.02				Wk	Tr	-	Tr	-	-	-	-	-	-	Tr	Tr Sp	5%	28%	Tr	Gyp Tr		Qtz. Vns 55°		As Above. Py is mod-sly bkn from 34.5 on.
37.9	47.2	9.3		.07				40	2.59						.07				Wk	Tr	-	-	-	-	-	-	-	-	-	Sp	-	2%	Wk		Synod drill 38.5'			Sp-Wk Alt. Slight clay develop in felds + slight chlor of Bxs. Rx cd by high angle This wk zone
47.2	56.4	9.2		.08				90	2.62						.04	.02	.02		Wk	0.8%	Tr	Tr	-	-	-	-	-	-	Pp Wk Sp	-	Sp	3%	5%	Wk	Gyp Tr	Da Bx 56.4'-56.5'	Fracts 20-60°		Wk Sil'n, wk development of epidote. Tr Py, cc + Tr-Sp M.
56.4	65.8	9.4		.11				96	2.52					.02	.05	.04	.02		Wk	1%	-	Sp	-	-	-	-	-	-	-	Sp	Wk Mod	3%	5%	Sp		Sp 56.2'			Wk-Mod Alt. Intermixed Sulfides + Oxides. Tr Qtz, local sil'n. Py. well dissem + veing
65.8	74.5	8.7		.09				91	2.49						.05	.02	.02		ST Jar	3%	-	-	-	-	-	-	-	-	-	Wk	Mod	5%	8%	Wk			Rx S.G. 68.5-72'		ST. Silicified Bx. ST Jar in Fet zone.
74.5	82.7	8.2		.24				96	2.61						.05	.14	.05		Tr	1%	-	Tr	-	-	-	-	Tr	-	Pp Wk 2% Tr	Sp Wk	-	2%	Mod					Alt-Wk-Mod, Bxs Area to chlor, wk clay develop in felds. 1% Hem after Mag (?)
82.7	92.7	10.0		.11				92	2.69							.04	.07		-	3%	-	Tr	-	-	-	-	-	-	Sp Wk 2%	-	Wk Mod	Tr	Tr	Mod					Mod-ST Alt. Well dissem + some vnd. Py. Tr cc. Tr Qtz
E.O.H																																							This Hole was stopped and the rig moved to miss the Syenodiorite Dike. This area is being drilled to determine whether paleozoic seds. underlythe dacite in this Area.

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO- SILVER BELL UNIT

Note (3)
Tt - Tactite
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Qt - Quartzite
Bx - Breccia
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Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D 297
Page 1 of 1 Pages
Collar Elev 2,990[33] Final Depth 392.9'
Coords. N 35,348[55] E 16,451[74]
Inclination VERTICAL
Logged by RE, NRN
Date: Start 2-1-68 Finish 2-12-68

Depth From	Depth To	Int'vl	Elev.	% Cu Total	Avg.	NS	Avg	% Core Recov	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Unknown NS	Cc.	Cpy.	Covellite Born
0	13.9																
13.9	22.6	8.7		.10				84	2.53					.10			
22.6	31.2	8.6		.07				92	2.33				.02	.05			
31.2	48.1	16.9		.06				40	2.52					.06			
48.1	58.3	10.2		.03				68	2.47					.03			
58.3	69.7	11.4		.04				94	2.52					.04			
69.7	77.0	7.3		1.33		.05		94	2.40					.05	1.23	.05	
77.0	85.8	8.8		2.69		.11		99	2.45					.11	2.53	.05	
85.8	90.5	4.7		1.49		.05		95	2.40					.05	1.39	.05	
90.5	102.7	12.2		.04		x		96	2.53						.04		
102.7	112.0	9.3		.14		.01		94	2.59					.01	.12	.01	
112.0	120.4	8.4		1.44		.03		88	3.07					.03	1.34	.07	
120.4	129.4	9.0		4.65		.04		100	2.56					.04	4.11	.10	.40
129.4	137.5	8.1		.54		.02		89	2.49					.02	.50	.02	
137.5	146.5	9.0		.64		.01		98	2.40					.01	.63		
146.5	159.3	12.8		.83		.05		98	2.47					.05	.75	.03	
159.3	164.4	5.1		.16				86	2.47					.02	.11	.03	
164.4	172.9	8.5		.19		.02		89	2.59					.02	.75	.32	
172.9	181.6	8.7		.65		Nil		93	2.57				.02		.61	.02	
181.6	189.3	7.7		.71		.02		89	2.28					.02	.59	.10	
189.3	198.6	9.3		.82		.01		85	2.51					.01	.73	.08	
198.6	206.6	8.0		.37		.01		97	2.53				.01		.31	.05	
206.6	214.7	8.1		.40		Nil		98	2.55						.32	.08	
214.7	223.8	9.1		.49		.01		98	2.59					.01	.38	.10	
223.8	232.0	8.2		.26		Nil		98	2.54						.21	.05	
232.0	241.2	9.2		.25				97	2.62						.17	.08	
241.2	250.2	9.0		.16				98	2.54						.08	.08	
250.2	258.7	8.5		.23				91	2.57						.13	.10	
258.7	267.3	8.6		.44		Nil		97	2.57						.34	.10	
267.3	276.0	8.7		.25				97	2.61						.15	.10	
276.0	284.7	8.7		.18				99	2.60						.13	.05	
284.7	293.7	9.0		.18				96	2.54						.13	.05	
293.7	301.9	8.2		.08				89	2.58						.05	.03	
301.9	310.4	8.5		.23				96	2.57						.07	.16	
310.4	319.5	9.1		.30				94	2.57						.14	.16	
319.5	327.7	8.2		.18				89	2.57						.06	2	
327.7	336.9	9.2		.11				90	2.63						.02	.09	
336.9	345.1	8.2		.11				98	2.50						.02	.09	
345.1	354.3	9.2		.24				98	2.53						.14	.10	
354.3	366.0	11.7		.18				83	2.62						.06	.12	
366.0	377.5	11.5		.16				92	2.53						.04	.12	
377.5	384.9	7.4		.29				[illegible]							.17	.12	
384.9	392.9	8.0		.16											.06	.10	
	EOH																

From	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip
0																			
13.9	md	-	-	md				Tr				wk	md	2	30	Tr	AK/MZ 17.5	Leached Veins	75°
22.6	md	-	-	wk								wk	md	-	10	Tr			
31.2	md	-	-	wk								wk	md ST	Tr	10	1	MZ/AK 47.4		
48.1	ST	-	-	ST								md	ST	3	40	Tr		leached veins lim filled fracts.	75°-90° 30°, 90°
58.3	ST	-	-	wk				Tr				wk	md	1	60	-			
69.7	md	5	-	ST	15							md	V. ST	-	30	md			
77.0	ST	5	-	ST	20							md	v.st	-	20	md			
85.8	md	5	-	ST	20							md	ST	-	10	wk			
90.5	md	Tr	-	md	-							ST	md ST	25	60	Tr		Quartz veins	80-90
102.7	wk-Mod	0.3%	-	Mod	-	-	-	-	-	-	-	-	ST-Inter	17.	45%	-			
112.0	Sp	20%	-	Tr	Tr	-	-	-	-	-	-	-	Inter	Tr	20%	-		Pebble Bx Dike 120.9-121.6	55°
120.4	wk	10%	-	Sp	-	-	-	-	-	-	-	WK	ST Inter	-	15%	-			
129.4	wk-Mod	5%	-	Mod		-	-	-	-	-	-	sp?	Inter	-	5%			Brxn & Gxy zone 131-136.5	
137.5	wk Mod	4%	-	Mod	-	-	-	-	-	-	-	? Mod	ST	2%	?		AK		
146.5	wk Mod	8%	-	wk	-	-	-	-	-	-	-	ST	ST	6%	?		Mz 149.4? 152	ST fat zone 149.8'-	
159.3	wk	2%	-	-	-	-	-	Tr	-	-	-	ST	ST	5%	6%				
164.4	wk	1-2	-	Tr								md	ST	1%	3	-			
172.9	wk	3	-	-				Tr				md	md	<1	5	Tr		Py Vein	70°
181.6	wk md	1-2	-	-								ST	ST	<1	3	Tr			
189.3	Tr	3-4	-	-								ST	md	5	10	Tr		sulfide veins	70-90
198.6	Tr	3-4						0.2?				ST	md	10	15	Tr		1" qtz sulfide v.	70-90
206.6	Tr	3-4						0.2?				ST	md	8	12	Tr		"	"
214.7	-	5						-				ST	wk md	5	10	Tr		qtz sulfide v.	70-90
223.8	-	10						-				ST	md	2	10	Tr		Py veins	60-90
232.0	Tr	6						0.2?				ST	md	2	8	md		Py-c.c.-moly v.	70°
241.2	Tr	4						-				ST	md	2	8	md		sulfide, sericite veins	80°
250.2	-	3-4						0.3?				ST	md	4	10	md		qtz-py moly v.	70°
258.7	-	4						Tr				ST	md	3	10	md		sulfide veinlets	70-90
267.3	-	4						Tr				ST	md	4	10	md		"	90
276.0	-	4						Tr				md ST	md	2	8	md			
284.7		4						-				md	md	Tr	6	md			
293.7		4						Tr				md	md	1	8	md			
301.9		6						-				md	md	Tr	6	md		Joints & Fracts.	90°
310.4		5						-				md	md	1	8	md			
319.5		6						Tr				md	md	Tr	6	md			
327.7		5						0.3?				md	wk	1	10	md		qtz-moly vein	60°
336.9		3-4						Tr				md	wk	3	13	md			
345.1		4?						-				md	ST	<1	6	md		min fractures	≈90°
354.3		3-4						Tr				md	md	3	10	md		qtz-sulfide veins	70-90
366.0		3-4						Tr				md	md ST	3	12	md		"	"
377.5		2-3						Tr				md	md	2	10	md			
384.9		3-4						Tr				md	ST	1	6	md			

From	Remarks
0	Fill.
13.9	ST alt., chlor-serp. in MZ. Hem staining stronger in MZ
22.6	Broken and alt. MZ w/ blue-green Cu minerals on fractures.
31.2	st'ly altd, & gougey. Broken - high coreless.
48.1	VST alt. live limonite in thick veins 43.5-53.3. Broken, mdly gougey
58.3	wk-md alt, & silicification.
69.7	Intense alt, py & spec in massive disseminations. F spars altd to clay. possible 2ndary kspar ^ ST C.C. on py.
77.0	Massive spec, hem, py. to 81.0, followed by gouge & intense alt.
85.8	As above, massive hem ends about 88.5.
90.5	steeply dipping thick quartz veins. st sericite adjacent to veins. Thoroughly oxidized except for trace of remnant py in qtz. live lim. cavities.
102.7	Rx is st'ly ALTD, But felds have all been altd to a hard white clay w/ no apparent ser.
112.0	EXTREEMLY UNUSUAL - Feld altd to v. hard clay(?) Qtz Genies Are being replaced by Pyrite - in Places Completely. Py is Aggregate. st C.C. coats Py + Fragts. C.C. is quite Black.
120.4	Pebble Dike Has Frags. Mz. + Ak. - Contacts between Sc Sulf - No Qtz and Remnant Qtz - No Py. Ak are very sharp. Degree of replacement of Py By C.C. varies from nil to nearly complete.
129.4	Brxn zone is strongly leached of Sulfs. Rx is As Above, but less CC.
137.5	Intermixed leached + unleached rk. Grnd mass is uniformly white + may have quite a bit of intermixed qtz + ser as well as clay
146.5	ST gouge from 152.8-158. Preceded + followed by brxn rk w/ a pre flt qtz vn cutting it. C.C. Appears to be of Mz
159.3	St'ly altd Mz. Contains v. little py, but some C.C. - Cut by thin ser-qtz seams.
164.4	Broken and gougey; st gouge 164.3-168.8; 171.6-173.5 mixed sulfides & limonite
172.9	wk oxidation, cc. & CuSO4 on fractures, Thick cc on dis py, cpy, md st alt
181.6	Gouge: 186.5-188.3. Blue-green nonsulfides. some st cc. in solid rk.
189.3	numerous steep sulfide veinlets, st alt, st cc, bi altd to hydromica
198.6	As above except for stronger oxidation of some veins and more moly in the thickest (1") veins undergoing oxidation
206.6	As above. Thick, sometimes vuggy QTZ veins and smaller sulfide veins
214.7	As above, with st dis py & cpy in addition to veins.
223.8	Interval from 227.5-228.8 has 25-35% py in steep veins, st alt
232.0	Py-c.c.-moly in steep veins, st alt.
241.2	occasional large blebs of cpy., st alt., cc continues st.
250.2	Pervasive sericite alt, large blebs of moly along walls of ½" qtz vein (70°)
258.7	sulfides dis., in steep stringers, and in thick qtz-py-moly veins, st cc.
267.3	Thin vertical sulfide stringers cut thick qtz-moly veins.
276.0	As above, Total sulfides >5%, wk cc, slight decrease in alt.
284.7	Sulfides dis. and in steep stringers, md alt.,
293.7	md-st alt., shear set dipping 85°. Chlor. - serp. along fractures and MZ 10% sulfides. Overall md-st alt.
301.9	Pebble dike, 1½" wide, 70°, 304.7-305.1. Contains fragments of QTZ
310.4	5-8% Total sulfides, but c.c. appears to be thinning. mdly broken
319.5	As above, st alt, Total sulf >5%, md sil, wk c.c. development
327.7	Broken but not gougey, md alt, high total sulf, wk c.c.
336.9	As above, highly broken, md alt., little c.c.
345.1	Vertical mineralized shears with post-min movement, otherwise wk cc on steep
354.3	5% Total sulfides in dis, veins & stringers, ≈1% cpy with wk uniform c.c
366.0	As above, dis moly, mdly brkn & gougey.
377.5	brkn; st'ly altd, sulfides on fracts, wk c.c.
384.9	Broken, brecciated & gougey, Breccia fragments up to 1"

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO- SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D-298
Page 1 of 1 Pages

Collar Elev. 2,903.27
Coords. N 39,446.07 E 16,925.03
Final Depth 90.1
Inclination VERTICAL
Logged by N.R.N
Date: Start 1-26-68 Finish 1-27-68

Depth From	Depth To	Depth Int'vl	Elev.	% Cu Total	% Cu Avg	% Cu N S	% Cu Avg	% Core Recov.	Sp Gr.	Cu (1) Chrys.	Cu (1) Pitch	Cu (1) Black	Cu (1) Blue Green	Cu (1) Non Sulfide	Cu (1) Cc.	Cu (1) Cpy.	Cu (1) Born	Fe (2) Lim.	Fe (2) Py	Fe (2) Mag.	Fe (2) Hem.	Fe (2) Spec.	Other (2) Galena	Other (2) Sphal.	Other (2) Molyb	Other (2) Calcite	Other (2) Garnet	Other (2) Silicates	Other (2) Sericite	Other (2) Clay	Other (2) Vn. Qtz.	Other (2) QUARTZ	Other (2) CHLORITE	(3) Rock Type	Structures (4) Depth	Structures (4) True Dip	Remarks
0.0	7.0	7.0																Wk Mod Str	-	-	Wk Mod	-	-	-	-	-	-	-	Wk Mod	Wk Mod	2%	2%	-				Rock B.T. - Not Recovered
7.0	14.5	7.5		.04				81	2.39						.04			Str Str Wk	-	-	Wk Mod	-	-	-	-	-	-	-	Wk	Wk Mod	2%	2%		Dp			Mod A.T., numerous solf. cavities. Dp has numerous plag eyes + xenos
14.5	25.0	10.5		.03				79	2.64						.03			Mod Str Wk	Tr	-	Sp Wk	-	-	-	-	-	-	-	Wk	Mod	4%	28%			Fst. Gtz 22'-27'		Mod-str A.T., mod-lok development on fracts. Rk is locally a rebedded Bx.
25.0	35.3	10.3		.05				82	2.46						.05			Str Mod Str	-	-	Tr	-	-	-	-	-	-	-	Wk	Str	-	?		Sp Sure 31'	Str Fst Zone 37'-56' 66' 43'-45'		Rk is str-Intens A.I.D. - Approaches fft zone. Contact w/ Sp Obscure - highly altd.
35.3	44.1	8.8		.07				100	2.22						.07			Wk	-	-	-	-	-	-	-	-	-	?	Intens	-	-	-					Intens A.T., Rk is 3ft bicks + probably fft. gg. mdcrd.
44.1	54.1	10.0		.11				76	2.56						.11			Mod	-	-	-	-	-	-	-	-	-	-	-	Str Intens	-	Str					Str Intens alt. - Str lx yellow-orang - staining of clays
54.1	63.0	8.9		.22				95	2.59						.05	.10	.07	Wk	1-2%	Tr	1%	-	-	-	-	-	-	3%	Tr	Wk	-	2%	Wk Mod	Sp Sp	Sulf. Cum 66'			Sp tes becomes distinct. Py v.f.gr. well disem. Disem then alter. Mag (?) also. Epitaxial growths
63.0	72.8	9.8		.17				87	2.72						.03	.07	.05	Wk	5%	-	1%	-	-	-	-	-	-	3%	-	Wk	-	3%	Mod	Sp Gtz			Most. Py now on fracts, Tr. c.c. Present - No cpy seen. Rock Lm + better assay w/ Py
72.8	81.3	8.5		.13				97	2.70							.07	.06		Tr	3%	1%	-	-	-	-	-	-	1%	Qtz Wk Mod	-	Sp	-	2%	Mod Str	Gtz Sp			Wk A.T. Sulfs well disem + on fracts - No visible Cu minerals.
81.3	90.1	8.8		.11				97	Sf'							.05	.06	Wk	3%	-	-	-	-	-	-	-	-	1%	Qtz Mod	Sp	-	2%	Mod Str	Gtz Sp			As Above except c.c. is now visible.

PRELIMINARY GEOLOGIC LOG
(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Note (3)	Note (4)
Tt - Tactite	V - Vein
Hf - Hornfels	F - Fault
Mb - Marble	D - Dike
Qt - Quartzite	C - Contact
Bx - Breccia	Ig - Undif igneous
Da - Dacite	
Mz - Monzonite	
An - Andesite	

Hole No. D-299
Page 1 of 3 Pages
Collar Elev 2906.35 Final Depth 911.4'
Coords. N 39,333.93 E 18,818.47
Inclination VERTICAL
Logged by N.R.N.
Date: Start 1-27-68 Finish 2-21-68

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov	Sp. Gr.	Cu (1) Chrys.	Cu (1) Pitch	Cu (1) Black	Cu (1) Blue Green	Cu (1) Oxy. Non-Sulfs.	Cu (1) Cc.	Cu (1) Cpy.	Cu (1) Born	Fe (2) Lim.	Fe (2) Py	Fe (2) Mag.	Fe (2) Hem	Fe (2) Spec.	Other (2) Galena	Other (2) Sphal.	Other (2) Molyb	Other (2) Calcite	Other (2) Garnet	Other (2) Epidote Silicates	Other (2) Sericite	Other (2) Clay	Other (2) Vn. Qtz	Other (2) QUARTZ	Other (2) CHLORITE	(3) Rock Type	Structures (4) Depth	Structures (4) True Dip	Remarks
0.0	7.0	7.0																																			Rock Bit Sample not Recovered.
7.0	18.7	11.7		0.01				69	2.54					0.01				wk	-	Tr	Mod	-	-	-	-	-	-	-	Sp	Sp	Tr	20%		Dp	Fracts 30°-75°		wkly Argo, Mod-stly Argld. Thin Lim along haloed fracts.
18.7	30.0	11.3		0.03				71	2.42		0.01			0.02				wk	-	-	Mod	-	-	-	-	-	-	-	Sp Wk	Sp	Tr	25%					Rk looks like a Rehealed Shatter Bx. There has been no differential movement of frags, but rk is composed of 1" diameter frags. bounded by thinly haloed fracts
30.0	40.6	10.6		0.06				74	2.50		0.03			0.03				wk	Tr	-	wk	-	-	-	-	-	-	-	wk	wk	Sp	20%			36.31'-42.6'		Rk stly brkn, fractd + gg. Mod sil'n + ser haloing around many fracts
40.6	50.4	9.8		0.05				81	2.56		0.02			0.03				wk	0.5%	T	-	0.03%	-	-	-	-	-	-	Tr Sp	Sp	Sp	25%		Inter Mixed sulfides + haloed			wkly altd dacite porphyry. Sp specularite dissem. & Py along minute irregular fracts. Tr cc on fracts
50.4	59.1	8.7		0.09				87	2.55		0.01			0.01	0.07			Sp	0.5%	Tr	-	0.03%	-	-	-	-	-	-	Tr	Tr Sp	-	25%	Tr				sply altd dp. Fracturing much decreased. minor haloing. Tr-sp PY, Tr c.c.
59.1	68.7	9.6		0.09				88	2.56		Tr		Tr	0.02	0.07			Tr Sp	0.3%	-	Tr	0.2%	-	-	-	-	-	-	Tr	Tr	-	20%	Tr Sp				sply Altd. Numerous xenos. Specularite-mag. xls altering to hem. Vitreous cc. coat present.
68.7	78.0	9.3		0.08				98	2.65		Tr			0.01	0.06	0.01		Sp	0.3%	Tr	Tr	0.2%	-	-	-	-	-	Epidote Tr	-	Tr	-	25%	Tr Sp				Rk wkly fractd. Brn Lim on unhealed fracts. Thin c.c. on Py. v. minor haloing of fracts.
78.0	87.5	9.5		0.06				95	2.68		-			0.02	0.04	Tr		Tr	0.8%	Tr	-	Tr	-	-	-	-	-	-	-	Tr	Tr	25%	Tr		Thinly Haloed Fracts	70°	As Above. Py mainly on fracts. Rk pretty solid
87.5	97.4	9.9		0.04				92	2.73					0.02	Tr	0.02		Sp	[illegible]%	Tr	-	Tr	-	-	-	-	-	-	Sp	Tr	2%	25%	Tr				Rk more fractd. mineralized + altd. More Haloing. Increased Lim on fracts.
97.4	106.1	8.7		0.02				98	2.65					0.01	Tr	0.01		Sp	2%	Tr	-	Tr	-	-	-	-	-	-	Sp	Tr	1%	25%	Tr		Haloed + Py lined Fracts	40°-60°	Increase in mineralized fracts - 3 in spacing. Grnd mass still dk + fresh appearing,
106.1	115.0	8.9		0.04				93	2.60		Tr			0.03	Tr	0.01		Tr	1%	Tr	-	Tr	-	-	-	-	-	Epidote Tr	Sp	-	2%	25%	Tr		Qtz-Ser Haloed Fracts	40° + 60°	Sp alt. except along fracts. Fracts lined w/ Py, but no CPY or cc. seen
115.0	124.6	9.6		0.02				90	2.66					0.01		0.01		-	0.5%	Tr	-	Tr	-	-	-	-	-	Tr	Tr	Tr	Tr	20%	Tr		Flt. Zone 112.3-115		Fresh + hard Dp
124.6	134.0	9.4		0.06				100	2.55					0.01	Tr	0.05		-	0.3%	Tr	-	Tr	-	-	-	-	-	Tr	Tr	Tr	Tr	20%	Tr				Fracts wide ~~spaed~~ spaced. Almost no dissem sulfs,
134.0	142.9	8.9		0.05				98	2.67						Tr	0.05		-	0.3%	Tr	-	Tr	-	-	-	-	-	Tr	Tr	Tr	Tr	20%	Sp				As Above
142.9	156.5	13.6		0.04				60	2.83					0.01		0.03		-	1%	Tr	-	Tr	-	-	-	-	-	Sp	Sp	Tr	1%	25%	Sp		Haloed Fracts		Rk is wk-mod brkn, vnd. + sply altd.
156.5	164.9	8.4		0.03				95	2.69							0.03		-	1%	Tr	-	Tr	-	-	-	-	-	Sp	Tr Sp	Tr	Tr	25%	Sp			40° + 70°	As above
164.9	173.2	8.3		0.05				95	2.67							0.05		-	0.5%	Tr	-	-	-	-	-	-	-	Tr	Tr	-	Tr	20%	Tr				Fresh except for few fracts w/ qtz-ser halo. Tr epidote
173.2	181.6	8.4		0.06				96	2.65							0.06		-	2%	Tr	-	Tr	-	-	-	-	-	Tr	Sp	Tr	2%	25%	Tr				Rk wk-mod fractd + rehealed w/ Py, qtz-ser along fracts. Generally as above
181.6	191.6	9.4		0.06				88	2.67							0.06		-	2%	Tr	-	Tr	-	-	-	-	-	Sp	Sp+	Tr	Sp	23%	Tr		Haloed Fracts	40° + 76°	Increase in density of haloed fracts. + min. Halos to ½" Thick. Intermediate Rk still Fresh
191.0	200.2	9.2		0.04				94	2.62							0.04		-	1%	Tr	-	-	-	-	-	-	-	Sp	Tr Sp	Tr	Sp	23%	Tr				More Brkn, but less vnlets. Numerous Sed. or + Pinkd(?) xenos in dacite
200.2	210.0	9.8		0.04				93	2.75							0.04		-	2%	Tr	-	-	-	-	-	-	-	1%	Tr Sp	Tr	Sp	23%	Sp				More pervasive alteration spreading out from py lined fracts.
210.0	218.3	8.3		0.06				97	2.68							0.06		-	+1%	Tr	-	-	-	-	-	-	-	Sp	Tr Sp	Tr	Tr	20%	Sp		Flow Structure ?	50°	Fresh dacite w/ sp epidote. Xenos common
218.3	227.3	9.0		0.04				98	2.65							0.04		-	1%	Tr	-	-	-	-	-	-	-	Sp	Tr Sp	Tr	Tr	20%	Tr		Fracts	25° + 60°	As Above
227.3	236.2	8.9		0.04				98	2.67							0.04		-	1%	Tr	-	-	-	-	-	-	-	1%	Sp	Tr	4%	25%	Tr				Numerous haloed fracts lined w/ py.
236.2	245.8	9.6		0.04				91	2.67							0.04		-	1%	Tr	-	-	-	-	-	-	-	1%	Sp	Tr	4%	25%	Tr				Rk is locally moderately altd. There has been core loss in brkn material of this interval
245.8	255.0	9.2		0.05				87	2.65							0.05		-	2%	Tr	-	-	-	-	-	-	-	1%	Sp	Tr	4%	25%	Sp				As Above. Py well developed on fracts
255.0	263.1	8.1		0.04				96	2.67							0.04		-	1%	Tr		Tr	-	-	-	-	-	1%	Sp	Tr	2%	25%	Sp		Possible Flow Structure	40°	Fresh dacite w/ wk fracturing
263.1	271.5	8.4		0.03				99	2.67							0.03		-	1%	Tr	-	Tr	-	-	-	-	-	Sp	Tr Sp	Tr	2%	25%	Sp				As Above
271.5	284.7	13.2		0.04				62	2.65							0.04		-	1%	Tr	-	Tr	-	-	-	-	-	Sp	Sp	Tr	4%	25	Sp		Flt Zone 278.0'-		Flt zone mod. altd.
284.7	295.8	11.1		0.03				70	2.63							0.03		-	1%	Tr	-	Tr	-	-	-	-	-	Sp	Sp Wk	Tr	5%	25%	Sp				Rk Mod-stly Brkn, wkly altd.
295.8	303.4	7.6		0.03				94	2.68							0.03		-	1%	Tr	-	Tr	-	-	-	-	-	Tr	Tr Sp	Tr	Tr	25%	Sp		Upper Bx	≈85°	Rk becomes sheared around 299'
303.4	317.3	13.9		0.10				89	2.79							0.10		-	3-4%	-	-	-	-	-	-	Tr	-	Tr	Tr	Tr Sp	-	3%	Sp	Biot Mz 303.4			Biot Qtz Mz - sply altd. at top, but becomes wkly-mod altd near bottom. Py Content increases Tremendously around 310'. It is v. well dissem.
317.3	321.6	4.3		0.14				100	2.79							0.14		-	3%	-	-	-	-	-	-	Sp	-	8%	Tr	Sp	-	Tr	Mod	Sp 317.3			Syenodiorite somewhat sheared near contact. Felds ~~[illegible]~~ altd to Epidote. Much Calcite on fracts.
321.6	333.5	11.9		0.10				91	2.78							0.10		-	4%	-	Tr	-	-	-	-	1%	-	10%	-	Tr	-	Tr	Mod St				wk-mod ALTD Sp. sulfs dissem. Calcite on fracts and as vns. Sp hem.
333.5	342.5	9.0		0.09				96	2.75							0.09		-	1%	-	-	-	-	-	-	1%	-	8%	-	-	Tr	Tr	Mod				Sp w/ felds altd to epidote + Femags to Chlor. Calcite on fracts
342.5	351.9	9.4		0.06				94	2.76							0.06		-	3%	-	-	-	-	-	-	1%	-	8%	-	Tr	Tr	Tr	Wk Mod				Rk slightly more bleached, Sulf. Content again increases circa 350'. well dissem
351.9	361.2	9.3		0.06				99	2.72							0.06		-	1-2%	-	-	-	-	-	-	Sp	-	10%	-	Tr	Tr	Tr	Mod				As Above
361.2	373.5	12.3		0.04				65	2.76							0.04		1	1-2%	-	-	-	-	-	-	Sp	-	10%	-	Tr	Tr	Tr	Mod				As Above. Only Tr CPY.
373.5	382.7	9.2		0.04				88	2.80							0.04		-	3%	-	-	-	-	-	-	Sp	-	10%	-	Tr	Tr	Tr	Wk				Increase in sulfides + alt. Py vning present, as well as disseminated
382.7	391.2	8.5		0.08				94	2.78							0.08		-	2-3%	-		+	-	-	-	Sp	-	10%	-	Tr	Tr	Tr	Sp Wk				As Above
391.2	399.8	8.6		0.10				87	2.38							0.10		-	3-4%	-	-	-	-	-	-	1%	-	8%	Tr	Tr	Wk	2%	Sp				Rk becoming wk-mod Brkn due to faulting. First appearance of qtz vning @ 39[illegible].5'
399.8	408.3	8.6		0.17				94	2.89							0.17		-	10%	-	-	-	-	-	-	4%	-	~~8%~~ Sp	Sp	-	-	?	Wk				Mod-stly altd. Sr Py as dissem. and vnlets. Calcite on numerous fracts. Rk becomes sheared circa 407'. Rk Does not show Por. Tex + could quite easily pass for sediment
408.3	420.1	11.8		0.10				83	2.78							0.10		-	8%	-	-	-	-	-	-	10%	-	Sp	Sp	?	-	Tr	Mod		Shear Zone 407'-420	60° (?)	Rk strongly sheared and veined w/ Calcite
420.1	427.4	7.3		0.04				89	2.64							0.04		-	<1%	-	2%	-	-	-	-	Tr Sp	-	Sp	Tr	Tr	-	15%	Mod	DP C@ 420'			Wkly altd Dp. V. fine sulfs assoc w/ femag sites. Dissem blotches of Hem Throughout. Rk is mod-stly brkn + sheared.
427.4	436.5	9.1		0.04				93	2.66							0.04		-	<1%	-	2%	-	-	-	-	Sp	-	2%	Tr	Tr	Tr	15%	Mod				Wkly altd Dp. Calcite on fracts. Hem as above.

PRELIMINARY GEOLOGIC LOG
(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D-299
Page 1 of 3 Pages
Collar Elev. 2,900.35 Final Depth 911.4'
Coords. N 39,333.93 E 18,818.47
Inclination VERTICAL
Logged by NRN, RE
Date: Start 1-27-68 Finish 2-21-68

Depth From	To	Int'vl	Elev.	% Cu Total	Avg.	NS	Avg	% Core Recov	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Cc.	Cpy.	Born
436.5	445.6	9.1						98	2.58							
445.6	454.4	8.8						97	2.59							
454.4	463.0	8.6						97	2.51							
463.0	471.9	8.9						100	2.64							
471.9	480.7	8.6						92	2.72							
480.7	490.7	10.0						86	2.68							
490.7	499.0	8.3						96	2.69							
499.0	508.2	8.4						93	2.70							
508.2	517.0	8.8						99	2.72							
517.0	525.9	8.9						83	2.70							
525.9	533.4	7.5						93	2.72							
533.4	541.8	8.4						97	2.74							
541.8	550.4	8.6						95	2.75							
550.4	560.3	9.9						80	2.6?							
560.3	570.0	9.7						74	2.61							
570.0	579.6	9.6						88	2.70							
579.6	589.0	9.4						100	2.71							
589.0	598.6	9.6						96	2.70							
598.6	607.3	8.7						97	2.55							
607.3	615.4	8.1						98	2.70							
615.4	623.0	7.6						94	2.69							
623.0	630.9	7.9						100	2.69							
630.9	640.2	9.3						93	2.69							
640.2	649.1	8.9						99	2.66							
649.1	658.2	9.1						100	2.66							
658.2	667.4	9.2						94	2.68							
667.4	675.0	7.6						86	2.67							
675.0	684.0	9.0						95	2.59							
684.0	692.7	8.7						97	2.68							
692.7	704.6	11.9						99	2.69							
704.6	713.5	8.9						91	2.66							
713.5	722.5	9.0						98	2.69							
722.5	731.6	9.1						94	2.66							
731.6	740.8	9.2						93	2.97							
740.8	749.8	9.0						95	2.70							
749.8	759.0	9.2						98	2.68							
759.0	772.5	13.5						95	2.67							
772.5	781.6	9.1						92	2.50							
781.6	791.1	9.5						94	2.44							
791.1	799.8	8.7						97	2.67							
799.8	809.1	9.3						95	2.68							
809.1	818.3	9.2						97	2.68							
818.3	827.4	9.1						100	2.67							
827.4	836.2	8.8						95	2.69							
836.2	845.7	9.5						98	2.67							
845.7	855.0	9.3						94	2.71							

From	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet / Epidote Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip
436.5	-	0.8%	-	2%	-	-	-	-	Sp-wk	- Tr	? Md	Sp	-	25%	Md	Da		
445.6	-	Tr	-	2%	-	-	-	-	wk	- Tr	? wk	Sp	-	25%	wk			
454.4	-	-	-	2%	-	-	-	-	Sp	- Tr	Sp wk	Sp	-	25%	wk md			
463.0		Tr		2%					Tr	?	Tr	SP	-	30	wk md			
471.9		1%		2%					wk		Tr	SP	-	30	md			
480.7		<1%		1%					wk		md	ST	-	10	md	Da 490.7		
490.7		1%		-					wk		md	ST	-	2?	md	SP 499.0		
499.0		1%		-					wk		wk	md	-	30	md	Da 508.5		
508.2		1-2		-					wk		wk	wk	-	2?	md	Mz or SP		
517.0		1%	-	Tr	-	-	-	-	Tr	- Tr Sp	Tr	Sp	-	Tr	wk Mod			
525.9		1-2%	-	Tr	-	-	-	-	Tr	- Tr Sp	Tr	Sp	5%	1%	Mod		Qtz + sulf vns	70°
533.4	-	1%	-	1%	-	-	-	-	Sp	- Tr	-	Tr	-	Tr	wk Mod			
541.8	-	1%	-	Sp	-	-	-	-	Tr Sp	- Sp	-	Tr	-	Tr	wk Mod	SP?	551.5	
550.4	-	1-2	-	SP					Tr	- SP	-	Tr	1	20	md	Da		
560.3		1-2		Tr					Tr	-	md	- Tr	1	25	md			
570.0	-	1%	-	-	-	-	-	-	Sp	- Sp wk	-	Tr	-	20%	wk Mod	Da - Mz ??		
579.6	-	1%	Tr	-	-	-	-	-	Sp	- Sp	-	-	Tr	25%	Sp wk			
589.0	-	2%	Tr	-	-	-	-	-	Sp	- Tr	-	-	-	25%	Sp			
598.6	-	2%	Tr	-	-	-	-	-	Sp	- Sp	Tr	Sp	-	25%	Tr			
607.3	-	2%	Tr	-	-	-	-	-	Sp	- Tr Sp	Tr	Sp	-	20%	Sp			
615.4	-	1-2%	-	-	-	-	-	-	Sp	- Sp	Tr	Tr	-	20%	Sp wk			
623.0	-	1%	-	-	-	-	-	-	Sp	- Sp wk	-	Tr	-	20%	Sp wk			
630.9	-	1-2%	-	-	-	-	-	-	Sp	- Sp wk	-	Tr	-	20%	Sp			
640.2	-	2%	-	-	-	-	-	-	Sp	- Sp	Tr	Sp	-	20%	Sp			
649.1	-	1-2%	-	Tr	-	-	-	-	Sp	- Tr	Tr	Tr	-	25%	Tr			
658.2	-	1-2%	-	-	-	-	-	-	Sp	- Tr	Tr	Sp	-	25%	wk Mod			
667.4	-	2%	-	-	-	-	-	-	Sp	- Tr	Tr	Sp	-	25%	Sp		shear zone 676'	85°
675.0	-	2%	-	-	-	-	-	-	Sp-wk	- Tr	Tr	Sp	-	30%	Sp			
684.0	-	2%	-	-	-	-	-	-	Sp	- Sp	Tr	Tr Sp	-	30%	Sp wk			
692.7	-	1-2%	-	-	-	-	-	-	Sp	- Sp	-	Sp	-	30%	Sp wk			
704.6	-	1-2%	-	-	-	-	-	-	Sp	- Sp	Sp	Tr Sp	Sp	30%	wk			
713.5	-	1-2%	Sp	-	-	-	-	-	Sp	- Tr Sp	Tr	Sp	1%	25%	wk			
722.5	-	1-2%	Tr	-	-	-	-	-	Sp	- Sp	Tr	Sp	Sp	30%	wk			
731.6	-	1%	Tr	-	-	-	-	-	Sp	- Sp	Tr	Tr Sp	-	30%	Sp		Intrusive Bx 740.4-	
740.8	-	1%	-	Tr	Tr	-	-	-	Sp	- Sp	Sp	Sp	Tr	30%	Sp		741.7'	
749.8	-	1-2%	-	-	-	-	-	-	Sp	- Sp	Tr	Tr Sp	Sp	30%	Sp			
759.0	-	1%	-	-	-	-	-	-	Sp	- Sp	Tr	Tr	Tr	30%	Tr			
772.5	-	1%	Tr	-	-	-	-	-	Sp	- Tr Sp	Tr	Tr Sp	Tr	30%	Tr			
781.6	-	1%	Tr	-	-	-	-	-	Tr Sp	- Tr	Tr	Tr Sp	Tr	25%	Tr Sp			
791.1	-	1-2%	Sp	-	-	-	-	-	Tr Sp	-	Tr	Tr Sp	wk	35%	Sp			
799.8	-	2-3%	-	-	-	-	-	-	Sp	- Tr	Sp	Tr Sp	wk	35%	Tr			
809.1	-	1-2%	Tr	-	-	-	-	-	Tr	- Sp	Tr	Tr Sp	Sp	30%	Tr			
818.3	-	1%	-	-	-	-	-	-	Tr	- Sp	Tr	Tr Sp	Tr	35%	Sp			
827.4	-	1%	-	-	-	-	-	-	Tr	- Sp	3%	Tr Sp	-	35%	Sp			
836.2	-	1%	-	-	-	-	-	-	Tr Sp	- Sp	Tr	Tr	-	35%	Sp			
845.7	-	1-2%	-	-	-	-	-	-	Sp	- Tr	-	Tr	-	35%	S			

From	Remarks
436.5	Rk has a cataclastic tex. All is mod. There are autolithic frags up to 2" diam. Mn is low
445.6	As Above.
454.4	Rk becomes more "normal" circa 462'.
463.0	Appears to have cataclastic texture, RK is overall dk green with numerous large "Qtz eyes"
471.9	calcite on fractures, Tr of epidote
480.7	Broken and gougey, md-st alt., gouge is stly acid reactive
490.7	35% elongate fspars in dk g.m. Reactive gouge 496.6-499.0, Rk appears to be syenodiorite porphyry.
499.0	Da as above, Tr of epidote, propylitic alteration, calcite on fractures
508.2	Texture again becomes that of S.P., absence of Qtz eyes, 25% elongate white fspars in dk groundmass
517.0	wkly altd Sp
525.9	As Above. Development of 2nd K-spar along one fract zone. Cpy present in v. minor amts
533.4	Sp-wk Arg. Calcite and hem. on fracts
541.8	As Above. Rock changes from SP or Mz to Da in highly broken interval extending from
550.4	552.3-552.7. Da has silicified breccia containing scol(?) fragments @ 560'.
560.3	Da has typical texture except for epidote apparently replacing fspar
570.0	Rather fresh dp. Some 2" diam round areas which appear to be autoliths. Mod v.f. gr. Biot. throughout & surrounding autoliths. Possibly secondary I suppose.
579.6	Rk appears to have been secondarily Biotized. The f. grained biotite follows fracts and is variably concentrated.
589.0	As Above. The rk has somewhat of a Mz tex, but isn't
598.6	As Above. More Calcite on fracts.
607.3	As Above. Biot seems definitely secondary. Tr 2nd K-spar flooding. Rk Mod Brkn 611-617'
615.4	2" zone of 2nd-Orthoclase circa 618'. Generally as above.
623.0	As Above. Few Chalcopyrite xls in Calcite vn. Biot is secondary, but pre Pyrite.
630.9	Rk is quite probably Mz. There have been no xenos for great distance. St. Biotization giving rk a Bx Appearance. Rk may be rehealed w/ Biot.
640.2	As Above
649.1	Biot Content somewhat down
658.2	Rk has St Biot locally w/ resultant Bx Text. On while rk looks like Mz
667.4	RK becomes brkn + bleached towards end of run
675.0	This rk is now tending to look more like the fine grained Rk. Locally appears aplitic
684.0	Rk again appears Mz + has 2nd Biot. (pebbles) Rock could be anything!
692.7	St Biot + Bx Tex 694-703'. Few look like ptxite. Rk then appears like a Mz again
704.6	RK As Above
713.5	Nothing significantly new except occurrence of mag
722.5	Much as Above.
731.6	As Above. Good mass of intrusive Bx v.f. grained + lt. avocado green color
740.8	Intrusive Bx v.f. grained and interfingers w/ dp. The host rk is more distinctively dp a
749.8	Generally As Above
759.0	As Above. 2nd Biot Moderately present again
772.5	St Secondary Biot. Rk again has Bx tex. Unbiotized portions are subhedral to euhedral equigranular and appear to be a quartz monzonite
781.6	As Above
791.1	As Above - more sil'n assoc w/ splotches of py
799.8	Sil'n, alt + pyritization stronger than other. Biot has been mod bleached
809.1	Biot fresh again + Rk shows pseudo Bx tex
818.3	Slight increase in alt. again
827.4	Biot fresh. Sericite-Muscovite appearing around some of the Bx frags. Sheets quite a bit larger than the common sericite.
836.2	Tex becomes quite distinct. Qtz + Feld grains are euhedral to subhedral and most the same size 2-4 mm. 8% primary biot is uniformly distributed. 4% secondary biot
845.7	As Above

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

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Tt - Tactite
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Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D-299
Page 3 of 3 Pages
Collar Elev. 2,900 35
Final Depth 911.4'
Coords. N 39,333 93 E 18,818 17
Inclination VERTICAL
Logged by N.R.N. + R.E.
Date: Start 1-27-68 Finish 2-21-68

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green		Cc.	Cpy.	Born	Lim.	Fe (2) Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE		(3) Rock Type	Structures (4) Depth	True Dip	Remarks
855.0	864.2	9.2						84	2.67									-	2%	-	-	-	-	-	-	Tr Sp	-	Tr	Tr	Sp Sp	Tr Sp	35%	Sp					Rk is more sily mineralized and altd.
864.2	870.7	6.5						89	2.67									-	1%	-	-	-	-	-	-	Tr	-	Tr	Sp	Tr Sp	Tr	35%	Sp					Most of Rock seems to have been fract controlled. Rk has bx tex
870.7	880.9	10.2						100	2.70									-	2%	-	-	-	-	-	-	—	-	Tr	Tr	-	-	?	?	Sp A	10 Qtz.	15°	Dark grey aphanitic groundmass w/small fold lets distributed on fracts + v. well dissem.
880.9	893.1	12.2						93	2.67									-	2%	-	-	-	-	-	-	Tr Sp	-	-	Tr	Tr	Tr	30%	Sp	870.7 Mz (?)	Low Qtz	50°	Op-Mz of indistinct tex looks like both.
893.1	903.0	9.9						93	2.67									-	1-2%	Tr	-	-	-	-	-	Tr	-	Tr	Tr Sp	Tr	Tr	35%	Sp	880.9			Rk seems definitely Mz. Bix. is at least 50% secondary
903.0	911.4	8.4						92	2.68									-	2%	-	-	-	-	-	-	Tr	-	-	Sp	Tr	Tr	35%	5%	Op 907.8-908.2'			Tex is distinctly Mz. Thin zone of Op seems to be cutting Mz. - Perhaps it simply represents an alteration of the Mz.
E.O.H.																																						

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

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Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D300
Page 1 of 1 Pages
Collar Elev. 3,064 73
Final Depth 353.6
Coords. N 35,165 03 E 16,416 91
Inclination VERTICAL
Logged by RE
Date: Start 2-19-68 Finish 3-1-68

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Unknown NS	Cc.	Cpy.	Covellite Bort	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0	10.8	10.8																																			
10.8	20.6	9.8		.08				80	2.34					.08				md	-	-	ST								md	ST	-	30	Tr	AK			stly altd., Fspars completely altd to clay, hem staining of groundmass
20.6	31.0	10.4		.01				75	2.40					.01				md	-	-	md ST								md	ST	1	35	Tr		leached vein	80°	As above, st alt of Fspars (Supergene?) decreases near bottom of int.
31.0	39.9	8.9		.02				95	2.41					.02				ST	-	-	ST								md	ST	1	35	Tr		"	80°	st alt, Serpentine becoming abundant.
39.9	48.9	9.0		.01				90	2.56					.01				md	-	-	md								md	md ST	4	40	-	Aplite dike	"	60-70°	Aplite followed by thick leached qtz-sulf veins. Talc and/or serp on fracts
48.9	58.5	9.6		.01				93	2.50					.01				md	-	-	ST								md	md ST	4	40	-		"	"	Cataclastic texture with 1-2% serpentine, leached veinlets widely spaced
58.5	66.8	8.3		.02				93	2.54					.02				md ST	-	-	md								md	md	2	40	-				slight decrease in alt, returning to "normal" AK texture. occasional liv lim.
66.8	75.6	8.8		.01				96	2.51					.01				md ST	-	-	md ST								md	md	2	40	-		leached veins	70	md-st alt, liv lim. & sericite along fractures
75.6	84.9	9.3		.07				88	2.46					.07				ST	-	-	md								md	ST	1	35	Tr?		"	55	stly brka, altd, & gouger from 77.5-82.5. 1-2% serpentine
84.9	92.0	7.1		.04				80	2.96					.04				ST	-	-	-								md	ST	4	35	Tr		"	75	Fspars again completely altd to clay, Texture is large qtz grains in white clay matrix
92.0	101.4	9.4		.28				93	2.55				.23	.05				md	-	-	-								md	md	1	40	Tr	AK ≈101.0	"	80	md alt, abundant green alt product
101.4	111.1	9.7		.28				97	2.45				.23	.05				md	-	-	ST								md wk	md	1	10	2?	Mz ≈111.1	101.4	60	Gradational contact, Mz is dark with light phenocrysts to 105.7, stly hem stained from 105.7-111.1
111.1	120.3	9.2		.20				85	2.54				.15	.05				md	-	-	md								md	md	10	45	Tr	AK	"	70-90	About 1' of Qtz absorves contact, veins & liv lim adjacent to contact. AK is indif altd w/ no Cu.
120.3	128.9	8.6		.04				95	2.54				.01	.03				ST	-	-	ST								md	md	<1	45	-		"	90	AK is brka, mdly altd, stly hem stained, sp liv limonite
128.9	137.7	8.8		.03				90	2.67					.03				md ST	-	-	md ST								md	md	1	40	-		"	60-80	mdly hem stained, exotic lim on fractures. estimated pre-leach sulf. 4%
137.7	146.8	9.1		.03				91	2.53					.03				wk	Tr	-	ST	-	-	-	-	-	-	-	Sp wk	wk Mod	3%	45	-				Mod Alto AK. Lim about equal parts 'Ser & Qtz-Ser. Hem Staining felds. Tr-Sp Py, Tr C.P.
146.8	152.3	5.5		.07				89	2.55					.02	.03	.02		Sp wk	2%	-	md	-	-	-	-	-	-	-	wk Mod	wk Mod	6%	45%	-		Leached & Inactive Filled Leached veins	60+80	Mod Alt, Mod-st Qtz-Ser. Halo'ing of fracts. 1/8" hem-lim seam line high angle fracts
152.3	161.7	9.4		.04				91	2.67					.01	.01	.02		wk	1/2	-	md								md	wk	3	45	-			60-80	Sp cement dis sulfides st oxidation along fractures, & veinlets
161.7	172.8	11.1		.03				73	2.54					.03				wk md	-	-	md ST								ST	wk	5	50			"	75-90	st Qtz-ser alt, some liv limonite. Stronger oxidation than above
172.8	181.9	9.1		.05				86	2.41					.03	.02			md	-	-	md								md	wk	1	45					md-st alt, hem staining of fspars, exotic lim on fractures
181.9	191.0	9.1		.19				89	2.60					.02	.14	.03		wk	2-3	-	wk								md	wk	1	45		Sulfides 181.9	py veins	60°	md alt, Beginning of dis sulfides, oxidation of veinlets ~1/2 percent
191.0	199.9	8.9		.26				96	2.57					.02	.19	.05		md	2-3	-	wk								ST	md	<1	45			stringers	80°	varying dis. py & cpy with varying cc, st ser alt,
199.9	210.7	10.8		.20				84	2.45					.02	.29	.07		wk	2-3	-	wk								ST	md	-	45					As above, st alt, & dis sulfides but no st cc along fractures or veins
210.7	218.0	7.3		.25				95	2.56					.02	.18	.06		wk	2	-	-								ST	md	Tr	45					st alt, dis sulfides as above.
218.0	223.5	5.5		.03				96	2.47					.03				ST	Tr	-	wk								md ST	md	Tr	40		Oxidation			increased oxidation with lim & hem staining of fspars, sp cuprite
223.5	230.5	7.0		.26				89	2.56					.02	.18	.06		wk	1-2	-	-								md	Tr	?	60					silicification and fine dis sulfides
230.5	236.1	5.6		.04				98	2.41					.02	.02			ST	Tr	-	-								md	md	1	40					st oxidation again. st alt of fspars
236.1	245.1	9.0		.03				92	2.48					.02	.01			ST	Tr	-	wk md								md ST	md	3	40			leached vein	≈90°	Has the appearance of rock found a few feet below surface. md-st alt,
245.1	255.3	10.2		.15				81	2.54					.03		.04	.08	ST	1	-	-								md ST	md	1	40			leached veins	70-90	dis sulfides in Qtz are preserved, veins are completely leached
255.3	268.0	12.7		.08				94	2.51					.01		.02	.05	ST	1	-	wk								md ST	md	3	40			leached veins	30-60	oxidation along veins & fracts to 263.4 where all of rock becomes leached!
268.0	277.4	9.4		.22				90	2.51					.02		.03	.12	ST	1	-	wk								md ST	md	1	40					As above, complete leaching along fractures, veinlets.
277.4	285.9	8.5		.11				98	2.45					.01		.03	.07	ST	<1	-	wk								md ST	md	3	45			leached veins	≈90°	As above, remnant dis. py, cpy, cc. covellite replacing cpy
285.9	299.8	13.9		.22				87	2.64					.02		.06	.14	ST	1	-	wk								md ST	md	3	45			"	60-90	decrease in oxidation below 295!
299.8	309.3	9.5		.22				93	2.66					.02		.06	.14	ST	1	-	Tr								ST	md	3	40			"	"	As above, st alt, ≈2% dis sulfides, complete oxidation along fractures & veins
309.3	318.7	9.4		.12				96	2.51					.02		.05	.05	ST	<1	-	Tr								ST	md	2	40					rest of sericite alt, st limonite, secondary Cu appears to be mostly covellite
318.7	327.9	9.2		.29				92	2.59					.02		.06	.21	ST	1-2	-	-								ST	md	3	40					decrease in oxidation, dis. py, cpy, covellite, lim still st along fracts.
327.9	335.8	7.9		.23				92	2.58					.02		.06	.15	md	1-2	-	-								ST	md	5	40			Qtz veins	80°	continuing decline in oxidation, occasional large blb of cpy replaced by covellite
335.9	344.7	8.9		.23				100	2.56					.02		.06	.15	md	1-2	-	-								md ST	wk	5	55					md-st silicification, otherwise as above
344.7	353.6	8.9		.14				90	2.65					.02		.03	.09	md	2	-	-								md wk	5	60					silicification, dis sulfides, limonite along fractures
	EOH																																				

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO- SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D301
Page 1 of 1 Pages
Collar Elev 2,845.54
Final Depth 304.9
Coords. N 38,326.64 E 16,532.07
Inclination VERTICAL
Logged by RR
Date: Start 3-1-68 Finish 3-5-68

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Cu Intensity Non Sulf	Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0	75.0	75.0		0.09																																	Dump
75.0	82.5	7.5		0.09				96	2.53		0.03				0.06			Mod ST	-	-	-							mkgnt		-	10	2		MZ			Mod Alt. Brn lim on fracts. Dissem grains of goethite + Cu pitch
82.5	91.2	8.7		0.14				98	2.56		0.11				0.03			Mod	-	-	-	-	-	-	Tr	-	-	wk	Mod	Tr	5%	2%					Mod Alt. Bit Becoming some what fresh. Fel grains all sized + sub-Anhedral in shape
91.2	98.3	7.1		0.18				79	2.68		0.11				0.04			Wk Mod	Tr	-	-	-	-	-	-	-	-	-	Sp wk	Mod	Sp	5%	1%				Sil'n along many irreg fracts. Sp. Not stly assoc. Cu. pitch (?) well dissem
98.3	107.8	9.5		0.17				92	2.55		0.09				0.03	0.05		Mod	Tr	-	-	-	-	-	-	-	-	-	Tr Sp	Mod	0.2%	4%	Sp				Mod-St Alt. Bit Also To Hydromica. Lim probably equally goethite + Jarosite
107.8	116.9	9.1		0.10				93	2.58		0.06				0.02	0.02		Wk Mod	2%	-	-	-	-	-	-	-	-	-	Sp	Mod	Tr	4%	2%				There remains one 3" patch of unleached sulfs Py is well dissem + contain w/ Thin C.C.
116.9	125.8	8.9		0.13				95	2.47		0.03				0.10			Mod	-	-	-	-	-	-	-	-	-	-	Wk	Mod	-	4%	1%		Shearing 121' -		Mod-St Alt Rk becomes moderately sheared at 121'
125.8	135.0	9.2		0.12				94	2.45		0.02				0.10			Mod	-	-	-	-	-	-	-	-	-	-	Mod	St	-	4%	-				St. Alt. Mod-St. shearing continues Tr-Sp MnO present.
135.0	144.7	9.7		0.18				85	2.46		0.05				0.05	0.01		Wk Mod	-	-	-	-	-	-	-	-	-	-	Wk	St	1%	10%	1%				St. Alt. Rk becoming less sheared. Lt Orange-brn lim on fracts.
144.7	159.6	15.9		0.08	C			97	2.49		0.01			Tr	0.07			Wk Mod	-	-	Tr	-	-	-	-	-	-	-	Wk	Mod	-	10%	2%		6.0-43'-145'		Mod-St Alt. Sp Cu Pitch in voids. Sp Cu Stain on fracts. Core loss + Core recovered 158-159'
159.6	172.2	12.6		0.55	0.07			91	2.53				0.06	0.01	0.47	0.01		Sp Wk	Tr	-	-	-	-	-	-	-	-	-	Sp	Wk	-	8%	3%	Sulf. Mt 159.6			Mod Alt. C.C. well developed as replacement of well dissem v.f.g. Py + MPY and as coatings on fracts. Grn Cu Staining also present.
172.2	180.8	8.6		0.56	0.07			89	2.61				0.07		0.47	0.02		Sp	Tr	-	-	-	-	-	-	-	-	-	Sp	Wk	-	8%	4%				Mod-St Alt. Grnd mass wkly pink as if flooded w/ K-spar. Most CC on fracts
180.8	186.7	5.9		0.91	0.01			86	2.60				0.01		0.88	0.05		Sp	3%	-	-	-	-	-	-	-	-	-	Wk	Sp Wk	-	4%	4%				As Above. C.C. content up
186.7	197.3	10.6		0.39	0.01			84	2.48				0.01		0.26	0.12		Sp	Tr	-	-	-	-	-	-	-	-	-	Sp	Wk	-	4%	4%				Wk Alt, Sp lt orange lim Stain on fracts. Bit alt to Chlor. Dissem sulfs sparse.
197.3	206.7	9.4		0.42	0.01			86	2.60				0.01		0.29	0.12		Tr Sp	Tr	-	Tr	-	-	-	-	-	-	-	Sp Wk	Mod	Tr	5%	4%				Rk shear. bed st. shearing. Grnd mass appears sly silt, Py fills alld to grn clay. 2nd K-spar along fracts
206.7	215.3	8.6		0.20				99	2.56						0.10	0.10		-	Tr	-	-	-	-	-	-	-	-	-	Sp	Wk Mod	Tr	4%	3%				Rk generally as above. C.C. is quite sparse. Py mainly dissem. One v. Thin CPY seam seen
215.3	227.6	12.3		0.18				63	2.56						0.08	0.0		-	Tr	-	-	-	-	-	-	-	-	-	Sp Wk	Wk	Tr	4%	1%		Shearing 216-222		Shearing becoming stronger. Increase in total sulf. & Amt. CC. incr. Chlor now subordinate
227.6	237.1	9.5		0.88				97	2.61						0.40	0.45		-	Tr	-	-	-	-	-	-	Tr	-	-	Sp Wk	Wk	Tr Sp	4%	Tr				Mod Alt. Rk Mod-stly broken v. Thin C.C. coating on Py + MPY in fracts
237.1	247.0	9.9		0.28				81	2.49						0.28			-	Tr	-	-	-	-	-	-	?	-	-	St Tr Sp	?	?	20%	-		Total Shearing 237-: ?		V. St Alt Along shear zone. Total sulfide content up, but not much CC.
247.0	254.7	7.7		0.15				79	2.60						0.02	0.13		-	Tr	-	-	-	-	-	-	?	-	-	Mod	Wk	?	5%	2%				Rk still stly Broken + mod. sheared, wk sil'n due to alt. of other silicates
254.7	263.9	9.2		0.14				88	2.58						0.02	0.12		-	Tr	-	-	-	-	-	Tr Sp	-	-	-	Sp	Sp Wk	-	6%	4%				Alt Wk. Felds generally do not stand out. Bit alt'd to chlor.
263.9	272.0	8.1		0.13				100	2.60						0.01	0.12		-	Tr	-	-	-	-	-	-	Tr	-	-	Sp	Sp Wk	2%	8%	3%				Wk-mod Alt, wk sil'n. Tex not distinct. Slight Pink color due to K-felds. Rk Mod broken
272.0	280.8	8.8		0.21				98	2.72						0.02	0.19		-	Tr	-	-	-	-	-	Tr	Tr	-	-	Sp Wk	Wk	Tr	8%	2%		Min. Shear 277.4	55°	Mod Alt, Rk Mod-stly broken. Slight increase in Total Sulf. Cpy in fracts. Hosted w/ qtz + ser
280.8	289.1	8.3		0.21				94	2.68						0.02	0.17		-	Tr	-	-	-	-	-	-	-	-	-	Tr Sp	Sp Wk	Tr	6%	2%				Felds. stand out along micro fracts which allowed alt. to Clays.
289.1	298.9	9.8		0.37				90	2.60						0.04	0.33		-	Tr	-	-	-	-	-	Tr	-	-	-	Sp	Sp Wk	-	6%	2%				Py well dissem. Some time assoc w/ alld. Bit. Cpy more fract controlled + Hosted w/ ser.
298.9	304.9	6.0		0.30				93	2.55						0.02	0.28		-	Tr	-	-	-	-	-	Tr	Sp	-	-	Tr	Sp?	-	4%	1%				wk alt.
E.O.H.																																					

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite.

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D302
Page 1 of ___ Pages
Collar Elev. 2849 56 Final Depth 265.8
Coords. N 38,231 69 E 16,593 79
Inclination Vertical
Logged by RS
Date: Start 3-6-68 Finish 3-8-68

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Unknown NS	Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0	90.0	90.0																																			Dump
90.0	98.5	8.5		0.12				97	2.54					0.12				ST	Tr	-	-	-						wk md	-	10	3		MZ				Light, limonite stained, f spar phenocrysts, light grey g.m.,
98.5	107.1	8.6		0.11				97	2.53					0.11				ST	-	-	Tr	-						wk md	-	10	2						close spaced fractures (35-45°) covered with brown limonite
107.1	116.9	9.8		0.12				91	2.56					0.07	.05			ST	Tr	-	-	-						wk md	wk	Tr	10	3					Generally leached but with short intervals of cement py & c.c.
116.9	126.3	9.4		0.19				95	2.54				.07	.10	.02			ST	Tr	-	Tr	-						md	wk	Tr	10	5					As above, malachite filling some fractures, occasional py & c.c.
126.3	140.2	13.9		0.23				93	2.49				.10	.03	.10			md	Tr	-	-	-						md	wk	Tr	10	5			leached vein	≈90°	wk oxidation with st dis sulfides - 126.3-128.6; st oxidation: 128.6-140.2
140.2	152.4	12.2		0.58		.05		96	2.57				.05		.33	.20		wk	2	-	-	-						md	wk	Tr	10	5		sulfides @ 140.2	violet	55°	wk md alt, ≈ 3% Total sulfides, Thick c.c. on cpy.
152.4	164.5	12.1		0.67		.08		92	2.63				.08		.39	.20		Tr	2	-	-	-						md	wk	Tr	10	8					As above, some 2nd f spar.
164.5	179.0	14.5		0.71	1.69 @ 0.12	.12	0.01	56	2.58				.12		.35	.24		Tr	2	-	-	-						md	wk	Tr	10	8					Vertical fractures lined with epidote; 2nd f spar, md dis sulfides
179.0	188.3	9.3		0.86		.13		87	2.58				0.13		.42	0.13		-	2	-	-	-						md	wk	-	10	8					Sulfides mainly as fine disseminations with thick c.c. on cpy, py, & veinlets
188.3	198.1	9.8		0.98		.05		87	2.52				0.05		0.50	0.43		md	2	-	-	-						md st	md	-	10	8					Broken throughout with md oxidation to 192.4. Sulfides mostly dis.
198.1	206.8	8.7		0.87		.02		96	2.57				0.02		0.58	0.27		-	2	-	-	-						md	wk	-	10	8					md alt, As above, 2-3% dis. sulfides
206.8	216.1	9.3		0.90		.01		90	2.60				0.01		0.10	0.29		-	2	-	-	-						md	wk	-	10	8					decrease in thickness of c.c. on dis py, cpy, md alt.
216.1	225.0	8.9		0.30				96	2.59						0.08	0.22		-	2	-	-	-						md	wk	-	10	8					As above
225.0	234.6	9.6		0.30				90	2.58						0.10	0.20			2									md	wk	Tr	10	8					wk c.c., md alt,
234.6	242.3	7.7		0.31				95	2.60						0.08	0.23			2									md	wk	-	10	8					wk c.c., wk-md alt, Appears to be below zone of strong enrichment
242.3	251.9	9.6		0.29				85	2.68						0.02	0.27		—	27	-	-	-	-	-	-	-	-	Mod wk	Tr	10	2%						Mod Hydrothermal ser and f. synpsene Kaolin. Fair cpy. assoc w/ ser. RV sly Beka
251.9	265.8	13.9		0.32				96	2.49						0.04	0.28		-	27	-	-	-	-	-	-	-	-	wk Mod	Sp	-	10	2%					wk Alt. Biot. only spy altd. sulfs. mainly Py

PRELIMINARY GEOLOGIC LOG
(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Note (3)
Tt - Tactite
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Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
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Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D-38-1
Page 1 of 1 Pages
Collar Elev. 2,843 38
Final Depth 276.2
Coords. N 38,322 58 E 16,684 58
Inclination VERTICAL
Logged by N.R.N.
Date: Start 3-8-68 Finish 3-13-68

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Cu (1) Pitch	Cu (1) Black	Cu (1) Blue Green	Cu (1) Wh Tornsteine Nna Sulfide	Cu (1) Cc.	Cu (1) Cpy.	Cu (1) Born	Fe (2) Lim.	Fe (2) Py	Fe (2) Mag.	Fe (2) Hem	Fe (2) Spec.	Other (2) Galena	Other (2) Sphal.	Other (2) Molyb	Other (2) Calcite	Other (2) Garnet	Other (2) Silicates	Other (2) Sericite	Other (2) Clay	Other (2) Vn. Qtz	Other (2) QUARTZ	Other (2) CHLORITE	(3) Rock Type	Structures (4) Depth	Structures (4) True Dip	Remarks
0.0	90.0	90.0																																			DUMP MATERIAL
90.0	99.0	9.0		0.16				97	2.58		0.10			0.06				Wk	-	Tr	Tr	-	-	-	-	-	-	Sp Wk	Wk	Tr	3%	Tr	Biot Mz			Sp's alt'd., Sp's Weathered. Lim Bra and only a Thin coat on fracts. Local sil'n
99.0	107.7	8.7		0.17				95	2.56		0.10			0.07				Mod	-	-	-	-	-	-	-	-	-	Sp	Wk	Tr	3%						wk-w alt'd Biot Mz. Tex somewhat finer than normal. Numerous dissem sulf cavities
107.7	116.8	9.1		0.14				92	2.52		0.12			0.02				Mod	-	-	Tr Sp	-	-	-	-	-	-	Tr Sp	Sp	-	2%	3%					Generally As Above. Lim. on fracts Bra. Sulf Cavities seem to be filled w/ hem.
116.8	125.6	8.8		0.12				93	2.67		0.11			0.01				Mod	-	-	Tr	-	-	-	-	-	-	Tr Sp	Sp	-	2%	3%					As Above
125.6	133.6	8.0		0.10				96	2.59		0.08			0.02				Wk Mod	-	-	Tr Sp	-	-	-	-	-	-	Tr Sp	Sp Wk	0.5%	3%	4%					Rk somewhat more broken. and altd.
133.6	145.1	11.5		0.06				78	2.53		0.03			0.03				Wk Mod	-	-	Wk	-	-	-	-	-	-	Sp Wk	Wk Mod	5%	8%	3%		Silicified fracts	20°-50°	Med Alt, Mod Sil'n along fracts. Alt & sil'n aided by increased fracturing
145.1	154.2	9.1		0.08				95	2.56		0.07			0.01				Wk Mod	-	-	-	-	-	-	-	-	-	Wk	Wk Mod	3%	5%	3%		Silic fracts	0-10°	As Above. Fracts are either partially or totally cebonded Some of silica and others lim.
154.2	166.9	12.7		0.09				81	2.48		0.06			0.03				Mod	-	-	-	-	-	-	-	-	-	Wk	Wk Mod	10%	15%	3%				Med Alt. Mod-St Sil'n along fracts. Rk moderately Brkn
166.9	176.8	9.9		0.06				85	2.52		0.02			0.04				Wk	Tr	-	Tr		-	-	-	-	-	Wk	Mod	2%	6%	Tr				Med-St Alt. Tr. CC as v.f. dissem grains
176.8	185.7	8.9		0.15				94	2.50		0.02			0.03		0.03	Tr 0.07	Sp	0.2%	-	-	-	-	-	-	-	-	Mod Wk	Mod	Tr	3%	Tr	End of Dr Core 188'			St Alt, Rk stly Brkn. V. Sp Sulfs remnant
185.7	194.9	9.2		0.32				99	2.58					0.02	0.23	0.06		Tr	0.5%	-	Tr	-		-	-	-	-	Sp	Wk	Tr	3%	3%		Dr. Core 188' to B.H. Stars 201'		Alt wk-Mod. Sulfs v.f.gr. + well dissem. Incomplete replacement of CPY by C.C.
194.9	203.4	8.5		0.37				98	2.56						0.25	0.12		Tr	1%	-	-	-	-	-	Tr	-	-	Tr Sp	Sp Wk	0.5%	4%	4%			60-75°	Rk Moderately Brkn. Qtz-mole valets frequent. Salmon pink K-spar. along fracts
203.4	215.6	12.2		0.17				67	2.60						0.05	0.12		-	0.5%	-	-	-	-	-	Tr	-	-	Tr	Sp	1%	3%	1%				Sp Alt. Biot. fresh. Very low Total sulf content. Only Tr CC on V.Sp CPY
215.6	225.8	10.2		0.23				56	2.59						0.05	0.18		-	0.5%	-	-	-	-	-	Tr	-	-	Sp	Sp	Tr	2%	3%				Sp-Wk Alt. (ALL HYDROTHERMAL). Few fine CPY valets, Tr ~~3%~~ CC.
225.8	238.0	12.2		0.16				66	2.65						0.02	0.14		-	1%	-	-	-	-	-	Tr	-	-	Tr	Sp	-	2%	3%				Sp-Wk Alt. As Above. Possibly some 2nd K-spar
238.0	246.9	8.9		0.16				92	2.59						0.02	0.14		-	1%	-	-	-	-	-	-	-	-	-	Tr Sp	-	2%	5%				Sp Alt. Sulfs. mainly dissem. Py often replacing Biot.
246.9	255.4	8.5		0.15				97	2.62						0.01	0.14		-	1%	-	-	-	-	-	-	Sp	-	-	Sp	Sp Wk	-	2%	5%				Wk Alt. Sudden occurrence of Calcite
255.4	263.9	8.5		0.20				95	2.61						0.02	0.18		-	2%	-	-	-	-	-	-	Tr Sp	-	-	Sp	Sp	-	2%	5%				Wk Alt. As Above
263.9	270.9	7.0		0.28				94	2.62						0.04	0.23		-	2%	-	-	-	-	Tr Sp	-	Tr	-	-	Tr	Tr	-	2%	5%				Sp Alt. Cpy content slightly up. Tr C.C.
270.9	276.2	5.3		0.20				92	2.48						0.02	0.18		1	1%	-	-	-	-	Sp	-	-	-	-	Tr	Tr	-	4%	3%				Sp Alt. CPY content still increasing

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO- SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D304
Page 1 of 1 Pages
Collar Elev. 3,065 48
Final Depth 275.6
Coords. N 35,309 48 E 16,313 72
Inclination VERTICAL
Logged by RC
Date: Start 3-11-68 Finish 3-22-68

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Cu (1) In Forms NS	Cc.	Cpy.	Born	Fe (2) Lim.	Py.	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0	4.0	4.0																																			Cover
4.0	13.5	9.5		.04				89	2.50					.04				ST	-	-	ST							wk	wk	Tr	45	-		AK			Hem stained feldspars, limonite in fractures
13.5	23.1	9.6		.03				87	2.49					.03				ST	-	-	ST							wk	wk	Tr	45	Tr			leached vein	60°	Few sulfide cavities, some sericite along fractures
23.1	27.4	4.3		.02				82	2.53					.02				ST	-	-	ST							wk	wk	-	45	-					As above
27.4	40.1	12.7		.03				63	2.50					.03				md	-	-	ST							wk	md ST	<1	45	-			leached vein	80°	Broken and gouged from 38.0-40.1. Few, widely spaced veinlets
40.1	51.5	11.4		.03				74	2.35					.03				md	-	-	ST							wk	wk ST	-	40						strongest clay alteration with white compact clay filling fractures
51.5	60.5	9.0		.03				92	2.45					.03				md	Tr	-	ST							wk	md ST	Tr	90				leached vein	50°	As above, trace remnant px & cc.
60.5	68.9	8.4		.02				100	2.45					.02				md	-	-	ST							wk	wk md	Tr	90						less clay alt, stibnite staining, few veinlets or sulfide cavities
68.9	77.4	8.5		.03				83	3.04					.03				md	-	-	md ST							wk	md	2	90						Several completely barren ½" QTZ veins (90°)
77.4	86.3	8.9		.10				85	2.66					.03	.07			wk md	-	-	md ST							md	ST	1	45						ST clay alteration, massive py 80.8-81.0; followed by increased in sulfide cavities
86.3	92.5	6.2		.18				85	2.57					.02	.16			md	Tr	-	wk							md	vst	1	40						Very strong clay alteration leading down to a strong fault from 88.0-100.6; spanning a AK-MZ contact wk sulfides along fault zone
92.5	100.6	8.1		.27				79	2.27					.02	.25			wk	Tr	-	md							md	vst	-	30		AK Tactites MZ	100.6	strong fault		ST gouge from 92.5-96.2, followed by broken and ctly altd AK
100.6	108.0	7.4		1.20		.01		90	2.60					.01	1.19			Tr	2	-	-							md	ST	-	10						Sulfides begin with MZ, which is brkn with st clay alteration
108.0	115.4	7.4		.45		.01		84	2.81					.01	.42	.02		-	23	-	-							md	ST	Tr	10		MZ		veinlets	70-90	ST sulfides & alteration, mdly broken.
115.4	124.3	8.9		.15				88	2.64						.18	.07		-	3	-	-							md	ST	Tr	10		MZ 124.3		"	90°	As above, MZ ends about 124.3 - contact is lstin alt & silicification
124.3	137.6	13.3		.12				64	2.56						.05	.07		-	23	-	-							ST	ST	3	40		AK		QTZ vein	55°	ST alt, some silicification, Gouge from 135.0-140.4
137.6	148.2	10.6		.13				81	2.56						.06	.07		-	23	-	-							md	ST	2	40				QTZ-ser py vein	60°	Broken & gouged to 142.3 followed by mdlpltd AK cut by QTZ-ser-pyrite
148.2	160.1	11.9		.13				94	2.63						.05	.08		-	2	-	-							md	md	2	40						As above, very little visible copper, either cpy or cc
160.1	171.5	11.4		.19				86	2.69						.05	.14		-	23	-	-							md	md	2	40				QTZ-py vein	60°	Fine, dis. py & cpx with some cc, mdalt, and silicification
171.5	180.1	8.6		.25				97	2.57						.08	.17			23									md	wk	-	45						As above
180.1	189.4	9.3		.09				91	2.59						.01	.08			2									wk	wk	-	45						md alt, dis py & cpx grains with wk c.c.
189.4	198.2	8.8		.17				97	2.59						.04	.13			2									wk md	wk	2	45				QTZ-ser py vein	40°	As above, rock is hard and cavelin in l'sections
198.2	208.1	9.9		.11				94	2.61						.03	.08			12									md	ST	10	50				"	80°	Silicification & QTZ veins leading to a st flt @202.5, Vein QTZ interlayered with breccia from 206.5 to 208.5. ST gouge from 205.5-208.1
208.1	215.3	7.2		.12				97	2.60						.04	.08			2									wk	wk	2	50						md alt & silicification, dis sulfides with wk c.c.
215.3	223.7	8.4		.14				95	2.61						.04	.10			2									wk	wk	<1	45				veinlets	45°	As above
223.7	233.3	9.6		.15				97	2.59						.05	.10			2				Tr					wk	md	<1	45						As above, wk c.c. on cpx, Tr of dis. moly.
233.3	241.9	8.6		.13				88	2.67						.04	.09			2									md	md	5	50	1			QTZ-py veins	60-90°	stronger alteration along QTZ veins. Chlorite adjacent to veins
241.9	250.6	8.7		.16				90	2.69						.06	.10			2				Tr					wk md	wk	3-5	50	.5					As above, slight decrease in overall alteration
250.6	263.4	12.8		.23				92	2.57						.07	.16			2									wk md	wk	1	50	-			ser-sulf veins	±90	Near vertical sulfide veinlets with wk c.c. & md alt
263.4	275.6	12.2		.15				87	2.60						.05	.10			2									wk md	md	10	55						silicification & vein QTZ from 269.5-271.0, otherwise feldspar altd tan, days stained yellow

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO- SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D-305
Page 1 of 1 Pages
Collar Elev. 2,745 43
Final Depth 195.0
Coords. N 38,031 76 E 16,669 21
Inclination VERTICAL
Logged by N. R. N
Date: Start 3-14-68 Finish 3-16-68

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Cu (1) Blue Green (Sp. Gravity Non Sulfide Pa. Nitrate)	Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0.0	5.0	5.0																																			Rock Bit. - Not Recovered
5.0	13.1	8.1		0.27				99	2.40					0.27				wk	-	-	Sp	-	-	-	-	-	-	Tr	Sp wk	-	3%	2%	R.O.T. Mz			Sp-wk Alt. wk WEATHERING. Biotite only partially altered
13.1	23.2	10.1		0.31				89	2.60		0.15		0.05	0.11				wk	-	-	Sp	-	-	-	-	-	-	Tr	Sp	-	2%	4%				Sp-wk Alt. Lim is lt. orange-brn. pale greenish clay intermixed along fracts.
23.2	32.7	9.5		0.18				92	2.55		0.15		0.03					Mod	-	-	Sp	-	-	-	-	-	-	Tr	Sp wk	-	2%	4%				As Above. Hem occurs as Pseudo Morphs after salts - v. f. grained + well dissem
32.7	43.9	11.2		0.16				72	2.60		0.06		0.02	0.06	Tr			wk Mod	-	-	Sp	Tr	-	-	-	-	-	Tr	wk Mod	-	3%	5%				Mod Alt. Many of the P. fields being altd. to lt. gra. waxy clay
43.9	55.3	11.4		0.24				68	2.58		0.15		0.02	0.07				Mod St	-	-	Sp	Tr	-	-	-	-	-	Tr	St	-	3%	3%				Mod-St Alt. Rk stly Brkn
55.3	64.9	9.6		0.15				88	2.59		0.10		0.01	0.01	0.03			wk Mod	-	-	Sp	Tr	-	-	-	-	-	Tr	wk Mod	-	2%	3%				Outcrop Rapidly decreasing, but no sulfides yet recognized
64.9	74.7	9.8		0.17				84	2.56		0.06		0.02	0.02	0.07			md	Tr	-	-	-						Tr	md	-	2%	3%				Stg. bleach, bi has gone to chlor; f sparse to clay; pr near bottom of interval
74.7	83.9	9.2		0.21				94	2.61		0.02				0.14	0.03	0.03	wk	1	-	-	-						wk	wk	-	3	5				low apparent total sulfide content, wk alteration, lim on fractures
83.9	92.8	8.9		0.37				95	2.60		0.02		Tr		0.28	0.07		wk	2	-	-	-						wk	wk	-	3	5				Core is hard, intact; 2-3% total sulfides, mdly bleached in appearance
92.8	102.0	9.2		0.27				96	2.64						0.19	0.08		Tr	1-2									wk	wk	-	3	5				biotite not as strongly altered to chlorite. c.c. on prolong fractures
102.0	110.8	8.8		0.41	0.02			96	2.66					0.02	0.32	0.07		Tr	1-2									wk	wk	-	3	5				C.C. is well developed where it occurs but total sulfide content is low
110.8	119.7	8.9		0.95	0.03			93	2.60					0.03	0.72	0.20		Tr	1-2									wk	wk	-	3	5				Some dis grains of cpy; C.C., assays may be higher than expected.
119.7	129.1	9.4		0.20				91	2.64						0.12	0.08		-	1-2									wk md	wk	-	3	5		cpy-sericite veinlets	65%	C.C. is strong where it occurs, total sulfides may be increasing
129.1	137.7	8.6		0.14				100	2.64						0.07	0.07		-	2									wk	wk	-	3	5				Alteration remains wk-md, st C.C. along fractures, dis cpy c.c.
137.7	146.9	9.2		0.17				95	2.64						0.09	0.08		-	2									wk md	wk	-	3	5		cpy veinlets	30%	Some cpy facts c.c. replacement, Secondary K spar along same veins.
146.9	156.5	9.6		0.08				95	2.65						0.02	0.06		-	2-3%	-	-	-	-	-	-	-	-	Sp	Sp	-	3%	Tr.				Sp Alt. Biotite Fresh, P. fields only sly clouded. Pl well dissem. Tr Sp and K-spar
156.5	165.4	8.9		0.09				89	2.62						0.02	0.07		-	2%	-	-	-	-	-	-	-	-	Tr Sp	Sp	-	3%	3%				As Above. Some wk-md fold alt. close to fracts. Salmon pink K-spar 4%
165.4	174.2	8.8		0.13				85	2.63						0.06	0.07		-	2%	-	-	-	-	-	-	-	-	Sp	wk	-	3%	3%				wk Alt. Rk Mod Brkn. Very little Cu
174.2	183.6	9.4		0.13				92	2.65						0.04	0.09		-	2%	-	-	-	-	-	-	-	-	Sp	Sp wk	-	3% 2-	3%				Rk Mod Brkn. Few v. thin salt. seams showing up. some cpy w/ wk sec. halo'ing. Tr Sp P.C.
183.6	195.0	11.4		0.11				97	2.64						0.02	0.09		-	2%	Tr	-	-	-	-	-	-	-	Tr Sp	Sp	-	3% 2-	2%				Sp alt. only occasional salt. seams. V. little Cu.
E.O.H.																																					

PRELIMINARY GEOLOGIC LOG
(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D-306
Page 1 of 1 Pages
Collar Elev 3,037.52 Final Depth 428.7
Coords. N 35,515.94 E 15,975.75
Inclination Vertical
Logged by N.R.N.
Date: Start 3-22-68 Finish 3-29-68

Depth From	To	Int'vl	Elev.	% Cu Total	Avg.	NS	Avg	% Core Recov	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Un Tarnished No Sulfide Cu Min	Cc.	Cpy.	Cov Born
0.0	20.8	20.8															
20.8	28.6	7.8		0.01				90	2.47					0.01			
28.6	37.5	8.9		0.02				93	2.45					0.02			
37.5	47.2	9.7		0.02				76	2.43					0.02			
47.2	56.1	8.9		0.02				91	2.42					0.02			
56.1	65.5	9.4		0.01				93	2.43					0.01			
65.5	76.0	10.5		0.01				84	2.35					0.01			
76.0	85.5	9.5		0.01				94	2.55					0.01			
85.5	94.6	9.1		0.02				91	2.43					0.02			
94.6	106.1	11.5		0.04				94	2.47					0.02	0.02		
106.1	115.9	9.8		0.11				93	2.44						0.10	0.01	
115.9	125.0	9.1		0.20				100	2.46						0.19	0.01	
125.0	134.9	9.9		0.20				84	2.55						0.19	0.01	
134.9	144.3	9.4		0.20				89	2.43						0.19	0.01	
144.3	153.1	8.8		0.23				100	2.40						0.10	0.03	Cov 0.10
153.1	162.4	9.3		0.42		0.01		92	2.63					0.01	0.20	0.08	Cov 0.13
162.4	171.5	9.1		0.34				84	2.75						0.10	0.04	Bov. 0.20
171.5	180.8	9.3		0.38				91	2.58						0.15	0.05	Cov. 0.19
180.8	193.2	12.4		0.24				76	2.40						0.21	0.03	
193.2	202.5	9.3		0.47		0.01		96	2.53						0.44	0.04	
202.5	212.4	9.9		0.50		0.02		94	2.42					0.02	0.12	0.04	0.32
212.4	221.2	8.8		0.35		N.I		93	2.55							0.04	0.31
221.2	230.6	9.4		0.35		N.I		89	2.62							0.06	0.27
230.6	239.6	9.0		0.82		0.01		99	2.54					0.01	0.55	0.06	0.20
239.6	248.7	9.1		0.27		0.01		99	2.53					0.01	0.20	0.03	0.03
248.7	257.5	8.8		0.47		0.01		97	2.56					0.01	0.08	0.06	0.32
257.5	267.2	9.7		0.29		0.01		92	2.56					0.01	0.20	0.04	0.04
267.2	276.7	9.5		0.70		0.01		88	2.62					0.01	0.53	0.07	0.09
276.7	288.0	11.3		0.29		N.I		69	2.53						0.20	0.05	0.04
288.0	296.0	8.0		0.82		0.01		94	2.78					0.01	0.69	0.12	
296.0	300.8	4.8		0.50		0.01		97	2.54					0.01	0.40	0.09	
300.8	310.3	9.5		0.10				96	2.55							0.05	0.05
310.3	319.6	9.3		0.17				93	2.56						0.08	0.04	0.05
319.6	328.3	8.7		0.21				93	2.47						0.04	0.07	0.10
328.3	334.6	6.3		0.22				80	2.55							0.04	0.18
334.6	349.4	14.8		0.32				61	2.55							0.10	0.22
349.4	359.2	9.8		0.61		0.01		98	2.51					0.01		0.15	0.45
359.2	381.0	21.8		0.43		0.01		63	2.37					0.01		0.12	0.30
381.0	389.8	8.8		0.13				90	2.49							0.04	0.09
389.8	398.9	9.1		0.12				95	2.57							0.06	0.06
398.9	410.3	11.4		0.15				91	2.70							0.12	0.03
410.3	420.6	10.3		0.14				100	2.57							0.09	0.05
420.6	428.7	8.1		0.13				63	2.75							0.09	0.04
E.O.H																	

Depth From	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena & Assoc Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip
0.0																		
20.8	Tr-Sp	-	-	Sp Wk	-	-	-	-	-	-	Tr	ST	-	40%	-	Ak		
28.6	Tr	-	-	ST	-	-	-	-	-	-	Mod	Wk Mod	-	40%	-		Lim. Lined & Ser. Haloed Fracts	30°-45°
37.5	Sp	-	-	Mod	-	-	-	-	-	-	Wk Mod	Mod ST	-	40%				
47.2	Tr Sp	-	-	ST	-	-	-	-	-	-	Mod	ST	-	40%				
56.1	-	-	-	Mod	-	-	-	-	-	-	Sp	Mod ST	-	40				
65.5	Sp	-	-	Mod	-	-	-	-	-	-	Sp	ST-Mod	20%	60%			Qtz Vn 66.3'-67.3'	75°
76.0	Tr	-	-	Wk Mod	-	-	-	-	-	-	Sp-Wk	ST Mod	-	35%				
85.5	Tr	Tr	-	Wk Mod	-	-	-	-	-	-	Sp	Mod ST	-	35%				
94.6	Tr	1%	-	ST	-	-	-	-	-	-	Wk	Mod ST	-	30%			Sulfs @ 103.9	
106.1	-	2%	-	-	-	-	-	-	-	-	Sp	ST	-	35%				
115.9	-	2%	-	-	-	-	-	-	-	-	Wk Mod	ST	-	35%				
125.0	-	3%	-	-	-	-	-	-	-	-	ST	ST	-	35%				
134.9	-	2%	-	-	-	-	-	-	-	-	Wk Mod	ST	4%	40%				
144.3	-	2%	-	-	-	-	-	-	-	-	Wk Mod	ST Inten	-	35%				
153.1	-	4%	-	-	-	-	-	-	-	-	ST	ST Inten	4%	40%				
162.4	-	1%	-	-	-	-	-	-	-	-	ST Inten	ST Inten	9%	50%			Qtz-Py Vn 3"-5"	65°
171.5	-	2%	-	-	-	-	-	-	-	-	ST Inten	ST Inten	3%	45%			Flt. Zone 173-175'	?
180.8	-	5%	-	-	-	-	-	-	-	-	ST Inten	ST	4%	45%			Flt Zone 185-186'	?
193.2	-	1%	-	-	-	-	-	-	-	-	ST	ST Inten	3%	45%				
202.5	-	4%	-	-	-	-	-	-	-	-	ST	ST	-	40%				
212.4	-	3%	-	-	-	0.15	-	-	-	-	Wk	ST	2%	40%				
221.2	-	2%	-	-	-	0.16	-	-	-	-	Wk	ST	-	38%				
230.6	-	3%	-	-	-	0.20	-	-	-	-	ST	Mod ST	-	45%				
239.6	-	2-3%	-	-	-	0.15	-	-	-	-	Mod	ST	-	40%				
248.7	-	2-3%	-	-	-	0.09	-	-	-	-	Mod	ST	-	40%				
257.5	-	2%	-	-	-	0.16	-	-	-	-	Mod	ST	-	45%				
267.2	-	3%	-	-	-	0.13	-	-	-	-	Mod	Mod ST	-	40%				
276.7	-	3%	-	-	-	0.08	-	-	-	-	Wk Mod	Mod	2%	45%				
288.0	-	5-8%	-	-	-	0.10	-	-	-	-	Inten	ST	-	?			Ser-Py Vn 288-290	
296.0	-	2%	-	-	-	0.08	-	-	-	-	Wk Mod	Mod	-	35%				
300.8	-	1-2%	-	-	-	-	-	-	-	-	Wk	Mod ST	-	40%				
310.3	-	1%	-	-	-	-	-	-	-	-	Sp Wk	Mod ST	-	40%				
319.6	-	2-3%	-	-	-	Tr	-	-	-	-	Wk Mod	ST	Tr	40%				
328.3	-	3%	-	-	-	Tr	-	-	-	-	ST	ST	-	40%			ST Flt Zone 334.6→	
334.6	-	3-4%	-	-	-	Tr	-	-	-	-	ST Inten	ST Inten	-	30%				
349.4	-	3%	-	-	-	-	-	-	-	-	ST Inten	ST Inten	-	40%				
359.2	-	3%	-	-	-	-	-	-	-	-	Inten	ST	-	35%				
381.0	-	1-2%	-	-	-	-	-	-	-	-	Mod	ST	-	35%				
389.8	-	6%	-	-	-	-	-	-	-	-	Inten	ST	-	30%				
398.9	-	7%	-	-	-	-	-	-	-	-	Inten	ST	-	?				
410.3	-	3-4%	-	-	-	-	-	-	-	-	ST	ST	-	35%				
420.6	-	3-4%	-	-	-	-	-	-	-	-	ST	ST	-	?		Mz @ 420.6		

Depth From	Remarks
0.0	Rock Bit - Not Recovered
20.8	Mod-ST Alt. P-Felds wholy gone to clay. K-Spars still fresh.
28.6	Mod Alt., but now Ser is main alt product. Felds are stly stained by Hem. Ser. Halos of fracts to 2"
37.5	ST Alt. - both Clay & Ser. developed. Rk becomes stly brkn. + Alt. circa 43'-47'
47.2	As Above. Ser haloing fracts - Clay developed in P-Felds. Significant lack of Goethite - Jarosite
56.1	Close spaced fracts w/ thin ser. halo 65°-70°. Some lined w/ lim
65.5	Mod-ST Alt. Qtz Vn is lined w/ 1/2" Limonite Box work.
76.0	Mod-ST Alt. Several 1/4" "Clay" seams in 75° fracts. Hem staining stly altd P. Felds
85.5	Generally as Above. Some remnant sulfs circa 92'
94.6	The white "clay" occures along all altd fracts. Sometimes bounded by Ser. End of leaching is abrupt at 103.9
106.1	ST Alt. Sulfs mainly in fracts and assoc. w/ 1/4" "Clay"
115.9	ST Alt. - more Ser as halo of fracts. Sp CC. on Py, no Cpy seen
125.0	ST Alt. K-spar still only wkly affected, however. Not much Cu
134.9	As Above. Not much min along fracts
144.3	ST-Inten alt. Numerous hair line seams of Cov-CC cutting rk. - Not assoc w/ ser halo.
153.1	ST. Alt. - Stronger pyritization w/ assoc. sericitization. Sp Cov-CC.
162.4	ST Alt - ST Qtz-Py veining. Sp Cov-CC. No Cpy
171.5	V. ST. Alt. Ser-Qtz Halos 6" or more. Cov-CC Less assoc w/ haloed fracts than norm.
180.8	ST Breccia (Bx Min) High Core loss
193.2	ST-Inten Alt. Thick Ser. Sulfs vns w/ the Py dissem in ser. V. Thin CC coatings
202.5	ST. Alt. Increase in Cov-CC occuring as v. thin, short seams in felds. Low Total Cu.
212.4	ST Alt., but almost all Kaolin. Sp CC. as above
221.2	ST Feld. Alt., V. minor min of fracts. Only Tr-Sp Cpy
230.6	ST Alt. Sulfs well dissem. CC. (?) Coats most of Py + Cpy. Appears to be some Spl assoc.
239.6	ST Alt. Ser. Haloed Py vns contain No Cu. Cov-CC. Coating dissem Cpy not assoc w/ ser.
248.7	ST Alt. As above - Sp amts of Cov-CC. throughout
257.5	ST Alt., but K-felds less affected
267.2	ST Alt. - As Above - Haloed + mineralized fracts not important in carrying Cu
276.7	Mod Alt. Sulf Cont down, but silic along fracts greater
288.0	Inten Alt. To Ser. + Py. Euhedral Py Cubes 1/8" uniformly distributed in ser. grnd mass. Qtz appears to be some. Locally ST CC. Cov.
296.0	Alt. Mod - decrease in Py, Clay alt. and total sulf content
300.8	Mod-ST Alt. Low Py content. Sp Cpy altering to Cov.
310.3	As Above
319.6	Increased alt + sulf min. Sp. sulf vning.
328.3	Increasing alt downward. Approaching Flt zone.
334.6	Intense Alt. Increase in total sulf content and Cov-Cpy. Rk quite brkn
349.4	As Above. Rk locally unbroken, but still highly altered.
359.2	Flt. gouge. V. Intense.
381.0	Rk is moderately brkn. Total sulf content down
389.8	Rk stly brkn, Intensely altd. & stly pyritized. Intense Green Ser. assoc w/ Py.
398.9	Intense Alt to ser - Py. Rk is locally quite porous.
410.3	Alt - Min much decreased. Some ser - sulf vn. Sp Cpy w/ v. thin Cov. coating
420.6	ST-Inten. Alt. Py euhedral - subhedral v.f. gr. & well dissem.

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D307
Page 1 of 1 Pages
Collar Elev 3,111.64 Final Depth 400.0
Coords. N 35,411.17 E 16,127.05
Inclination vertical
Logged by RE
Date: Start 4-2-68 Finish 4-15-68

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov	Sp. Gr.	Cu (1) Chrys.	Cu (1) Pitch	Cu (1) Black	Cu (1) Blue Green	Cu (1) Intermediate Non-Sulfides Min	Cu (1) Cc.	Cu (1) Cpy.	Cu (1) Cov. Born	Fe (2) Lim.	Fe (2) Py	Fe (2) Mag.	Fe (2) Hem.	Fe (2) Spec.	Other (2) Galena	Other (2) Sphal.	Other (2) Molyb	Other (2) Calcite	Other (2) Garnet	Other (2) Silicates	Other (2) Sericite	Other (2) Clay	Other (2) Vn. Qtz	Other (2) QUARTZ	Other (2) CHLORITE	(3) Rock Type	Structures (4) Depth	Structures (4) True Dip	Remarks
0	6.0	6.0																																			Cover
6.0	14.6	8.6		0.01				94	2.33					0.01					md		ST							md	wk	<1	35	Tr		Ap	leached veinlets QTZ	≤90°	Fine to medium grained Aplite, stly stained with hematite
14.6	23.4	8.8		0.01				96	2.39					0.01					md		ST							md	md	3	40	Tr		Ap & Ak	sulfide vein	40°	Aplite to approx. 17' followed by Ak with thin Aplite dikes
23.4	30.7	7.3		0.02				82	2.40					0.02					md	-	- ST							md	wk md	Tr	35	-		Ak & Ap (brecciated)			Mixed Ak & Aplite with high core loss. Some boxwork & lim. limonite
30.7	38.5	7.8		0.07				90	2.47						0.07				wk	2-3	- wk							wk	wk md	-	30	-		Ap			Stranded sulfides in medium grained Aplite. cc & px (altered to FeOx) unilateral & disseminated
38.5	51.4	12.9		0.02				73	2.42					0.02					md	-	- ST							md	ST	-	30	-		Ap & Ak			Broken and gouge except for solid piece of Ap from 420-43.4. Aplite generally sit as broken as Ak.
51.4	62.2	10.8		0.02				95	2.39					0.02					md	-	- ST							md	ST	-	40			AK	leached sulfide veinlets	85°	mdly broken, st clay alt, st hem staining of Fspars.
62.2	72.5	10.3		0.02				88	2.59					0.02					md		ST							wk	md	Tr	40						As above, slightly less altered
72.5	81.2	8.7		0.01				97	2.45					0.01					md	-	- ST							wk	md ST	-	40						As above, fractures filled with white clay up to ½" Thick
81.2	90.0	8.8		0.01				96	2.44					0.01					md	Tr	- ST							wk	md	<1	40			Aplite Dikes	leached vein let.	70°	Aplite dikes: 82.3-82.5; 84.7-84.9. ST hem staining
90.0	98.7	8.7		0.01				96	2.46					0.01					md	Tr	- ST							wk	md	<1	40				"	80°	As above, AK cut by thin Aplite dikes, fractures filled with clay
98.7	104.4	5.7		0.01				99	2.37					0.01					md	Tr	- ST							wk	md	1	40		- sulfides -	QTZ-sulf vein	70°	As above.
104.4	114.6	10.2		0.17				91	2.46						0.16	0.01			wk	1-2	- wk bil.							wk md	md	-	40						Sulfides begin about 104.4, gradual decrease in hem. and clay alt of AK below oxide contact
114.6	124.1	9.5		0.11				91	2.50						0.11				wk	1-2	- -							wk md	md	5/45				QTZ-sulf vein	70°	Vein QTZ: 122.5-123.3., md alt, disseminated sulfides
124.1	135.1	11.0		0.08				99	2.44						0.08				-	1-2	- -							md	md ST	-	40						md-st clay-ser alt, dis. sulfides.
135.1	144.4	9.3		0.17				94	2.50						0.17				-	1-2	- -							md	ST	-	40				P/V vein	≥90°	less altered pieces of core increased alteration, rock is soft and crumbles easily. Some large cc
144.4	153.8	9.4		0.10				96	2.49						0.10				-	1-2	- -							md	ST	-	40						Rock is broken and gouge from 144.4-145.7 otherwise st lr altd
153.8	163.5	9.7		0.10				92	2.52						0.10				-	1-2	- -							md	ST	-	40						soft, stly altd, sulfides generally as fine disseminations, but occasional st c.c.
163.5	172.8	9.3		0.24				97	2.31						0.24				-	1-2	- -							md	ST	-	40						As above
172.8	182.1	9.3		0.24				74	2.46						0.24					1-2								md	ST	<1	40				sulfide veinlet	70°	As above
182.1	196.0	13.9		0.42		0.01		63	2.38					.01	.40	.01				2								ST	ST V	-	35						Very strongly altered and gouge. Gouge from 178.2-179.0.
196.0	206.0	10.0		0.95		0.01		79	2.41					.01	.92	.02				2								ST	ST md	61/35%							QTZ from 200.7-204.5., As above from 186.0-200.7
206.0	217.0	11.0		0.43		0.01		81	2.54					.01	.40	.02				2								md	ST	-	35						Soft and strongly altered. cc appears wk; but clay may contain sulfide
217.0	225.5	8.5		0.27				96	2.52						.10	.07	.10			2								ST md	ST	3	40				QTZ-sulf veins	70°	Strong clay-sericite alte, large grains of sericite, wk-md sulfides
225.5	235.3	9.8		0.13				84	2.50						.10	.03				2?								ST	ST V	-	30?						Gouge from ~~225.5~~ 229.5-236.5. Otherwise broken & stly altd
235.3	243.4	8.1		0.30				83	2.44						.27	.03				2								ST md	ST	Tr	35			Aplite 240.0-243.0			Plag altd to clay and stained yellow. Appears to be wk oxidation along fault zone
243.4	253.0	9.6		0.41		Nil		98	2.44						.33	.04	.04			2								md	md	1	40				sulf-ser veinlets	75°	decrease in alteration. wk-md dis. sulfides
253.0	262.7	9.7		0.15				84	2.69						.08		.07			4								md	ST md	5	40				QTZ sulf veins	80-30°	QTZ-sulf veining from 255-258'. gouge-st alt. from 254.2-262.7
262.7	271.7	9.0		0.20				91	2.39						.16	.05			Tr	2								ST	V ST	1	25						stly altd & gouge to 267.0. Brecciated and limonite stained to
271.7	282.6	10.9		0.21				79	2.38						.16	.05			Tr	2								ST	ST	2	30				QTZ sulf veins	70°	st alt, 3% Total sulfides, wk cc
282.6	291.6	9.0		0.16				88	2.49						.08	.02			Tr	2								ST	ST	1	35						As above
291.6	299.8	8.2		0.09				98	2.53						.04	.02				2.5								ST	ST	2	40				QTZ sulf veins	70°	Py veinlets shown cc., stalt
299.8	307.7	7.9		0.16				87	2.55						.09	.04	.03		Tr	2-3								ST	ST	2	40						As above, wk limonite staining along fractures
307.7	316.8	9.1		0.13				93	2.55						.10	.03				2								ST	ST	1	40						st alt, very little cc.
316.8	325.8	9.0		0.12				93	2.70						.08	.04				1-2								ST	ST md	1	40						As above, st alt but little or no c.c., about 2% total sulfides
325.8	334.5	8.7		0.10				94	2.62						.06	.04				1-2								ST	md	1	45						md alt & silicification
334.5	343.4	8.9		0.11				91	2.59						.06	.05				1-2								md	md	1	45						As above
343.4	352.8	9.4		0.09				87	2.93						.03	.06				1-2								md	md	1	45						As above, no c.c., silicification gives rock a fresh appearance
352.8	361.3	8.5		0.15				81	2.12						.05	.10				2%	-	-	-	-	-	-	-	Mod	Sp ALT	1	40%						Mod Alt. mainly as ser. veining of fracs. Only trace amts of staining of CPY by CC
361.3	369.2	7.9		0.18				89	2.74						.05	.13				1-3%	-	-	-	-	-	-	-	Mod	Sp ALT	3%	45%						Mod Alt. Generally as above. Somewhat BIKA. 4" QTZ-PY VN @ 368'. Much of PY-OPY precipitated in Plag. FrVs
369.2	379.0	9.8		0.15				94	2.62						.03	.12				2%	-	-	-	-	-	-	-	Mod	Sp Pol	1%	50%				N-Ser Vns	60°	Mod Silt, Mod-Sr Ser and wk-md clay alt. Thick zones (3-5') of Ser-QTZ Halo PY vns
379.0	388.1	9.1		0.07				98	2.61						.01	.06				2-3%	-	-	-	-	-	-	-	ST	Sp WK	3%	45%			Aplite 380.5-385?			Sr. Ser-PY alt. Some PY vns ⅓" thick, only trace amts of CPY.
388.1	400.0	11.9		0.11				98	2.60						.01	.10				3%	-	-	-	-	-	Tr	-	-	ST	Mod WK	2%	45%						Generally as above. Some "non-sharp" QTZ vns assoc. w/ PY. Local CPY 30% replaced by CC-COV.

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D308
Page 1 of 3 Pages
Collar Elev 2,712.51 Final Depth 947.9
Coords. N 37,463.49 E 15,951.56
Inclination vertical
Logged by RE
Date: Start 6-12-68 Finish 7-13-68

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	unknown N.S.	Cc.	Cpy.	Born	Fe (2) Lim.	Py.	Mag.	Hem	Spec.	Other (2) Galena	Sphal	Molyb.	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0	20.0	20.0																																			Rock bit
20.0	36.0	16.0		.08				29	2.57					.08				ed	-	-	ST	-						ST	ST	-	30	-	AK	32.0			Poor Recovery. Broken AK to 32.0. Fault gouge to 40.0
36.0	48.0	12.0		.16				35	2.62					.16				ad	Tr	-	Tr	-						md	ST	-	25	-	Gouge / Da	40.0			fragments of Da. Breccia, Average size: 1/2" cave from above.
48.0 / 49.5	49.5 / 60.4	1.5 / 10.9	(Rock bit)	.10				0 / 57	2.52					.10				ST	-	-	-	-						md	ST	-	30	Tr	Da				stly broken Da, st clay alt. & silicification
60.4	70.0	9.6		.07				73	2.55					.07				ST	Tr	-	-	-						md	ST	-	40	Tr	AK & Da				identification difficult due to alteration, silicification, and brecciation fragments vary from short pieces of core to sand size.
70.0	77.8	7.8		.29				87	2.54				.29					ST	-	-	-	-						wk	ST	-	40	Tr	AK				V. stly altd. AK with st MnO & Cu Ox
77.8	87.1	9.3		.44	0.41	.07	0.01	81	2.60					.07	.33	.04		ST	1	-	-	-						wk	ST	-	40	Tr	AK, Da				st alt. py and st zones of cc. present in leached rk.
87.1	95.0	7.9		.55		.08		86	2.53					.08	.43	.04		ST	1	-	-	-						wk	ST	-	40	2	AK?				st oxidation except for zones of cement sulfides
95.0	104.6	9.6		.07				84	2.59					.07				md	-	-	-	-				1		-	wk	-	-	5?	Post-Min.	97.3			Fractured, limonite stained post-mineral andesite
104.6	113.9	9.3		.06				84	2.61					.06				md	-	-	-	-				1		-	wk	-	-	5?	Andesite				As above, thin calcite veinlets
113.9	119.1	5.2		.04				94	2.41					.04				md	-	-	-	-				1		-	wk	-	-	5?	"	121			As above
119.1	130.0	10.9		.32				49	2.65					.22?		.10?		md	Tr	-	-	-				10	-	50	-	15	-	-	5	Hf			Brecciated and gouged green Hf. with Qtz veins
130.0	141.3	11.3		.20				97	2.66					.10?		.10?		md	1/2	-	-	-				10	5	65	-	-	-	-	5	Hf			stly broken, medium hard (3 ps) green Hf. wk cpy
141.3	151.1	9.8		.46	0.43	.02	0.01	88	2.69					.02		.44		-	3	-	-	-				10	-	75	-	-	-	5	Hf				" " , high py:cpy ratio.
151.1	161.5	10.4		.41		Nil		83	2.32					Nil		.41		-	3-5	-	-	-	-	-	-	5	-	70	-	-	-	10	5	Hf			shattered, but not gouged. dense, hard, silicified(?) Hf.
161.5	170.0	8.5		.14				89	2.68							.14		-	3	-	-	-	-	-	-	5	5	80	-	-	-	5	2	Hf			" , thin veinlets of cpy
170.0	177.1	7.1		.28				85	2.75							.28		-	3-5	-	-	-	-	-	-	5	5	70	-	-	-	3	5	Hf			" , As above, dk. green Hf., dense, flinty.
177.1	187.0	9.9		.14				82	2.65							.14		-	3	-	-	-	-	-	-	5	3	80	-	-	-	-	5	Hf			" , average Fragment size: 1/4"
187.0	199.5	12.5		.18				90	2.76							.18		-	3	-	-	-	-	-	-	5	5	80	-	-	-	-	5				" , slightly less fractured. cpy in some qtz veins
199.5	207.2	7.7		.20				90	2.76							.20		-	2	-	-	-	-	-	-	5	5	80	-	-	-	-	5				" , As above
207.2	214.9	7.7		.08				93	2.78							.08		-	1-2	-	-	-	-	-	-	5	Tr	80	-	-	-	-	5				dk green-black, f.g. Hf., wk dis sulfides
214.9	222.8	7.9		.09				93	2.82							.09		-	2	-	-	-	-	-	-	5	7	80	-	-	-	-	3				As above
222.8	230.0	7.2		.16				88	2.62							.16		-	2	-	-	-	-	-	-	2	10	75	-	-	-	-	5				As above, dk green-dk brown f.g. Hf. dis sulfides
230.0	237.2	7.2		.20				100	2.76							.20		-	1-2	-	-	-	-	-	-	2	10	75	-	-	-	-	5				As above
237.2	246.3	9.1		.09				69	2.70							.09		-	1-2	-	-	-	-	-	-	2	10	75					5				As above, some garnet borders thin cpy veinlets
246.3	253.5	7.2		.21				82	2.80							.21		-	1-2	-	-	-	-	-	-	2	10	75					5				cpy along vertical fractures and in thin veinlets
253.5	257.1	3.6		.24				93	2.83							.24		-	1/2	-	-	-	-	-	-	2	2	90	-	-	-	-					light tan-green, hard, f.g. Hf., few visible sulfides
257.1	264.7	7.6		.10				100	2.74							.10		-	-	-	-	-	-	-	-	2	-	-	-	-	-	-	5	Hf Post Min. And.	257.1 / 264.7		Dark green post-mineral andesite dike.
264.7	273.4	8.7		.25				70	2.64							.25		-	1	-	-	-	-	-	-	2	-	90	-	-	1	1	2	Hf			stly broken, sulfides dis and in veinlets
273.4	283.5	10.1		.20				74	2.71							.20		-	1	-	-	-	-	-	-	2	-	90	-	-	-	-	2		cpy vein 85°		hard, flinty. stly broken into angular fragments, but not gouged.
283.5	292.7	9.2		.43		.02		100	2.67				.02			.41		-	1	-	-	-	-	-	Tr	2	5	80	-	-	3	3	2				cpy disseminated and in thin steep Qtz veinlets with moly
292.7	304.0	11.3		.13				77	2.67							.13		-	1	-	-	-	-	-	Tr	2	7	78	-	-	3	3	2				As above, dense, f.g., garnet-diop(?) Hf.
304.0	315.2	11.2		.26				56	2.76							.26		-	2	-	-	-	-	-	Tr	2	7	78	-	-	2	2	4	Hf			dk green, f.g. Hf. cpy dis and along fractures and in veins
315.2	323.6	8.4		.18				76	2.84							.18		-	2	-	-	-	-	-	-	2	5	10	-	-	1	7	5	Qtzite			cream colored impure Quartzite
323.6	337.0	13.4		.22				46	2.78							.22		-	1	-	-	-	-	-	Tr	2	Tr	70	-	-	2	1	2	Hf			f.g. very pale green, Hf, with Qtz veins and bands of Qtzite
337.0	343.9	6.9		.30				80	2.67							.30		-	1	-	-	-	-	-	Tr	2	Tr	80	-	-	3	3	5		Qtz-cpy vein 70°-90°		light tan-green Hf. cpy and moly in steep Qtz veins
343.9	355.4	11.5		.19				70	2.67							.19		-	1	-	-	-	-	-	Tr	2	Tr	75		1	5	5					strongly sheared with thin bands of Qtzite
355.4	363.4	8.0		.11				91	2.66							.11		-	1/2	-	-	-	-	-	-	2	-	80	-	-	-	-	5	Shattered	355.5 / 356.2		mdly broken, light green Hf. (H=5)
363.4	370.9	7.5		.26				91	2.68							.26		-	1/2	-	-	-	-	-	-	2	-	85	-	-	-	-	5				As above
370.9	380.2	9.3		.86		.02		78	2.74				.02			.84		-	2	-	-	-	-	-	-	2	1	80	-	-	10	10	3		Qtz sulf veins 80°-90°		py & cpy in near vertical Qtz veins up to 1" thick.
380.2	388.0	7.8		.34				89	2.74							.34		-	1	-	-	-	-	-	Tr	2	-	85	-	-	2	2	3				dis py, cpy in f.g., hard, green Hf.
388.0	394.8	6.8		.35				100	2.76							.35		-	1	-	-	-	-	-	-	2	-	85	-	-	-	-	5				As above
394.8	402.8	8.0		.24				100	2.51							.24		-	1	-	-	-	-	-	-	2	-	85	-	-	-	-	5				uniform, f.g., light green Hf.

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO- SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D308
Page 2 of 3 Pages
Collar Elev 2,712.51 Final Depth 997.9
Coords. N 37,463.49 E 15,951.56
Inclination Vertical
Logged by RE
Date: Start 6-12-68 Finish 7-13-68

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green		Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb.	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
402.8	411.7	8.9		.08				94	2.76					.08				-	-	-	-	-	-	-	-	2	-	-	-	-	-	10	Hf Post min dike	403.5		Andesite (?) porphyry dike with 20-30% biotite plus pyroxene.
411.7	418.2	6.5		.05				94	2.77					.05				-	-	-	-	-	-	-	-	2	-	-	-	-	-	10	"	418.2		As " Above
418.2	430.9	12.7		.29				95	2.76							.29		-	1	-	-	-	-	-	Tr	2	-	90	-	-	-	2	Hf			f.g. medium green Hf, dis. cpy
430.9	437.1	6.2		.30				100	2.83							.30		-	1	-	-	-	-	-	-	2	-	90	-	-	-	2				As above
437.1	445.3	8.2		.53		.01		95	2.72					.01		.52		-	1	-	-	-	-	-	-	2	-	90	-	-	-	2				As above. fine dis. cpy
445.3	453.7	8.4		.40	0.42	.02	0.01	94	2.75					.02		.38		-	1	-	-	-	-	-	Tr	2	3	80	-	-	3	3	2	Hf			f.g., dark green Hf, mdly broken; QTz veins contain breccia fragments
453.7	462.8	9.1		.47		.01		100	2.81					.01		.46		-	1	-	-	-	-	-	-	2	3	80	-	-	-	-	4		bending	70°	As above, dis. py, cpy
462.8	472.0	9.2		.53		.01		100	2.93					.01		.52		-	1	-	-	-	-	-	Tr	2	3	80	-	-	-	-	4				As above
472.0	482.8	10.8		.63		Nil		97	2.76					Nil		.63		-	1-2	-	-	-	-	-	-	2	-	85	-	-	-	-	1	Hf Post min Dike	482.8		light green, f.g., Hf (H2S). dis. py, cpy
482.8	492.2	9.4		.09				89	2.75					.09				-	-	-	Tr	-	-	-	-	2	-	-	-	-	-	10		492.2		Post min And. porphyry. 20-30% biotite plus pyroxene and epidote?
492.2	502.3	10.1		.25				86	2.78							.25		-	2	-	-	-	-	-	Tr+	2	-	90	-	-	-	-	2	Hf			light green f.g. Hf, py, cpy in veinlets
502.3	509.7	7.4		.16				98	2.78							.16		-	2	-	-	-	-	-	Tr	2	-	90	-	-	-	-	2				As Above; mdly broken
509.7	519.0	9.3		.39		.01		94	2.85					.01		.38		-	2	-	-	-	-	-	Tr	2	-	90	-	-	1	1	2				As Above;
519.0	528.2	9.2		.30				88	2.82							.30		-	2	-	-	-	-	-	Tr	2	-	90	-	-	-	-	2	Hf Post min Dike	Bending 528.2	65-70°	As above; f.g., light green Hf. cpy in veinlets
528.2	535.8	7.6		.03				100	2.76					.03				-	-	-	-	-	-	-	-	4	-	-	-	md	-	10	"			Post Mineral Andesite dike similar to those above, only broken/gouge
535.8	541.7	5.9		.05				79	2.64					.05				-	-	-	-	-	-	-	-	4	-	-	-	wk	-	10	"	541.7		As above
541.7	552.0	10.3		.24				90	2.79							.24		-	1	-	-	-	-	-	-	2	-	90	-	-	2	2	3	Hf			stly broken, f.g. light green Hf. QTz py vein 550.6-550.7
552.0	564.3	12.3		.61		Nil		65	2.79					Nil		.61		-	2	-	-	-	-	-	-	2	-	90	-	-	2	2	3	Hf	565.4		As above, py in fractures, QTz veins, wk cpy in QTz veins
564.3	572.4	8.1		.44	0.43	Nil	Nil	90	2.86					Nil		.44		-	1	-	-	-	-	-	-	3	-	85	-	Tr	1	1	3	Hf Hf	566.1		Thin Mz dike, occasional less broken, less py - and in veinlets
572.4	581.0	8.6		.36				92	2.75							.36		-	1	-	-	-	-	-	Tr	3	-	90	-	-	1	1	3				mod-stly broken, v.f.g., light tan-green Hf. sulfides on fractures
581.0	590.0	9.0		.50		Nil		100	2.71					Nil		.50		-	2	-	-	-	-	-	-	1	-	90	-	-	3	3	3				sulfides dis. on fractures and in QTz vein. Trace epidote
590.0	598.5	8.5		.29				94	2.71							.29		-	2	-	-	-	-	-	Tr	4	-	90	-	-	1	1	3				Mod green Hf, (H2S) thin ribbon like calcite veinlets, dis. cpy
598.5	606.0	7.5		.15				95	2.76							.15		-	1-2	-	-	-	-	-	-	1	-	80	-	-	Tr	10	Tr	Hf or Qtzite			dense siliceous Hf, stly broken into sharp angular fragments
606.0	614.9	8.9		.13				88	2.71							.13		-	1	-	-	-	-	-	Tr	1	-	?	-	-	-	?	-	"			silicified Hf or Qtzite. broken as above
614.9	623.4	8.5		.21				88	2.75							.21		-	1/2	-	-	-	-	-	Tr	1	-	50	-	-	90	1	Tr	Qtzite?			v. stly broken. QTzite (?) sulfides f'sorp on fractures
623.4	632.4	9.0		.34				90	2.73							.34		-	1	-	-	-	-	-	Tr	1	-	50	-	-	90	Tr	Tr	"			" " " " (?), some dolomite silicified Hf. open QTz veins
632.4	643.9	11.5		.32				76	2.67							.32		-	1	-	-	-	-	-	Tr+	1	-	60?	-	-	34?	Tr	Tr	Silic. Hf	639 QTz sulf veins	≥ 70°	Silicified Hf. Brecciated f'gouge along contact. cpy, mdly epidote in strip
643.9	651.5	7.6		.07				96	2.69					.07				-	-	-	-	-	-	-	-	2	-	-	-	Tr	-	-	-	Post-Min And	643.9 Qtz. contact		Post-Min Andesite porphyry w/20-30% biotite
651.5	654.9	3.4		.29				100	2.54							.29		-	1/2	-	-	-	-	-	Tr	2	0	80	-	-	2	2	Tr	Hf		85-90°	Garnet-Diop Hf.
654.9	659.3	4.4		.03				90	2.56					.03				-	-	-	-	-	-	-	-	4	-	-	-	Tr	-	-	1	Post Min And.	654.9 659.3		Post-Min Andesite, as above
659.3	670.2	10.9		.26				86	2.78							.26		-	1	-	-	-	-	-	-	3	5	60	-	-	-	25?	Tr	Hf	670.2		2" long angular fragments very hard, dense light green silicified Hf. Unusually broken into
670.2	683.1	12.9		.20				88	2.60							.20		-	2	-	-	-	-	-	-	1	-	-	ST	ST	-	10	3	Mz			stly broken, stly alted Mz. Biotite complete → chl, hydromica; Plag, Kspar → calc, sericite
683.1	695.0	11.9		.12				100	2.69							.12		-	2	-	-	-	-	-	Tr	-	-	-	ST	ST	-	20	1	Mz	fault	60°	fault gouge zone 683.2-684.4. stalt, v.st. silicification
695.0	704.0	9.0		.09				90	2.63							.09		-	1	-	-	-	-	-	Tr+	Tr	-	-	ST	ST	2	40	-	Ak			v stly alted and silicified Ak. Identified by abundance of large QTz quins
704.0	713.3	9.3		.06				81	2.59							.06		-	1	-	-	-	-	-	Tr	Tr	-	-	ST	ST	2	40					As above
713.3	724.6	11.3		.11				77	2.55							.11		-	1	-	-	-	-	-	Tr	Tr	-	-	ST	ST	2	40					slightly less alted, recognizable Ak.
724.6	733.8	9.2		.08				94	2.58							.08		-	1	-	-	-	-	-	Tr	-	-	-	ST mod	ST	1	40	Tr				mod-stly alted. Ak, dis. sulfides
733.8	742.5	8.7		.11				100	2.56							.11		-	Tr	-	-	-	-	-	Tr	-	-	-	ST ind	ST	2	40	Tr				As above, Trace dis. magnetite
742.5	751.2	8.7		.04				90	2.59							.04		-	1	-	-	-	-	-	-	-	-	-	ST mod	ST	1	40	Tr	Ak	contact 62°		Thin fault at 740-75°. Gypsum on some fractures
751.2	761.1	9.9		.01				100	2.64					.01				-	Tr	-	-	-	-	-	-	2	-	2	-	-	-	-	5	Post min And			Post-min. andesite with inclusions of Mz & Hf (5-10%)
761.1	772.5	11.4		.01				88	2.64					.01				-	Tr	-	-	-	-	-	-	2	-	2	-	-	-	-	5	"	contact 772.5	55°	" " " " " " " " "
772.5	780.9	8.4		.19				83	2.69							.19		-	1	-	-	-	-	-	-	-	-	-	wk mod	-	10	10		Mz			mod-stly alted. & silicified Mz. Gypsum on fractures.
780.9	790.3	9.4		.15				96	2.71							.16		-	1/2	-	-	-	-	-	-	-	-	-	wk	wk mod	-	10	10				silicified Mz, dis. py, cpy. " " "

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D308
Page 3 of 3 Pages
Collar Elev 2,712.51 Final Depth 947.9
Coords. N 37,463.49 E 15,951.56
Inclination Vertical
Logged by RS
Date: Start 6-12-68 Finish 7-13-68

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green		Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem.	Spec.	Other (2) Galena	Sphal.	Molyb.	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
790.3	797.1	6.8		.03				92	2.69					.03				-	-	-	-	-				5			-	-	-	5		Post Min And	Contact 797.1	50°	Post-Mineral Andesite sharp contact with Mz
797.1	801.4	4.3		.14				73	2.71							.14		-	-	-	-	-						wk md	1	10	8			Mz	801.4		mdly altd Mz grey white to light green bonded Hf with patches of garnet epidote and px in veins gypsum, scap on fractures.
801.4	809.7	8.3		.14				93	2.75							.14		-	-	-	-	-				2	15	80	-	-	-	2		Hf			
809.7	818.4	8.7		.04				94	2.80					.01		.03		-	-	-	-	-				2	15	60	-	-	-	5		Hf	818.4 819.9		Hf as above, cut by Post-min andesite dike.
818.4	827.5	9.1		.14				100	2.89							.14		-	-	-	-	-	-	-	-	2	25	65	-	-	-	3		Hf			grey-tan Hf few blebs of cpx - gypsum on fractures
827.5	837.0	9.5		.20				100	2.66							.20		-	-	-	-	-	-	-	-	3	25	65	-	-	-	3		Hf			green-tan Hf dis cpx 5-10% gypsum, 3% sericite inclusions qtzite or Hf
837.0	844.8	7.8		.14				91	2.88							.14		-	-	-	-	-	-	-	-	3	25	55	-	-	-	10	3	Hf Qtzite	at Da?		same rock is fg., siliceous and contains large qtz eyes - but otherwise
844.8	853.4	8.6		.07				90	2.69					.07				-	-	-	-	-	-	-	-	10	-	-	-	-	-	5		Mz	853.4	85°	Post-min andesite with numerous irregular calcite veins
853.4	864.4	11.0		.21				91	2.65							.21		-	-	-	-	-	-	Tr	Tr	1	-	20°	-	-	2	70°	-	Qtzite or Hf	qtz qpx vein	50°	Silicified Hf or Qtzite, with Quartz-py-cpx veins, altered (Core has also recovered this zone)
864.4	871.2	6.8		.19				100	2.52					.04		.15		-	1/2	-	-	-	-	Tr	Tr	5	20	md	ST	ST	-	5 md		Hf Mz	864.1 865.1 872.1		P.M. and 862.5-864.1, Da 864.1-865.1; Mz & Hf to 871.2. St all silicification with secondary kspar. St moly mainly on vertical shears. steep kinks of py, cpx, sphal.
871.2	885.9	14.7		.39				95	2.62							.39		-	2	-	-	-	-	Tr	Tr	-		ST	ST	T.	10	3		Mz	885.9		
885.9	895.1	9.2		.04				81	2.64					.04				-	-	-	-	-	-	-	-	1	-	-	-	-	-	10		Post Min And			Post-Mineral Andesite with thin calcite veinlets
895.1	905.8	10.7		.04				79	2.63					.04				-	-	-	-	-	-	-	-	1	-	-	-	-	-	10					As above
905.8	912.0	6.2		.04				86	2.65					.04				-	-	-	-	-	-	-	-	1	-	-	-	-	-	10					As above
912.0	927.7	15.7		.02				79	2.65					.02				-	-	-	-	-	-	-	-	1	-	-	-	-	-	10					As above
927.7	942.0	14.3		.03				91	2.73					.03				-	-	-	-	-	-	-	-	1	-	-	-	-	-	10			Contact 942.0	60°	As above
942.0	947.9	5.9		.16				98	2.65							.16		-	1	-	-	-	-	-	Tr	-		ST	ST	-	20	5		Mz			stly altd sil Mz with st. sericite along px veins.

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO- SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D309
Page 1 of 2 Pages
Collar Elev 2,694.46 Final Depth 510.0
Coords. N 39,701.14 E 14,456.14
Inclination vertical
Logged by RE, RHL
Date: Start 6-28-68 Finish 7-12-68

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg	% Cu NS	% Cu Avg	% Core Recov	Sp. Gr	Cu (1) Chrys.	Pitch	Black	Blue Green	Unknown NS	Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0	5.0	5.0																																			Rock bit
5.0-	14.6	9.6		.04				92	2.52				.04 →					md	-	-	Tr	-						-	wk	-	40	1		AK			wk alt, orthoclase veaktered, 1% biotite altered to chlorite.
14.6	26.6	12.0		.02				88	2.60				.02 →					wk	Tr	-	-	-						-	wk	-	60	2					Secondary kspar along thin py veinlet, quartz lim (mag) on fractures wk alt of alt plag.
26.6	41.8	15.2		.01				85	2.77					.01				wk	Tr	Tr	Tr+	-						-	wk	-	50	2					1% wk alt, 5% unidentified green alt mineral, no alteration of orthoclase.
41.8	50.6	8.8		.05				95	2.56					.03	.02			wk	Tr		Tr	-		Tr				-	md	-	50	3					plag alted to green clay (2%) mainl. Grains at hem altd from mag.
50.6	59.9	9.3		.03				100	2.59					.02	.01			Tr	1/2		Tr	-						-	md	-	45	2			Thin fat 51.6	83°	As above
59.9	73.8	13.9		.03				99	2.60					.02	.01			—	1/2	Tr	Tr	-						-	md	-	50	2		AK, Ap, Mz			Tr of S.S. oxpy. py in biotite to chl. Aplite contains Tr of dis mag. Mz 1% fresh, contains 40% QTZ, 5% fresh bi in pink groundmass.
73.8	84.5	10.7		.01				90	2.48					.01				—	<1/2	Tr	-	-						-	wk md	-	35	2		AK, Ap, Mz?			AK: 74.1-75; Ap: 75.1-77.1, Mz?: 77.1-84.3. Mz?? is mod green (between AK & Ap)?
84.5	92.1	7.6		.01				100	2.44					.01				—	<1/2		-	-						-	wk md	-	30	2		AK & Ap			85% Aplite - 15% AK. Ap is fg. salmon pink, wk to alted, <1/2% sulfides
92.1	100.4	8.3		.01				100	2.51					.01				—	<1/2		-	-						-	wk md	-	30	2		Ap & AK			As above, wkly altd, AK & Ap. 2% sulf green alt min.
100.4	109.4	9.1		.01				99	2.61							.01		-	<1/2	Tr	-	-						-	wk	-	45	3		AK			Poly wkly altd coarse grained AK. Tr of dis mag
109.4	119.5	10.0		.01				89	2.61							.01		-	<1/2		-	-						-	wk	c	45	3			1/8" QTZ crst. on 1/4"	70°	As above, Jointing 70°-90°. No alt along QTZ vein
119.5	127.6	8.1		.01				100	2.71							.01		-	<1/2		Tr	-						-	wk	-	45	4					As above, Tr of hem after mag.
127.6	136.3	8.7		.01				100	2.63							.01		-	<1/2		-	-						-	wk	-	45	2					Coarse grained AK with 1% biotite, 2% chl, <1/2% py.
136.3	145.6	9.3		.01				97	2.62					.01				-	1/2		-	-						-	wk	-	45	2					Core unfractured. Plag altd to light green clay min.
145.6	154.5	8.9		.08				100	2.60					.06		.02		-	<1/2	1/2	-	-						-	wk	-	45	2					dis mag exceeds py in abundance
154.5	163.8	9.3		.01				93	2.60					.01				-	<1/2	1/2	-	-						-	wk	-	45	2					As above, dis magnetite grains, alt of plag to green clay.
163.8	176.1	12.3		.02				88	2.66					.01		.01		-	Tr	1/2	-	-						-	wk	-	45	2					As above
176.1	186.0	9.9		.01				91	2.61					.01				-	Tr	1/2	-	-						-	wk	-	45	2					" "
186.0	194.3	8.3		.03				100	2.62					.01		.02		-	Tr	1/2	-	-						-	wk	-	45	2					" "
194.3	204.0	9.7		.02				85	2.61					.01		.01		-	Tr	1/2	-	-						-	wk	-	45	2					" "
204.0	212.4	8.4		.01				97	2.58							.01		-	1/2	Tr	-	-						-	wk	-	45	2			Shears	55-70	" " mdly sheared with chlorite on shears.
212.4	222.0	9.6		.01				85	2.60						.01?			-	1/2	1	-	-						-	wk	2°	45	2			Shears	50°-70	Silicified Bx: 216.5-217.5
222.0	231.4	9.4		.02				89	2.59							.02		-	1/2	Tr	-	-						-	wk md	-	50	2			"	50°	Plag altd to green clay. dis mag altering to hem
231.4	240.0	8.6		.01				100	2.62							.01		-	1/2	Tr	-	-						-	wk md	-	50	2			Aplite dike	35°	Aplite: 236.8-237.0, otherwise as above.
240.0	247.7	7.7		.02				96	2.62					.02				-	1/2	Tr	-	-						-	wk md	-	50	2		AK 247.7			10% green clay mineral altd from plag.
247.7	257.9	10.2		.01				92	2.62							.01		-	1/2	Tr+	-	-						-	wk md	-	20	8		Mz, Ap, AK	Mz contact	45°	Mz occurs from 247.7-248.7; 250.2-251.0. AK & Aplite: 248.7-250.2; 251.0-257.9
257.9	267.7	9.8		.02				88	2.63							02		-	<1/2	1/2	-	-						-	wk mg	-	45	3		AK			1% biotite, 3% chlorite. Massive -- very few joints
267.7	276.4	8.7		.03				100	2.57							.03		-	<1/2	1/2	-	-						-	wk md	-	45	4					As above, biotite in all stages of alteration to chlorite.
276.4	286.5	10.1		.01				90	2.70							.01		-	<1/2	<1/2	-	-						-	md	-	45	4					stronger alt of plag. to green-white clay. Some alt. of kspar.
286.5	296.0	9.5		03				89	2.82							03		-	1/2	1/2								-	md	-	45	4					As above, mag altering to hem
296.0	304.8	8.8		02				100	2.61							02		-	1/2	1/2								-	md	-	45	4					" "
304.8	313.9	9.1		.02				98	2.61							.02		-	1/2	1/2								-	md	-	45	4					" "
313.9	323.4	9.5		.02				96	2.61							02		-	1/2	1/2								-	md	-	45	4			Shears	65°	" "
323.4	332.1	8.7		.01				100	2.60							.01		-	1/2	1/2								-	md	-	45	4			1" aplite dike	55°	" " Serpentine on wide spaced shears
332.1	342.3	10.2		.02				93	2.61							.02		-	1/2	1/2								-	md	-	45	2					" "
342.3	351.7	9.4		.03				91	2.62							.03		-	1/2	1/2								-	md	-	45	2			Shears	60°	Aplite dike: 349.7-349.9: 45°.
351.7	360.2	8.5		.03				100	2.54							03		-	1/2	1/2				Tr				-	md	-	40	2		AK & Ap			Aplite: 351.7-351.9; 352.0-352.2; 357.2-358.7. AK as above
360.2	369.6	9.4		.03				98	2.57							03		-	<1/2	1/2	-	-		Tr+				-	md Tr	-	45	2			Qtz-cpy mat'l v.	65°	slight increase in mineralization. 1/8" Qtz-cpy-mdy stringers (sulfides on fractures) plus more
369.6	378.3	8.7		.02				100	2.58							02		-	1/2	1/2	-	-						-	md	-	45	4					Plag. completely altd to green clay.
378.3	387.3	9.0		.03				94	2.62							.03		-	1/2	1/2	-	-						-	md	-	45	4					Aplite: 379.2-380.0. Otherwise as above.
387.3	395.0	7.7		.03				88	2.73							.03		-	<1/2	1/2	-	-	Tr					-	md Tr	-	45	4		AK			Tr of galena in stringers cutting 60° shear (shear zone) - py & mag along vertical shears
395.0	404.5	9.5		.02				81	2.80							02		-	1/2	1/2	-	-	-					-	wk md	-	30	1			Shears	90°	Decrease in biotite-chl & QTZ. dis py & mag.
404.5	413.1	8.6		.06				89	2.72							.06		-	<1/2	1/2	-	-	-					-	md	2°	55	2		Silicified AK & Ap			Stly silicified AK & Ap with py & mag only in strong stringers

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

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Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
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Hole No. D 309
Page 2 of 2 Pages
Collar Elev 2,694.46 Final Depth 510.0
Coords. N 39,701.14 E 14,456.14
Inclination Vertical
Logged by RE, RHL
Date: Start 6-28-68 Finish 7-12-68

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Native Cu	Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb.	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	epidote	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
413.1	422.8	9.7		.08				86	2.63							.08		-	½	½	-	-	-	-	Tr	-	-	-	ST	-	30	15	wk		AK			st clay alt. of plag., low QTZ., st chlorite, wk epidote
422.8	431.3	8.5		.03				100	2.60							.03		-	1	½?	-	-	-	-	-	-	-	-	md ST	-	35	20	wk					15-20% biotite largely altd to chlor (appears to be primary). zones of st clay alt.
431.3	440.6	9.3		.03				95	2.57							.03		-	1	1	-	-	-	-	-	-	-	-	md	-	30	20	wk					generally fresher, more unaltered biotite, plag. mag. occurs in and around biotite. pulls small magnet bits 1/4" from core.
440.6	450.8	10.2		.06				88	2.75					.02		.04		-	½	1	-	-	-	-	-	Tr	-	-	-	-	40	20	md					Epidote, cpy and Tr of native Cu on fractures.
450.8	458.0	7.2		.04				100	2.71							.04		-	1	½	-	-	-	-	-	Tr	-	-	-	-	35	20	md					numerous thin calcite veinlets.
458.0	469.5	11.5		.06				79	2.69							.06		-	½	<½	-	-	-	-	-	3	-	-	-	md ST	-	35	20	wk				Gouge 461.5-462.5, Aplite 465.5-465.9. followed by vuggy calcite veins
469.5	483.0	13.5		.05				90	2.67							.05		-	½	<½	-	-	-	-	-	3	-	-	-	md ST	-	35	20	wk				" 473.8-474.1. AK cut by several Ap dikes and calcite veins
483.0	492.7	9.7		.07				86	2.70							.07		-	½	½	-	-	-	-	-	Tr	-	-	-	wk	-	35	20	wk				wkly altd & silicified with thin stringers of cpx
492.7	500.5	7.8		.09				100	2.73							.09		-	½	½	-	-	-	-	-	Tr	-	-	-	wk	2	35	20	wk				As above
500.5	510.0	9.5		.09				88	2.71					.03		.06		-	½	½	-	-	-	-	-	Tr	-	-	-	wk	-	35	20	wk				As above, Native Cu on some fractures
	EOH																																					

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D310

Hole No. D310
Page 1 of 2 Pages
Collar Elev 2,694.99 Final Depth 590.4
Coords. N 39,481.92 E 14,901.12
Inclination vertical
Logged by RE and RHL
Date: Start 7-13-68 Finish 7-31-68

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Unknown NS	Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0	8.0	8.0																																			Rock bit
8.0	19.3	11.3		0.12											0.12			mod ST	½	-	-	-							wk	md	-	20	1	Da			stly broken, limon fractures, remnant dis. py, wk-md alt. (19.3-20.0 Robit)
20.0	29.1	9.1		0.17									.08		.09			md ST	½	-	-	-							WK	md	-	15	-	Da			As above, but with cc. along fract @ 26.6' and malachite @ 28.3'.
29.1	38.8	9.7		0.06											.06			mod ST	½	-	-	-							WK	mod	-	15	1	Da			Highly shattered rock to 43.8' - less intense to 38.8'. lim on fract.
38.8	45.4	6.6		0.07											.07			mod	<½	-	-	-				½			NK	NK	½	10	2	Da	45.4		Mod. broken, mod lim on fractures. Qtz lining vugs in places. Som chl. diss & fract.
45.4	51.3	5.9		0.07												.07		tr	1	-	tr	-				5	25	65	-	-	-	2	tr	Hf	51.3		Garnet - diopside hornfels. Dense and unshattered. Calc. mainly along fract.
51.3	61.0	9.7		0.06												.06		-	2	tr	-	-							wK	wK	-	35	T	Da			Silicified dacite. Py locally abundant along fract. Tr. cpy
61.0	69.9	8.9		0.05												.05		tr	1	-	-	-							Wk	mod	-	30	½	Da			As above. Py occurs along fractures and as disseminations. Bi → chlorite (in part)
69.9	79.0	9.1		0.07												.07		-	1	-	<½	-				tr			NK	WK	-	30	3	Da			Sil. Da. Local strong fract. containing chlorite and pyrite. Some brecciation.
79.0	87.9	8.9		0.02												.02		-	1	-	-	-							NK	NK	-	35	1	Da			As above. WK. fracturing of rock. Py mainly along veinlets and fract.
87.9	96.7	8.8		0.01												.01		-	1	-	-	-							NK	NK	-	30	½	Da			Essentially as above. Tr. of cpy along a fracture.
96.7	105.6	8.9		0.01												.01		-	½	-	-	-							NK	mod	-	30	½	Da			As above. Biotite shows less alt. to chl. WK-mod alt.
105.6	114.3	8.7		0.03												.03		-	1	-	-	-							NK	NK	-	35	½	Da			Silicified dacite. py mainly along fract and some as dissem. Tr. cpy
114.3	121.5	7.2		0.02												.02		-	½	-	tr	-						½	mod	mod	-	25	½	Da	121.5		As above. Prop. of clay min. is higher. Some hem. along fract. 119.5-120.5'
121.5	126.8	5.3		0.03												.03		-	1	-	½	-				2	•	80	—	—	-	15	½	Hf ?	126.8		Massive epidote with sp. hem along fractures. Py along fract and as diss. (epidote along fract + tr. hem.)
126.8	138.7	11.9		0.05												.05		-	½	-	tr	-						2	wK	mod	-	30	2	Da			Sil. dacite. Sp. incl. of epidote. Some hem along fract. 133.6-138.7' a "pink" stain (CaCO3 along veinlets.)
138.7	147.1	8.4		0.02												.02		-	½	-	-	-						½	NK	NK	-	25	5	Da			As above. Chl. and py along fract. Only v. sp. epidote (in groundmass (feldspar?))
147.1	156.5	9.4		0.03											.01	.03		-	½	-	-	-			tr			-	NK	NK	-	30	5	Da			Essentially as above. Tr. molybdenite along fract. Some cc(?)
156.5	165.0	8.5		0.02											.01	.01		-	½-1	-	-	-			tr			2	wk	mod	-	25	10	Da			Sil. da. Fractures filled by py, chl. and sparse molybdenite. WK epidote
165.0	172.8	7.8		0.02											.01	.01		-	1	-	-	-							mod	st	-	15	25	Da			St. clay with chlorite in fault zone. cc. veinlet @ 165.9'. Gouge from 167.3-168' (Incr. in clay min last 2 ft of run.)
172.8	181.7	8.9		0.01												.01		-	½	-	-	-				tr			mod	mod	-	20	50	Da			Chloritized dacite. Numerous small shears throughout run with traces of calcite.
181.7	190.3	8.6		0.02												.02		-	½	-	-	-				tr			mod	mod	-	20	50	Da			As above.
190.3	195.2	4.9		0.01												.01		-	<½	-	-	-				tr			NK	mod	-	25	50	Da			Chl. dacite. Sil. stronger now. Calcite persists along fractures. WK-mod alt.
195.2	204.5	9.3		.02												.02		-	<½	-	-	-			tr	tr			NK	mod	-	25	35	Da			Silicified dacite. Chl. & tr. molybdenite along fract. Some calc. Tr c.c?
204.5	213.1	8.6		.03												.03		-	1	-	-	-			tr	tr			mod	mod	<½	20	35	Da			As above, but run now includes qtz. lining cavities and becomes broken from 229-231.1
213.1	225.0	11.9		.04												.04		-	½	-	-	-				tr			mod	mod	tr	15	40	Da			Strongly broken with diss. py. Mod. alt.
225.0	228.8	3.8		.08												.08		-	½	-	½	-				tr		8	NK	WK	1	35	4	Da ?	228.8		St. fract. & sil. dacite(?) Locally vuggy with qtz and calc. St. alt. From 227.6 to 228.8 becomes increasingly epidotized.
228.8	230.6	1.8		.01												.01		-	tr	-	tr	-				4	5	80	-	-	-	15	2	Hf			Pronounced calc. along fract. Run appears to be mainly comp. of epidote w/ garnet.
230.6	240.0	9.4		.07												.07		-	tr	-	tr	-	tr		tr	5	tr	85	-	mod	½	5	2	Hf	240.0		Diopside(?) and epidote. Clay min along fract. Tr. moly. Calcite veinlets.
240.0	243.0	3.0		.30												.30		-	½	-	-	-			tr	1	-	-	WK	WK	-	25	5	Mz	240' 243.0	30°	Silicified Monzonite dike, Tr. moly, cpy along sh'd contact. Chl. as coating along fract. (Incr. in chl. last foot of interval and bi → chl.)
243.0	248.6	5.6		.04												.04		-	½	-	-	-			-	2	10	85	-	wk	-	1	2	Hf			St. chl. along fract. Diopside with garnet to a lesser extent. Carb. in groundmass.
248.6	257.4	8.8		.10												.10		-	½	-	tr	-			-	3	10	80	-	-	-	2	4	Hf			Ep, garnet, diopside are the main components. Fract. filled with calcite. Tr. cpy.
257.4	266.8	9.4		.08												.08		-	<½	-	tr	-			-	2	3	75	-	mod	-	10	8	Hf			Generally soft & friable from 260-265'. Essentially epid.-chl.-qtz assemblage.
266.8	271.2	4.4		.03												.03		-	tr	-	-	-			-	4	-	75	-	-	tr	Tr	10	Hf	271.2		Epidote-garnet-diopside rock with chlorite coating fractures. Calc. fract. fillings.
271.2	273.9	2.7		.03										.03		—		-	-	-	-	-			-	tr	-	-	-	-	-	-	-	Post min An	271.2 273.9'	15°	Andesite dike, purplish, fine matrix with num. lathlike feldspar phenos. Calcite along fract, gr mass.
273.9	283.0	9.0		.02												.02		-	½	-	tr	-			-	5	7	60	-	-	3	Tr	15	Hf			From 273.9-275.9' mostly light green ep. remainder of int. mostly dk green chl, diop Hf.
283.0	294.3	11.3		.03												.03		-	½	-	tr	-			-	4	tr	85	-	-	2	Tr	15	Hf	upper		As above. Generally dk green Hf with veinlets of $CO_3^=$ and epidote.
294.3	301.2	6.9		.02										.02		—		-	-	-	-	-			-	tr	-	-	-	-	-	-	-	An	294.3 lower	35°	Post min An. dike. Calcite along fract and $CO_3^=$ in groundmass
301.2	307.2	6.0		.09												.09		-	½	-	-	-			-	8	tr?	80	-	-	-	Tr	8	Hf	301.2	50°	Diopside(?) hornfels, with chl, ep, calcite veinlets traversing groundmass.
307.2	314.1	6.6		.03												.03		-	tr	-	tr	-			-	5	40	50	-	-	-	-	2	Hf	307.2	20°	Garnet-diopside Hf. Very hard. tr. hem and calc. veinlets. Healed fract @ 313.8'
314.1	318.8	4.7		.07												.07		-	½	-	tr	-			-	4	-	85	-	-	-	Tr	5	Hf			DK. green rock composed mainly of diopside with chl, calc. along fract, groundmass.
318.8	326.4	7.3		.16												.16		-	<½	-	tr	-			-	2	25	65	-	-	-	-	4	Hf			Garnet-diopside Hf. Minor epidote. Chl, calc. along fract, and in groundmass.
326.4	335.5	9.1		.02												.02		-	tr	-	tr	-				20	25	40	-	-	-	-	2	Hf			Pale yellow-brown Hf. High carb. content. Unmin. except for py along fract.
335.5	341.0	5.5		.02												.02		-	tr	-	½	-				15	5	55	-	-	-	-	6	Hf			Light green Hf.
341.0	352.9	11.9		.01										.01		—		-	-	-	-	-				1	-	-	-	-	-	90+	-	Qt (hf)			Greenish-white qtzite. Unmin. Very hard. Not acid reactive. Calc. along fr.
352.9	359.0	6.1		.02										.02		—		-	-	-	-	-				1	-	-	-	-	-	90+	2	Qt (hf)			Light-green hard, dense, f.g. rock. Unmin. Chl. coating fract.

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging).

ASARCO- SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D-310
Page 2 of 2 Pages

Collar Elev 2,684.99 Final Depth 590.4
Coords. N 39,481.92 E 14,901.12
Inclination vertical
Logged by RHL
Date: Start 7-13-68 Finish 7/31/68

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	as Known NS	Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb.	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	Dolomite	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
359.0	371.0	12.0		.08												.03	.05	-	½	-	-	-	<½	-	-	15	5	55	-	-	-	-	4		Hf.			Increase in $CO_3^=$ content, chl. along fract & groundmass. At 366.5' galena, cpy & Fibrous tem
371.0	378.8	7.8		.06												.02	.04	-	<½	-	-	-	-	-	-	15	10	65	-	-	-	-	-		Hf			Massive, unfractured, pale green to white rock, consisting mainly of gi. calc. Diss. born from 367' diss. bornite within calc. groundmass.
378.8	389.4	10.6		.15												.10	.05	-	-	-	½	-	-	-	-	20	-	70	-	-	-	-	3		Hf			As above, but incl. chl. along fract. Calc. lining rug @ 379.3'. WK. cpy, tr. born. ep. cpy, py.
389.4	397.1	7.7		.23												.03	.27	-	-	-	-	-	-	-	-	15	-	75	-	-	-	-	-		Hf			Ep, di, calc and tlem? or wollastonite(?) Diss. born to 396.1' Some cpy, Est ½% sulph.
397.1	402.3	5.2		.04												.04		-	tr	-	-	-	-	-	-	10	-	80	-	-	-	-	2		Hf			Light green diopside Hf. Tr py, cpy. Est 2% chl as diss, but mostly along fract.
402.3	413.7	11.4		1.50		.01								.01		.04	1.45	-	tr	-	-	-	-	tr	-	10	15	65	-	-	-	-	-		Hf			This interval quite vuggy with well formed well (?) x'tals ass. w/ born, cpy. Est 2% sulph
413.7	421.0	7.3		1.38		.02								.02		.02	1.34	-	-	-	-	-	-	tr		10	12	70	-	-	-	-	-		Hf			As above. About 1½-2% sulph. Some sections show x'tals of gros. garnet, massive ep. Also grossularite garnet?
421.0	430.6	9.6		.01													.01	-	-	-	-	-	-	-	tr	8	10	70	-	-	-	-	tr		Hf			Massive, unfract. pale greenish-grey Hf. Sparsely mines, moly
430.6	438.0	7.4		.62		.01							.01			.08	.53	-	-	-	-	-	-	-	-	10	12	60	-	-	-	-	-		Hf			Gen. as above but @ 432.3' - 433' massive born, cpy, cc.
438.0	449.5	11.5		.12												.06	.07	-	-	-	-	-	-	<½	-	8	10	65	-	-	-	-	-		Hf			As above with ½% disseminated sulphides throughout interval. WK sphalerite.
449.5	459.0	9.5		.01													.01	-	-	-	-	-	-	<½	-	65	-	20	-	-	-	-	-		Hf?			Generally limestone throughout interval, recrystallized. WK diss. sulphides. Massive dust? and unbroken.
459.0	463.0	4.0		.01												.01		-	-	-	-	-	-			75	-	10	-	-	-	-	tr.		Ls			As above. No sulph. Very high lime content.
463.0	473.4	10.4		.01												.01		-	-	-	-	-	-			30	-	55	-	-	-	-	-		Hf			Very limey sed. Tr. of sulph, moly(?) only.
473.4	482.7	9.3		nil														-	-	-	-	-	-			45	3	40	-	-	-	-	-		Hf			Pale green to white recrystl. lms, w/diopside. No sulph.
482.7	492.5	9.8		.29													.29	-	-	-	-	-	-	tr.		40	?	45	-	-	-	-	-		Hf			Mostly as above. Diss. born ½-1% from 489 to end of int. Tr. sphalerite.
492.5	501.2	8.7		.01												.01		-	-	-	-	-	-			30	15	50	-	-	-	-	tr		Hf			Massive, unfract. Hf. Increase in prop. of garnet. V. sp. cpy.
501.2	510.3	9.1		.02												.02		-	-	-	-	-	-			25	12	55	-	-	-	-	tr		Hf			Pale to dK green unfractured rock. Slightly banded in places. V. sp. cpy, moly?
510.3	518.9	8.6		.09													.09	-	-	-	-	-	-			20	5	65	-	-	-	-	-		Hf			WK. dissem. bornite (< ½%), v. sp cpy in a pale greenish-white Hf.
518.9	529.6	10.7		6.02		.01								.01		.10	5.90	-	-	-	-	-	-	½		10	-	5	-	-	-	-	-	75	Dol			Mod. 1st dissem. bornite, cpy along fract. within a dolomite groundmass. Noted WK sphalerite.
529.6	534.0	4.4		.68		.01								.01			.67	-	-	-	-	-	-			15	10	60	-	-	-	-	-		Hf			V. sp. min. garnet-diopside hf.
534.0	542.5	8.5		.27		.01								.01		.09	.18	-	-	-	-	-	-			20	-	60	-	-	-	-	-		Hf			Unmin. except for last foot of int w/sp. born, cpy. Calc. lining vugs. Otherwise as above.
542.5	551.3	8.8		.11												.03	.08	-	tr	-	-	-	-			15	-	70	-	-	-	-	½		Hf			Massive, unfract. Hf. Unmin. except for v. WK sulph. from 543-544'. Tr. cpy throughout int.
551.3	560.2	8.9		.05												.05		-	tr	-	-	-	-	tr		10	3	75	-	-	-	-	-		Hf			Diopside hf. Tr. cpy throughout int. V. WK sulph. last ft. of int, incr in $CO_3^=$
560.2	570.7	10.5		.02												.02		-	tr	-	-	-	-			30	-	55	-	-	-	-	tr		Hf			Massive calc. to 562.3'. Otherwise as above. Last ½' incr in $CaCO_3$
570.7	580.2	9.5		.08												.08		-	tr	-	-	-	-			45	2	40	-	-	-	-	-		Hf.			Carb to 574.7'. Otherwise as above. Traces of py, cpy along fract.
580.2	590.4	10.2		.03											.03			-	tr	-	-	-	-			10	-	50 mod	mod st	-	7 mod				Da.	Fault?		Silicif. dacite: 580-581.2'. Highly crushed, clayey zone 584.8-585.8'. Rock type appears brecciated in places. Py along fract.
	E.O.H.																																					

PRELIMINARY GEOLOGIC LOG
(Subject to Revised Logging)
ASARCO- SILVER BELL UNIT

Note (3): Tt - Tactite; Hf - Hornfels; Mb - Marble; Qt - Quartzite; Bx - Breccia; Da - Dacite; Mz - Monzonite; An - Andesite

Note (4): V - Vein; F - Fault; D - Dike; C - Contact; Ig - Undif igneous

Hole No. D-311
Page 1 of 2 Pages
Collar Elev. 2765.43 Final Depth 658.4
Coords. N 38,704.28 E 14,678.73
Inclination vertical
Logged by RHL, RE
Date: Start 8/1/68 Finish 8/20/68

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Unknown NS	Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem.	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0	17.9	17.9		.01				49	2.53					.01				wk	-	-	-	-				-	-	-	wk mod	mod	-	35	tr	AK			C.gr. Alaskite. Mod. alt. Bi → chl. (in part). V. sp. [illegible]? WK-mod Mn. stain along fract.
17.9	28.5	10.6		.01				80	2.55					.01				wk	-	-	-	-				-	-	-	mod	mod st	-	30	tr				Interval quite broken up. Mod-st. alt. Otherwise as above.
28.5	37.5	9.0		.01				79	2.54					.01				WK	-	-	-	-							wk mod	mod	-	35	tr				Moderate alt. Tr. chl along fract. Bi → chl. (complete)
37.5	47.1	9.6		.01				92	2.55					.01				wk mod	-	-	-	-							WK	wk mod	-	40	tr				As above. No Cu min obs. Mod. Mn. stain along fract.
47.1	56.3	9.2		.01				91	2.49					.01				wk mod	-	-	-	-							mod	wk mod	-	40	tr				Mod. alt, mod. broken. A little cc (?)
56.3	65.8	9.5		.01				87	2.54					.01				wk mod	-	-	-	-							mod	mod st	-	35	-				Same as above. No Cu min. obs. Lim occ. mainly along fract.
65.8	76.7	10.9		nil				78	2.55					-				wk mod	-	-	-	-							mod st	mod st	-	30	tr				Mod. broken but alt. st. Tr. chl along fract. WK. jarosite.
76.7	90.0	13.3		nil				52	2.55					-				wk	-	-	-	-							st	st	-	20	tr				Intensely shattered and gougey from 78.0 - 87.2'. Bi → chl. No Cu min. WK jar.
90.0	98.8	8.8		.01				71	2.56					.01				wk mod	-	-	-	-							st	st	-	25	-				St. broken and altered.
98.8	103.0	4.2		.03				72	2.64					.03				mod	-	-	-	-						1	st	st	-	18	1				St. fragmented with lim along fract. Last 6" of int'l, chl. & ep. within groundmass.
103.0	112.2	9.2		.08				86	2.89					.01	.07			mod	1	-	tr	-				tr	-	4	st	st	-	20	2		112.2'		Mod-st. fragmented. Diss py, WK cc. St. alt. with increase in ep, di, chl.
112.2	119.0	6.8		.18		.01		100	3.03					.01	.17			tr	1½	-	-	-				2	-	40	-	WK	3	-	15	Hf			Pale green Hf, dense, with dissem. py and tr. cc. WK. silicif. as qtz veinlets
119.0	128.1	9.1		.87	}1.05	.06	}0.10	95	3.21					.07	.76	.04		-	3	-	-	-	tr			tr	-	45	-	-	-	-	25				Pale to dK green Hf. Abrupt. incr. in chl. content as well as py. Gouge zone from: 126.2-127.2
128.1	135.4	7.3		1.27		.14		86	3.25					.14	1.03	.10		-	5	-	-	-				-	-	10	-	-	-	-	70		135.4'		Highly broken, soft zone from 129.4' to end of int. St. py and cc. High chl. cont.
135.4	141.8	6.4		.12				79	2.41					.12				st	-	-	wk mod	-				-	-	-	V. st	V. st	-	7	tr	Mz ?	141.8'		St. alt, brecc. Mz?
141.8	150.7	8.9		.12				92	2.83							.12		wk	tr	-	wk	-				55	-	25	-	-	tr	½	8	Hf			Gen. hard, f.gr. Hf with high carb. cont. Somewhat vuggy in places. Tr. py, cpy.
150.7	156.0	5.3		.15				-	2.72				·α			.14		wk mod	tr	-	-	-				45	-	35	-	tr	-	-	10				Mod. broken with conspicuous vugs lined by calc. x'tals. Tr. NS @ 151' along fract.
156.0	161.5	5.5		.35				100	3.04					.02	.03	.30		wk	4	½	tr	-				50	-	25	-	-	-	-	15				V. st. lim along some fract. but overall aspect is WK. Tr. mal @ 157'. Conspic. vuggy. Diss. mag. from 159-160'. WK. cpy.
161.5	169.7	8.2		.25				79	3.24							.25		mod	tr	-	mod	-		tr?		55	7	15	-	-	-	-	15		169.7'		Gossan from 161.7 - 162.7'. Vuggy throughout interval. V. WK diss. cpy, cc.
169.7	177.3	7.6		.08				79	2.56					.08				st mod	½	-	wk mod	-				tr	-	-	V st	V st	-	10	2	Mz			St. alt. monz. st. fract. Bi → chl. Noted occ. euhedral 2nd K-feldspar phenos.
177.3	190.6	13.3		.02				85	2.65					.02				mod	tr	-	-	-				tr	-	-	st	st	-	12	3				Mod. broken with lim. along fract. Euhedral 2nd K-feldspar dispersed thru int. WK. jarosite.
190.6	195.3	4.7		.08				97	2.63							.08		wk mod	<½	-	-	-				tr	-	-	mod st	mod st	-	10	2				As above. Mod. alt. Bi → chl. Cavities lined by calc. x'tals.
195.3	198.3	3.0		.11				100	2.64							.11		wk	<½	-	-	-				½	-	-	mod st	mod st	-	10	1		198.3'		Same as above.
198.3	205.4	7.1		.03				91	2.67							.03		wk	tr	-	tr	-				25	-	45	-	-	-	-	10	Hf	205.4'		WK lim. coating calc. x'tals in cavities. Sp. diss. py. Gen. f.gr. dk. green massive Hf
205.4	211.9	6.5		.03				95	2.65							.03		tr	½	-	wk	-				3	-	-	wk mod	mod st	-	7	4	Mz	211.9'		Mod-st. alt. with disp. euhedral 2nd K-feldspar. Fract. ∥ to core. Tr. chl. along fract. From 203.9 brecciated with occ. Hf. fragm.
211.9	222.0	10.1		.05				88	3.42							.05		tr	tr	-	-	-				30	-	55	-	-	-	-	7	Hf			From 212.5' - 213.6' large cavities lined by euhedral calc. x'tals. DK. green diopside(?) Hf.
222.0	231.2	9.2		.03				95	3.43							.03		-	tr	-	-	-	tr		tr	20	8	65	-	-	-	-	3				Dense, unfract. light green with patches of brown garnet. Tr. galena, moly.
231.2	240.3	9.1		.09				89	3.37							.09		-	tr	-	tr	-			tr	20	-	60	-	-	-	-	4				Essentially as above with occ. vuggy calc. Tr. moly.
240.3	247.4	7.1		.10				91	2.76							.10		-	½	-	tr	-				10	-	60	-	-	-	15	1		247.4'		Light to dK. green Hf. St. silicif. locally. Thin py. veinlets with tr. cpy.
247.4	256.2	8.8		.05				92	2.60							.05		-	<½	-	-	-		tr?		-	-	-	WK mod	WK mod	1	35	1½	AK			Medium to coarse grained AK. Py along veinlets and as dissem.
256.2	262.1	5.9		.04				72	2.62							.04		-	½	-	-	-				-	-	-	wk mod	wk mod	-	30	1		262.1'		Essentially as above. Tr. sulph, moly.
262.1	265.6	3.5		.16				87	2.95							.16		-	½	-	-	-	tr	tr?	-	1	-	40	WK	WK	-	10	tr	Hf, AK	265.6'		A mixed interval. From 262.1 - 263.7', light green Hf; 263.7-265.6' st. AK. Tr. sulph, moly
265.6	272.3	6.7		.17				95	2.88							.17		-	2	=	tr	-	tr	tr	tr	½	-	75	-	-	-	8	tr	AK, Hf	272.3'		From 265.6 - 266.1', sil. AK. Remainder of int. diopside-ep. Hf. WK. sulph. Tr. moly (dissem)
272.3	278.0	5.7		.08				85	2.74							.08		-	1	-	tr	-			tr	½	-	12	wk	wk	-	4	tr	Mz	278.0		Medium grained monzonite, with incl. of Hf. Text. coarse grained from 275.0 - 278'.
278.0	282.7	4.7		.19				79	3.02							.19		-	2	-	½	-			-	½	-	70	-	-	-	3	1	Hf	282.7		DK. green di-ep. Hf. with chl, hem. along fract.
282.7	291.9	9.2		.14				100	2.67							.14		-	½	-	-	-			tr	tr	-	-	wk mod	mod st	-	7	tr	Mz			Med-st. alt. Monz. with widely dispersed 2nd K-feldspar phenos. Bi → chl. (complete)
291.9	301.6	9.7		.09				82	2.67							.09		-	½	-	-	-			-	tr	-	-	mod	mod	-	7	tr				Mod. alt. Otherwise as above.
301.6	312.9	11.3		.15				96	2.67							.15		-	½	-	-	-			tr	tr	-	-	mod	mod	-	6	tr				As above. Tr. sulph.
312.9	322.2	9.3		.02				94	2.67							.02		-	½	-	-	-			-	Tr	-	-	wk	md	-	5	3				white plag and pink 2nd kspar in a brownish grey groundmass
322.2	331.4	9.2		.01				91	2.67							.01		-	½-1	-	-	-			Tr	Tr	-	-	wk	md	-	7	3				As above, wk silicification, dis py, Tr of moly
331.4	343.6	12.2		.01				100	2.67							.01		-	½-1	-	-	-			Tr	Tr	-	-	wk	md	-	7	3				" " , chlorite, -sarp on flat (<20°) fractures
343.6	354.0	10.4		.02				85	2.64							.02		-	1	-	-	-			-	Tr	-	-	md	md st	-	7	2	Mz	shears	55-75	st alt. along shears, phenos of 2nd kspar
354.0	361.3	7.3		.02				100	2.89							.02		-	3	-	-	-			-	2	55	40	-	-	-	-	Tr	Tt	→70°		intrusive contact with brown Tt w/ vugs & weak cpy, st py
361.3	369.8	8.5		.01				77	3.35							.01		-	2	-	-	-			-	2	70	25	-	-	-	-	Tt	Tt			As above, numerous vugs, few cpy stringers

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D311
Page 2 of 2 Pages

Collar Elev 2765.43 Final Depth 658.4
Coords. N 38,704.28 E 14,679.73
Inclination Vertical
Logged by RCE and RHL
Date: Start Finish 8-20-68

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Unknown	NS	Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem.	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
369.8	373.0	3.2		.05				100	2.77								.05		-	4	-	-					1	3	20	mod	mod	-	7	2	Mz Hf	369.8 372.2	60°	Mz similar to above; Hf contains about 10% py
373.0	380.8	7.8		.01				98	2.68								.01?		-	-	-	-					5	-	-	-	-	-	-	mod	Post-min.	373.0		Post-min. Andesite with L patches of calcite.
380.8	388.0	7.2		.02				67	3.02								.02		-	8	-	-					3	?	15	mod	mod	-	7	2	An Mz Hf	380.8 384.6		Mz sheared, similar to above, 10% epidote in Hf plus 20% py
388.0	398.0	10.0		.16				100	3.07								.16		-	10	-	-					4	-	75	-	-	-	-	tr		398.0		Epidote Hf with about 10% pyrite.
398.0	405.1	7.1		.04				99	2.67								.04		-	½	-	-					1	-	-	mod	mod	-	10	-	Mz			Mod. alt. Mz. No Cu min obs. V. sp. 2nd K-feldspar phenos.
405.1	412.0	6.9		.04				100	2.65								.04		-	½	-	-					½	-	-	mod	mod	-	10	-		412.0		As above.
412.0	422.8	10.8		.03				67	2.74								.03?		-	-	-	-					2	-	-	-	-	-	-	mod	An	422.8		Post-min andesite. Calcite lining fractures.
422.8	430.2	7.4		.04				100	2.59								.04		-	½	-	-					½	-	20	mod st	mod st	-	6	wk mod	Mz, Hf			Sh'd monz. to 428'o, thence light green, dense Hf. to end of int.
430.2	435.0	4.8		.02				100	2.65								.02		-	1½	-	-					4	-	25	mod st	mod st	-	8	wk mod	Mz, Hf			Mod-st. alt. Mz to 433.7', Hf to end of int.
435.0	440.6	5.6		.07				83	3.49								.07		-	2	-	-	-			tr	5	6	65	-	-	-	-	tr	Hf	440.6'		Garnet-silicate Hf. Tr. moly along fract. last 2' becomes vuggy with incr. inch. serp.
440.6	449.8	9.2		.07				100	2.64								.07		-	-	-	-	-			-	5	-	-	-	-	-	-	mod st	An	440.6' 449.8	70° 85°	Post-min. chl. andesite. Calcite lining fractures.
449.8	461.2	11.4		.04				100	2.83								.04		-	5	-	tr	-			-	tr	-	15	-	wk	-	20	2	AK			St. alt. of AK. Feldspars → epidote (almost complete)
461.2	470.9	9.7		.03				100	2.69								.03		-	2	-	wk	-			-	tr	-	10	-	wk	-	30	3				Propylitic alt. less pronounced to 466.9'. Aplite dike from 464.0-465.5' (appears fresh) Otherwise as above.
470.9	475.9	5.9		.07				76	2.62								.07		-	3	-	wk	-			-	3	-	8	-	wk	-	25	4	Ak, Hf			Essentially as above. At 474.9' dk green Hf with 7% diss. py
475.9	484.0	8.1		.15				100	2.53								.15		-	4	-	-	-			-	1	-	4	wk mod	wk mod	-	35	25	AK	484		Hf to 477.9 with 7% py. Thence AK to end of int. Feldspars → chl. (in part) Hf. alt.
484.0	487.9	3.9		.02				92	2.53								.02?		-	-	-	-	-			-	2	-	-	-	st	-	-	v. st	An	487.9		Post-min andesite dike. Highly chloritized, argillized. Barite, calcite lining vugs
487.9	503.0	15.1		.07				96	2.63								.07		-	5	-	-	-	tr		tr	tr	-	?	mod	mod	-	15	25	Mz			Chl. monzonite with mod to st. pyrite. Bi → chl. (complete) Euhedral feldspars → grayish blue clay min.
503.0	512.6	9.6		.12				87	2.69								.12		-	2	-	-	-	-		-	1	-	-	mod st	mod st	-	20	25				Essentially as above.
512.6	524.4	11.8		.09				100	2.68								.09		-	3	-	tr	-	-		-	tr	1	-	-	mod st	mod st	-	18	25				Feldspars → light gray to bluish clay min. and Bi → chl. (complete). Alteration: strong.
524.4	529.9	5.5		.04				88	2.70								.04		-	tr	-	-	-			-	30	-	-	mod st	st	-	6	45	An	526.2		As above to 526.2'. Thoroughly fractured and sheared chl. andesite to end of int. St. calc.
529.9	537.4	7.5		.02				81	2.62								.02		-	-	-	-	-			-	45	-	-	-	-	-	-	45		537.4		Post min andesite. Appears highly chloritized with calcite(?) within groundmass and within groundmass and along fract.
537.4	542.8	5.4		.14				100	2.69								.14		-	3	-	-	-			-	15	-	-	st	st	-	10	20	Mz? An			St. alt. Feldspars → light green clay min. Serp. and/or. chl. along fractured. At 540.0' post-min. andesite to end of int.
542.8	552.2	9.4		.13				95	2.54								.13		-	1-2	-	-	-			-	10?	-	-	st	st	-	15	10	Mz?			St. alt. Rock is quite soft and fractured. Calc. along fract., groundmass. Rock type obscure.
552.2	561.3	9.1		.24				90	2.65								.24		-	1	-	-	-			-	15	-	-	st	st	-	12	15				As above. At 554' fault zone to 555.3'. In places does seem like Aplite.
561.3	572.5	11.2		.31				96	2.69								.31		-	1-2	-	-	-			tr	12	-	-	st	st	-	15	10				Core has a distinct mottled light to dk. green aspect. WK. cpy. Tr. moly along fract @ 562'.
572.5	581.9	9.4		.55				95	2.63								.54		-	4	-	-	-		Tr	Tr	1	-	-	ST	ST	1	10	10	Mz?			As above, unusual diabasic texture of narrow plag. laths. Numerous violets of py, cpy, moly, tr of sphal.
581.9	590.6	8.7		.53	0.52	.01	0.01	100	2.67								.52		-	5	-	-	-		-	-	3	-	-	ST	ST	<1	5?	10	Mz?			Py and chlorite occur together in clumps. Soft, st'ly alt'd, as above
590.6	598.9	8.3		.46				97	2.75								.45		-	3	Tr	-	-		-	-	1	-	-	ST	ST	<1	5?	10	Mz?			Overall dk green in color. No longer diabasic in texture. dis. grains of magnetite
598.9	605.1	6.2		.29				90	2.69								.29		-	2	-	-	-	-	-	Tr	3	-	-	ST	ST	Tr	3?	10	Mz?	605.1		As above, less visible mineralization.
605.1	616.9	11.8		.13				99	2.65								.13		-	<1	-	-	-			Tr	-	-	-	-	Tr	-	95	-	Qtzite			f.g. white Quartzite
616.9	625.8	8.9		.11				96	2.66								.11		-	½	-	-	-			Tr	-	-	-	-	Tr	-	95	tr				as above. WK. cpy (mainly along fract)
625.8	635.9	10.1		.07				73	2.63								.07		-	½	-	-	-			Tr	-	-	-	-	wk	-	90	tr				Mainly as above. Tr. moly, cpy along fract.
635.9	640.5	4.6		.30				60	2.39								.30		-	Tr	-	-	-			-	-	-	-	-	-	-	90	2		640.5		Last foot of int. qtzite becomes chloritized. Incr. in cpy. cont.
640.5	658.4	17.9		.26				78	2.63								.26		-	½	-	-	-			-	-	-	-	-	st	1	18	10	AK?			Igneous text. rock with light green groundmass. Few orth. phenos still visible. Plag. phenos → chlorite (complete) Medium to c. grained. st. alt.
	E.O.H.																																					

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO- SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D-312
Page 4 of 4 Pages
Collar Elev. 2588.26 Final Depth 1549.6
Coords. N 55,994.55 E 16,464.31
Inclination Vertical
Logged by L.J., RS
Date: Start 8/20/68 Finish 10/5/68

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Native Cu	Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb.	Calcite	Garnet	Silicates	Sericite	Clay	Vn Qtz	QUARTZ	CHLORITE	K Feldspar	BIOTITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
1186.7	1195.3	8.6		.19												.19		<1						TR	TR				WK MD	WK MD	2	18	2	WK MD	2	MZ	Joints	50-70°	silicification locally ST., 70° joints w/ calcite filling & gyp. sulf. dissem. in joints.
1195.3	1202.4	7.1		.22												.22		<1						TR	TR				MD	MD	2	15	2	ST	1				silicification DECREASING; 2nd K-SPAR W-ST
1202.4	1211.8	9.4		.27												.27		<1						TR	TR				WK	WK MD	3	18	1	MD ST	2		Qtz VEINS	60-80°	silicification MD, 2nd K-SPAR MD., MAINLY ON JOINTS.
1211.8	1220.9	9.1		.25												.25		1						<1	TR				WK MD	WK MD	2	15	3	MD	1	SHEAR ZONE	1215-1218.	70-80°	SULFIDES on high ∠ SHEARS (coarse-spaced); 2nd K-SPAR locally on joints.
1220.9	1230.2	9.3		.27												.27		<1						<1	TR				MD	MD	3	15	3	WK MD	2		Qtz VEIN	60°	SULF. MAINLY IN qtz. VEINS, silicification WK-MD., 2nd K-SPAR ON JOINTS.; TR. gyp.
1230.2	1240.0	9.8		.09										.07		.02		<1							TR	TR			WK MD	MD	2	15	2	WK MD	2	MZ IN PM ANDESITE	CALCITE VEINS	60°	THIN CALCITE VEINS IN ANDESITE, AS ABOVE FOR MZ
1240.0	1249.3	9.3		.05										.05																						ANDESITE			AS ABOVE.
1249.3	1263.7	14.4		.02										.02																						"	2% qtz-sulf		AS ABOVE.
1263.7	1274.3	10.4		.17												.17		<1						<1	TR				WK MD	WK MD	3	18	2	MD	2	MZ	VEINS	40-60	silicification MD; 2nd K-SPAR MD. MAINLY ON JOINTS.
1274.3	1282.6	8.3		.15												.15		<1						<1	TR				MD ST	MD ST	2	15	3	MD ST	1	"	"	"	feld. alt. MD-ST., GREEN STAIN ON feld.; 2nd K-SPAR MD.-ST.
1282.6	1291.7	9.1		.17												.17		<1						<1	.0950				MD	WK ST	3	18	3	MD ST	<1		"	"	MD-ST 2nd K-SPAR. ALT., concentrated on JOINTS.; high concen. moly on qtz-sulf. veins.
1291.7	1300.8	9.1		.17												.17		<1						<1	.0244				MD	WK ST	3	15	3	MD ST	<1				AS ABOVE.
1300.8	1310.0	9.2		.24												.24		1						TR	TR 2.74				ST	MD	1	18	1	—	<1				Porphyritic MZ to 1305.6', LARGE feld phenc., groundmass fine gr., ST. SERICITE, sulf. finely dissem.
1310.0	1319.0	9.0		.21												.21		1							<1				MD	MD	3	18	3	MD ST	<		qtz-sulf. VEINS	70-80°	good moly in qtz. sulf. veins.; feld STAINED green; 2nd K-SPAR MD-ST on joints.
1319.0	1327.4	8.4		.17												.17		.1							TR				MD	MD	3	18	2	MD ST	1				silicification locally ST., REST AS ABOVE w/ less moly.; TR. gypsum.
1327.4	1336.1	8.7		.17												.17		1							Tr				WK MD	MD	3	18	4	MD					As above, 2nd K-spar in bands and around qtz veins
1336.1	1345.7	9.6		.07												.07		1							Tr				WK MD	ST	7	18	7	MD ST	—		Barren qtz w/ hnt	45°	very strong 2nd K-spar along thin barren qtz veinlets varying sil.
1345.7	1354.2	8.5		.06												.06		1							Tr				WK MD	WK	2	20	4	WK	—				Joint spacing 3'-1'; wk K-spar alt., mod silicification
1354.2	1363.1	8.9		.14												.14		<1							<1 .045 TR .024				WK	WK MD	3	18	3	MD	1		Qtz sulf. K-SPAR IN 3x-5x massive		silicification MD, 2nd K-SPAR locally ST. along qtz. sulf. veins.
1363.1	1372.4	9.3		.16												.16		<1							1-2 .006				ST	ST	3	20	4	MD	—		Tr. moly. jam. w/ qtz sulf veins		intersecting shears pulverize much part of core.; alt. ST.; 2nd K-SPAR on JOINTS.
1372.4	1381.1	8.7		.17												.17		<1							<1				ST	ST	3	15	4	MD				20-80	BLACK ST. ALTERED, sulf on high ∠ FRACTURES. (2-3/IN)
1381.1	1385.7	4.6		.10												.10		1							— TR				MD ST	MD ST	5	15	4	MD	—		MZ-Py. VEINS	80°	sulf w/ qtz. on high ∠ SHEARS.; ALT. decreasing.
1385.7	1395.1	9.4		.16												.16		1							TR				MD	MD ST	3	15	4	MD ST	—		"	60-80°	TR moly. on qtz VEINS 2nd K-SPAR MD-ST. ON FRACT.
1395.1	1403.0	7.9		.19												.19		1							TR				MD	MD ST	3	15	3	MD ST	1		qtz-sulf VEINS	80°	silicification locally ST.; AS ABOVE.
1403.0	1412.2	9.2		.20												.20		1							TR				MD	MD ST	3	15	4	MD ST	—		"	"	qtz-sulf. fract & VEINS., high ∠, 2nd K-SPAR MD-ST on fract.
1412.2	1420.1	7.9		.17												.17		1							TR				MD	MD ST	3	15	4	MD ST	—		"	"	AS ABOVE., TR. MOLY. in high ∠ fract.
1420.1	1429.0	8.9		.14												.14		1							TR				MD	MD ST	3	15	3	MD	—		Local ST. shearing	50°	clay & sericite alt. MD-ST., TR. MOLY ON SOME qtz. VEINS; TR. BARITE.
1429.0	1438.2	9.2		.14												.14		1							TR				MD	MD ST	2	15	3	MD	<1		fract. mas.	45°	AS ABOVE w/ local ST. silicification, TR. MOLYB. PAINT ON SOME FRACTURES.
1438.2	1447.4	9.2		.16												.16		<1							TR				WK MD	MD	4	18	2	MD	2		qtz VEINS	45°	TR. MOLY. ON QTZ. VEINS, WK-MD silicification; MD 2nd K-SPAR on fract.
1447.4	1460.0	12.6		.14												.14		1							<1→ .002				WK MD	MD	5	18	3	MD	1		closely spaced qtz-sulfides	45°	ABOVE AVERAGE MOLY ON qtz. VEINS.; wk-silicification, SOME SERPENTINE ON FRACT.
1460.0	1469.5	9.5		.09												.09		<1							T.R.				MD	MD	2	15	3	MD	1		fract	45°	silicification locally ST., 2nd K-SPAR MD ON FRACT; TR MOLY w/ cpy. on FRACT.
1469.5	1478.5	9.0		.10												.10		1							<1→ .002				MD	MD	4	18	3	MD ST	—		qtz sulf VEINS	50°	moly. locally ST. in qtz. VEINS. @ 1471.5', 2nd K-SPAR MD-ST. ON JOINTS. & G.M.
1478.5	1487.7	9.2		.14												.14		1							<1→ .0060				MD	MD	3	15	3	MD ST	<1		"	"	AS. ABOVE, sulf in qtz VEINS & FRACT. FILLING.
1487.7	1496.1	8.4		.09												.09		1							<1→ .0058				MD	MD	3	15	3	ST.	<1				AS. ABOVE.; 2nd K-SPAR. ST ON JOINTS & G.M.
1496.1	1503.0	6.9		.12												.12		1							<1→ .0120				WK MD	MD	4	25	3	ST	<1				AS ABOVE, qtz. CONTENT LOCALLY high.
1503.0	1512.1	9.1		.04												.04		1							—				WK MD	WK MD	4	8	1	MD ST.	3				silicification ST. LOWER HALF; MD.-ST 2nd K-SPAR alt. of G.M.
1512.1	1521.0	8.9		.06												.06		1							TR				WK MD	WK	3	20	2	MD ST.	2		Joints	45°	silicification MD-ST., REST. AS ABOVE.
1521.0	1530.4	9.4		.08												.08		<1							TR				ST	ST	1	0	2	MD ST	—		SHEARS	80°	ROCK STY. sheared & broken.; ST. ALT
1530.4	1535.9	5.5		.03												.03		1							—				WK MD	WK MD	1	18	1	MD	3				silicification WK-MD.; 2nd K-SPAR. MD.
1535.9	1549.6	13.7		.07												.07		1		Tr					—				WK MD	MD ST	1	20	3	WK	3				WK-ST silicification, Tr of Hem after mag., gypsum on fractures
	EOH																																						

PRELIMINARY GEOLOGIC LOG
(Subject to Revised Logging)

ASARCO- SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D-312
Page 1 of 4 Pages
Collar Elev 2588.26 Final Depth 1549.6
Coords. N 35,994.55 E 16,464.31
Inclination Vertical
Logged by RHL & RE, LJ
Date: Start 8/20/68 Finish 10/5/68

Depth				% Cu				%		Cu (1)								Fe (2)					Other (2)													(3)	Structures (4)		
From	To	Int'vl	Elev.	Total	Avg.	NS	Avg	Core Recov	Sp. Gr.	Chrys.	Pitch	Black	Blue Green	Unknown N.S.	Cc.	Cpy.	Born	Lim.	Py	Mag.	Hem	Spec.	Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	2nd feldspar	Biotite	Rock Type	Depth	True Dip	Remarks
5.0	14.9	9.9		.54	0.10	.02	0.02			.02					.40	.14		wk	1	-	-	-			Tr	-	-	-	mod	mod	1	10	-	v.wk		Mz			Mod. alt. Monz. Moderately broken. wk. cpy. cc. Tr. chrys, jarosite. V.wk 2nd K-feldspar phenos.
14.9	23.3	8.4		.92		.02				.02					.80	.12		-	1-2	-	-	-		-	-	-	-	-	wk mod	mod	1	10	1	tr					Mod. alt. From 17-20' st. fract with st. clay, ser. develop. Tr. cpy, wk cc, chrys.
23.3	36.5	13.2		.69		.01				.01					.55	.14		-	1	-	-	-			Tr	-	-	-	mod	mod	-	8	2	-					Essentially as above. Bi → chl. (in part)
36.5	45.7	9.2		.36		.01								.01	.16	.20		-	1	-	-	-			-	-	-	-	mod	mod	-	15	2	tr					As above with slight incr. in silicif. No further NS cu noted.
45.7	54.8	9.1		.30											.20	.10		-	1-2	-	-	-			-	-	-	-	ST	ST	-	10	2	Tr	10				ST clay-ser. alt of groundmass. Secondary (?) biotite
54.8	63.3	8.5		.39											.20	.19		-	1-2	-	-	-			Tr	-	-	-	ST	ST	-	10?	5	-	10		cpy on shears	50°-70°	Dark 2nd (?) biotite ± chlorite in white stly altd groundmass
63.3	71.8	8.5		.20												.15		-	1-2	-	-	-		[illegible]	-	-	-	-	ST	ST	7	15	3	-	5				vein qtz; silicification 67.1-68.9, less bi, ± chl than above
71.8	83.0	11.2		.24											.05	.19		Tr	1-2	-	-	-			-	-	-	-	md	md	-	20	2	-	5				md-ST silicification
83.0	95.9	12.9		.47	0.52	.01	0.02							.01	.20	.24		Tr	2	-	-	-			Tr	-	-	-	md	md	2	20	6	-	4				stly broken: 93.9-95.9 with st chlorite, md c.c. on fractures.
95.9	104.4	8.5		.64		.04								.04	.30	.34		-	1	-	-	-			Tr				md	md	1	20	5	Tr	5				mdly broken, as above
104.4	113.0	8.6		.34												.34		-	1	-	-	-			Tr				wk	wk md	2	25	5	wk	5		1" qtz vein @109.4	70°	md-st silicification, c.c. on some fractures, stly sheared
113.0	122.0	9.0		.21												.21		-	1	-	-	-			Tr+				wk	wk md	3	25	5	wk	5				" " " , white qtz veins contain blebs of py, cpy, moly but no visible wallrock alt.
122.0	130.7	8.7		.17												.17		-	1	-		-			-	-	-	-	wk	wk	10	30	4	wk	4		Vein qtz 122.0-125.5	≈90°	" " " Thin bands of 2nd kspar alteration
130.7	140.3	9.6		.32												.32		-	1	-	-	-			Tr	-	-	-	wk	wk	1	25	4	wk	5				" " " As above
140.3	149.2	8.9		.30												.30		-	1	-	-	-			Tr	-	-	-	wk	wk	1	35?	3	wk	5				ST silicification.
149.2	158.0	8.8		.38												.38		-	1	-	-	-		Mo ASSAY	Tr	-	-	-	md	wk	5	35	3	wk	5				" " , large blebs of cpy in steep qtz veins. Several patches of 2nd Kspar
158.0	167.2	9.2		.24												.24		-	1	-	-	-		.022	Tr	-	-	-	wk	wk	1	35	5	-	5				" " , no visible c.c., glassy groundmass
167.2	175.9	8.7		.19												.19		-	1	-	-	-		.023	Tr+	-	-	-	md	wk md	-	25	3	wk	3				" " Green-brown alt min: 172.4-174.9. moly on fracts.
175.9	186.6	10.7		.41		.02								.02		.39		-	1	-	-	-		.008	Tr+	-	-	-	md	md	2	20	3	wk	3		qtz-cpy vein	70°	md-ST silicification, varying ser-clay alt., large blebs of cpy in qtz
186.6	195.0	8.4		.20												.20		-	1	-	-	-		.015	Tr+	-	-	-	wk	wk	2	30	3	-	5				ST silicification, mdly broken but not gougey
195.0	204.4	9.4		.18												.18		-	1	-	-	-		.007	Tr+	-	-	-	wk	wk	-	30	3	wk	5				" " As above
204.4	209.3	4.9		.20												.20		-	1	-	-	-		.030	Tr+	-	-	-	wk	wk	8	30	3	-	5		qtz-mo vein	80°	qtz-moly vein 204.4-204.8. As above
209.3	218.2	8.9		.15												.15		-	1	-	-	-			-	-	-	-	wk	wk	2	35	2	-	5		qtz vein 216.4	80°	ST. SILICIFICATION, SOME SER.-CLAY ALT, SOME CPY, BIOT. FRESH
218.2	227.7	9.5		.26												.26		-	1-2	-	-	-			-	-	-	-	wk	wk	8	35	3	-	4		VERT. QTZ VEIN	90°	VERT. QTZ VEIN 224'-227' AS ABOVE.
227.7	236.4	8.7		.18												.18		-	1-2	-	-	-			-	-	-	-	wk	wk	6	30	3	-	6		QTZ VEINS	80°	INCREASE IN BIOTITE @ 231.8' AS ABOVE.
236.4	245.6	9.2		.27												.27		-	1-2	-	-	-			-	-	-	-	wk	wk	4	25	3	-	5		QTZ-PY VEIN	80°	QTZ-PY VEIN 242-242.8' HIGHER % BIOTITE, AS ABOVE
245.6	254.5	8.9		.26												.26		-	1	-	-	-			-	-	-	-	wk	wk MOD	2	25	3	wk	3		FAULT [illegible]	[illegible]	DECREASE IN BIOTITE @ 247'; INCREASED feld ALT. @ 252' LESS SILICIFICATION.
254.5	263.4	8.9		.29												.29		-	1-2	-	-	-	TR		TR	-	-	-	wk	wk MOD	2	20	5	wk	3		FAULT 262.7	45°	FAULT w/ GALENA + MOLY, SOME GOUGE, AS ABOVE
263.4	272.5	9.1		.23												.23		-	1	-	-	-			-	-	-	-	wk	MOD	5	25	5	-	3		QTZ VEINS	90°	CPY-PY CONCENTRATED IN QTZ VEINS FROM 269-272.5; AS ABOVE.
272.5	282.6	10.1		.22												.22		-	1	-	-				-	-	-	-	wk	wk MOD	2	25	4	wk	3		VERT FRACT @274.8	90°	PY CONCENTRATED ALONG FRACTURES, SILICIFICATION MORE INTENSE FROM 279.5-282.6
282.6	287.5	4.9		.25												.25		-	1	-	-	-			-	-	-	-	wk	wk	3	20	3	wk	3				AS ABOVE
287.5	296.3	8.8		.12												.12		-	1	-	-	-				-	-	-	wk	wk	2	25	3	wk	3		FAULT @ 294	80°	ST. SILICIFICATION, WK. 2ND K. FELDSPAR.
296.3	304.7	8.4		.15												.15		-	1	-	-	-			-	-	-	-	wk	wk	3	25	3	wk	3				AS ABOVE, SOME CPY-PY ON VERT. FRACT.; DECREASE IN 2nd K-feld
304.7	313.8	9.1		.38												.38		-	1-2	-	-				-	-	-	-	wk	wk MOD	3	20	4	wk	3				ALT., CPY, 2nd K-feld INCREASE 309.3' to 316.2'; DECREASE TO 319.4
313.8	323.1	9.3		.23												.23		-	1	-	-	-				-	-	-	wk	wk	3	25	3	wk	3				SILICIFICATION ST.; AS ABOVE.
323.1	332.2	9.1		.25												.25		-	1	-	-	-				-	-	-	wk	wk	3	25	3	wk	3		(FAULT ZONE 332-335 ↓	50°) ↓	AS ABOVE; CPY/PY >1
332.2	340.7	8.5		.25												.25		-	1-2	-	-	-				-	-	-	wk	wk MD	4	25	3	-	3				AS ABOVE; SLIGHT INCREASE IN CLAY ALT.
340.7	345.0	4.3		.17												.17		-	1	-	-	-				-	-	-	wk	MD	3	20	4	-	2		FAULT ZONE 343-345	60°-80°	MOD-ST CLAY ALT. WITHIN FAULT ZONE.
345.0	353.8	8.8		.26												.26		-	1	-	-	-				-	-	-	wk	wk	2	20	3	Tr	3				ST silicification. dis py, cpy
353.8	363.0	9.2		.29												.29		-	1	-	-	-			-	-	-	-	wk	wk	2	20	3	-	5				Texture becomes fine grained @ 358.7. Abundant f.g., 2nd (?) biotite
363.0	371.8	8.8		.23												.23		-	1	-	-				Tr	-	-	-	wk	md	2	15	md	wk	3				f.g. to 363.7, decreasing sil.-increasing clay, chlorite alt.
371.8	380.8	9.0		.33												.33		-	1	-	-	-			Tr	-	-	-	wk	wk	2	20	2	Tr	5				stly silicified, as above
380.8	389.6	8.8		.25												.25		-	1	-	-	-			-	-	-	-	wk	wk	1	20	md	wk	4				" " , mdly broken, wk-md 2nd kspar; chlor
389.6	399.1	9.5		.21												.21		-	1	-	-	-			Tr+	-	-	-	md	wk	3	20	md	wk	3		QTZ-MOLY VEINS	75°	large grains of sericite on some fractures. 2nd Kspar along some veins.
399.1	403.5	4.4		.15												.15		-	1	-	-	-			-	-	-	-	md	wk	2	15	md	wk md	3				" " " " " " " increase in 2nd Kspar

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D-312
Page 2 of 4 Pages
Collar Elev 2588.26 Final Depth 1549.6
Coords. N 35,994.55 E 16,464.31
Inclination Vertical
Logged by L.V. RE
Date: Start 8/20/68 Finish 10/5/68

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green		Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb.	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz.	QUARTZ	CHLORITE	2nd Feldspar	BIOTITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
403.5	412.2	8.7		.25												.25		1										wk	wk MD	2	15	3	wk	3	MZ			MD. SILICIFICATION, WK-MOD POTASH ALT. of GROUNDMASS.
412.2	417.0	4.8		.22												.22		1										wk	wk	3	15	2	wk	3				AS. ABOVE, CPY/PY = 1.
417.0	422.9	5.9		.20												.20		1/2-1										wk	wk	2	25	–	wk	–	AK			MD. - ST. SILICIFICATION of GROUNDMASS.
422.9	434.4	11.5		.24												.24		1										wk	wk	3	20	1	wk MD	1	MZ to 427 AK to 434.4			MD. POTASH ALT. of GROUND MASS IN ALASKITE.
434.4	446.7	12.3		.31												.31		1/2-1										wk	wk MD	5	25	–	ST.	–	AK			BADLY BROKEN, NUMEROUS QTZ. VEINS., CPY/PY >1; ST. K-feld. ALT.
446.7	458.9	12.2		.19												.19		1										wk	wk MD	3	25	–	wk	TR				.5' SILL? MONZONITE @ 449.5', CPY/PY >1.
458.9	467.3	8.4		.46		.01									.01	.95		1										wk	wk	3	20	2	wk	3-4	MZ AK to 471.9	VERT FRACT.	~90°	ST. SILICIFICATION; VERT. FRACTURE filled w/ CPY-PY.; CPY/PY >1
467.3	481.2	13.9		.24												.24		1										wk	wk MD	3	15	2	MD	2	MZ to 481.2			MD. SILICIFICATION; MD - ST. K-feld. ALT. of MZ ALONG FRACTURES
481.2	494.3	13.1		.25												.25		1										wk	wk MD	3-4	25	–	wk	–	AK			MD. SILICIFICATION; CPY/PY = 1.
494.3	503.9	9.6		.26												.26		1						TR				wk	wk MD	3	25	TR	MD ST.	–				TR. MOLYB. @ 500'. AS ABOVE.
503.9	512.5	8.6		.15												.15		1										wk	wk	3	20	1	wk	1	MZ 508-509 & 511-512	REST AK.		MD. SILICIFICATION CPY/PY = 1
512.5	522.0	9.5		.25												.25		1						TR				wk	wk MD	3	20	–	–	–	AK	FAULT 519-521		CORE BROKEN; TR. MOLYB IN FAULT, ALT. INCREASES IN FAULT
522.0	529.5	7.5		.22												.22		1										wk	MD	3	20	1	wk	1	MZ 523-527	REST AK		Feld IN MZ LITE GREEN, SOME APLITE AK NEAR TOP; CPY/PY >1
529.5	538.5	9.0		.18												.18		1/2-1										wk	wk	2	25	–	–	–	AK	FAULT 534.3 – 535.2	~90°	Clay alt. wk; CPY/PY >1.
538.5	547.8	9.3		.23												.23		1										wk	wk	4	25	–	wk	–		FAULT 540.5 – 541.0	~90	K-feld INCREASE; AS ABOVE.
547.8	559.0	11.2		.20												.20		1										wk	wk MD	3	15	2	MD ST.	3	MZ TO 550.7 AK	REST		CPY/PY >1 IN MZ. IN VERT. FRACT. 2nd K-SPAR MD → ST. IN ALASKITE.
559.0	565.6	6.6		.24												.24		1										wk MD	wk MD	2	15	4	MD	2	MZ	JOINTS	40-50°	CORE BROKEN; clay ALT, MD - ST. 2nd K-feld. MD.
565.6	574.6	9.0		.19												.19		1										wk	wk	1	15	4	md	2	MZ			mdly broken, st silicification, mod 2nd Kspar
574.6	582.6	8.0		.24												.24		1										wk	wk	1	20	4	md	2				As above
582.6	591.4	8.8		.21												.21		1										wk	wk	1	20	3	wk	3				wkly broken, st Sil., cpy and 2nd Kspar along some fractures
591.4	599.5	8.1		.25												.25		1						Tr				wk	wk	3	20	3	wk md	3		QTZ. VEINS	55°	As above st 2nd Kspar @ 595.4 - 596.0. large blebs of CPY in QTZ veins
599.5	607.2	7.7		.28												.28		1										wk	wk	1	20	3	wk md	4				" " CPY on fractures bounded by 2nd Kspar CPY-[illegible]
607.2	615.9	8.7		.15												.15		1						Tr				wk	wk	1	20	2	wk	4				" "
615.9	624.9	9.0		.13												.13		1										wk	wk	1	20	2	wk	4				" "
624.9	634.5	9.6		.13												.13		1						Tr				wk	wk	1	20	3	md	3				st silicification, 2nd Kspar mostly along fractures
634.5	643.0	8.5		.16												.16		1										wk	wk	2	25	2	wk	3				V. ST. silicification.
643.0	647.5	4.5		.12												.12		1						Tr				wk	wk	2	25	2	wk md	3				" " "
647.5	656.6	9.1		.17												.17		1										wk	wk	3	20	2	wk	3		QTZ. VEINS.	70-80°	AS ABOVE 2nd K SPAR along FRACTURES, py/cpy filling SOME FRACTURES.
656.6	669.6	13.0		.14												.14		1										wk MD	wk MD	2	20	2	wk MD	3		"	~90°	MD. Silicification, py filling 50° Joints.
669.6	678.8	9.2		.16												.16		1										wk	wk	2	20	2	wk	3				MD - ST. silicification; cpy/py >1 filling 50° Joints & fractures.
678.8	692.6	13.8		.17												.17		1										wk MD	wk MD	1	20	3	wk MD	2				WK - MD silicification, 2nd K SPAR along SOME FRACTURES.
692.6	700.8	8.2		.13												.13		1										wk MD	wk MD	1	20	3	wk	2				MD BROKEN; PY/CPY >1.
700.8	707.0	6.2		.15												.15		1										MD	MD	2	20	3	wk	1		CPY ON FRACT.	80°	CPY/PY >1 on high ∠ FRACT. (70°-80°)
707.0	716.5	9.5		.19												.19		1										wk	wk MD	2	25	1	wk	3		PY/CPY/QTZ VEINS.	40-80°	AS ABOVE; WK - MD. SILICIFICATION
716.5	725.1	8.6		.12												.12		1										wk	wk	2	25	1	wk	3				MD - ST. SILICIFICATION, TR. CPY.
725.1	735.2	10.1		.15												.15		1										wk	wk MD	2	20	1	wk	3	MAJOR FAULT	FAULT 733-735	BROKEN	GOUGE FROM 733-735'; py/cpy >1, MD. silicification ABOVE FAULT ZONE.
735.2	744.9	9.7		.20												.20		<1										md	ST	3	10	1	wk md	–	Bx MZ	1/2" QTZ vein	90°	Bx to 738.5, Then soft and stly altd but not silicified. (high core loss.
744.9	754.1	9.2		.21												.21		<1						2				md	ST	3	10	1	wk	–		shears	45°	stly sheared, altered, calcite xtals on fractures
754.1	766.5	12.4		.16												.16		<1						Tr				md	ST	2	10	2	wk	1		"	"	less sheared than above, soft, friable, stly. alth.
766.5	774.4	7.9		.22												.22		1						Tr				wk	wk	–	25	2	wk	3				mdly broken, very hard, stly silicified, 2nd Kspar on fractures
774.4	782.5	8.1		.20												.20		1						Tr				wk	wk	–	25	2	wk	3				CPY on some fractures, others have thin zone of Clay alt. v.st. Sil.
782.5	793.1	10.6		.20												.20		1						Tr				wk	wk	–	25	2	wk	4				V. ST. silicification, Joints spacing about 3".
793.1	805.0	11.9		.21												.21		1						1				wk	wk	–	20	3	wk	3				Clay alt.; 2nd Kspar slowly increasing towards end of interval

PRELIMINARY GEOLOGIC LOG
(Subject to Revised Logging)

ASARCO- SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4)
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

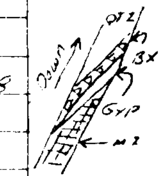
Hole No. D-312

Collar Elev 2588.26 Final Depth 1549.6
Coords. N 35,994.55 E 16,454.31
Inclination vertical
Logged by LV, RE
Date: Start 8/20/68 Finish 10/5/68

Depth From	Depth To	Int'vl	Elev.	% Cu Total	Avg.	NS	Avg	% Core Recov	Sp Gr	Cu (1) Chrys.	Pitch	Black	Blue Green	Cc.	Cpy.	Born
805.0	813.3	8.3		.16											.16	
813.3	821.9	8.6		.20											.20	
821.9	828.1	6.2		.21											.21	
828.1	837.2	9.1		.23											.23	
837.2	846.9	9.7		.23											.23	
846.9	854.8	7.9		.25											.25	
854.8	863.8	9.0		.20											.20	
863.8	869.6	5.8		.25											.25	
869.6	879.8	10.2		.16											.16	
879.8	887.8	8.0		.24											.24	
887.8	896.7	8.9		.17											.17	
896.7	903.2	6.5		.06											.06	
903.2	912.5	9.3		.27											.27	
912.5	921.2	8.7		.14											.14	
921.2	929.1	7.9		.19											.19	
929.1	938.5	9.4		.32											.32	
938.5	947.4	8.9		.28											.28	
947.4	956.6	9.2		.18											.18	
956.6	963.6	7.0		.21											.21	
963.6	972.4	8.8		.20											.20	
972.4	981.2	8.8		.19											.19	
981.2	991.2	10.0		.21											.21	
991.2	999.9	8.7		.15											.15	
999.9	1005.4	5.5		.14											.14	
1005.4	1015.0	9.6		.29											.29	
1015.0	1024.2	9.2		.24											.24	
1024.2	1030.2	6.0		.21											.21	
1030.2	1039.9	9.7		.31											.31	
1039.9	1049.5	9.6		.21											.21	
1049.5	1058.8	9.3		.29											.29	
1058.8	1067.0	8.2		.16											.16	
1067.0	1076.0	9.0		.11											.11	
1076.0	1080.8	4.8		.23											.23	
1080.8	1089.6	8.8		.13											.13	
1089.6	1098.6	9.0		.15											.15	
1098.6	1107.7	9.1		.15											.15	
1107.7	1119.7	12.0		.15											.15	
1119.7	1129.2	9.5		.29											.29	
1129.2	1138.4	9.2		.28											.28	
1138.4	1147.9	9.5		.30											.30	
1147.9	1157.6	9.7		.27											.27	
1157.6	1167.2	9.6		.22											.22	
1167.2	1177.0	9.8		.22											.22	
1177.0	1186.7	9.7		.19											.19	

From	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	2nd Feldspar	Biotite
805.0		½							TR			wk MD	wk MD	1	10	3	MD	1
813.3		1						TR	TR			MD	ST	3	15	4	MD wk	—
821.9		1							TR			MD	ST	1	15	3	MD wk	1
828.1		1						TR				MD	MD ST	2	15	3	MD wk	1
837.2		½						TR				MD	MD ST	2	15	3	wk MD	1
846.9		<1							TR			MD ST	MD ST	1	15	3	MD	1
854.8		<1							TR			wk MD	wk MD	2	20	1	wk MD	3
863.8		<1										wk MD	wk MD	5	20	1	wk MD	3
869.6		1						Tr				wk	wk MD	3	20	1	wk MD	1
879.8		1						Tr	Tr			wk	md ST	5	15	3	wk	1
887.8		1							Tr			wk	ST	2	15	5	wk	1
896.7		1							Tr			wk?	ST	-	10	6	wk	-
903.2		1						Tr				wk?	ST	9	15	6	Tr	-
912.5		1						Tr	Tr			wk?	ST	50	55	3	-	-
921.2		1						TR				wk	ST	10	25	2	-	2
929.1		1-2						TR				wk 10	wk MD	0	25	3	-	1
938.5		1-2						TR	TR			MD	MD	10	25	2	-	2
947.4		1							TR			MD	MD	8	20	6	-	-
956.6		1						1	TR			MD ST	MD ST	10	25	6	-	
963.6		1						-	-			md	Md	1	15	5	wk md	1
972.4		1										wk	md ST	5	20	5	wk	Tr
981.2		1						Tr t				wk	md	3	20	4	md	2
991.2		1						-	-	-	-	wk	wk	3	15	1	wk	1
999.9		1						-	-	-	-	wk	wk	1	20	1	wk	1
1005.4		<1						TR				wk MD	wk MD	3	20	2	wk	1
1015.0		~1						TR				wk	wk	3	20	1	wk	2
1024.2		<1						Tr				wk MD	wk MD	5	20	2	wk MD	2
1030.2		1						TR				wk	wk	4	20	·	wk MD	2
1039.9		<1						Tr				MD	MD	3	5	3	MD	
1049.5		<1										MD ST	MD ST	2	15	3	MD ST	1
1058.8		<1						TR				wk MD	wk MD	4	20	1	wk	4
1067.0		<1						TR				wk MD	wk MD	3	20	2	MD	2
1076.0		<1										MD	MD	2	15	3	MD	1
1080.8		<1	Tr									wk	md	Tr	15	3	md	1
1089.6		<1						Tr				wk	md	2	15	3	wk md	1
1098.6		<1						Tr t				md?	ST	1	10	4	Tr	—
1107.7		<1										wk	md	Tr	15	3	wk md	1
1119.7		<1						TR				wk	MD	3	20	3	wk	<1
1129.2		<1						TR				wk	MD ST	4	15	3	wk	<1
1138.4		<1						TR				wk MD	wk ST	3	20	3	wk	<1
1147.9		<1							TR			wk MD	MD ST	3	20	3	wk MD	2
1157.6		<1							TR			wk	wk	3	20		MD	4
1167.2		<1										wk	wk MD	3	25	1	MD	4
1177.0		<1						TR	TR			wk MD	wk MD	1	20	1	wk MD	4

From	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
805.0	MZ	Joints	50°	some py on joint surfaces; calcite (caliche?) on joint surfaces.
813.3		QTZ VEINS	70-90	cpy & moly in qtz veins. py filling high ∠ joints., calcite xtls. on joints.
821.9				cpy >> py; calcite xlts on joints
828.1		QTZ VEINS	70°	cpy-moly on high ∠ shears & qtz. veins; some "slick" surfaces (70°).
837.2		CPY VEINS	~70°	cpy-moly in thin veinlets; some "slick" surfaces. cpy/py >1
846.9				CLEAR GYPSUM ? COATING SOME 45° JOINTS.
854.8		Joints	40-60	MD-ST silicification; 2ND K-SPAR MAINLY ON JOINTS.
863.8		QTZ VEINS	80°	QTZ VEINS 3/4-1" THICK w/ STRINGERS PY, PY ON SOME HAIRLIKE JOINTS AS ABOVE.
869.6		"	40-80	MD ST. silicification, 2ND K-SPAR MAINLY along joints, TR. cpy & Molyb.
879.8		"	70°	wkly broken, spotty silicification. 2nd kspar bordering QTZ-sulf veins
887.8				As above, steep irregular QTZ veins contain gypsum
896.7		gypsum vein	70°-90°	mdly broken. Kspars alt'd to green clay mineral.
903.2		QTZ vein	45°	massive white qtz vein with thin sulfide seams: 910.0-910.8
912.5		QTZ vein	80°	massive white QTZ veins: 915.2-916.0; 917.5-921.2 see sketch →
921.2		QTZ VEIN	80°	AS ABOVE @ 922.2'-923.0, TR. MOLY & CPY
929.1		SHEAR ZONES	50-70	shears filled w/ qtz. & py. ST. silicification in places.
938.5		"	30-40	shears filled w/ qtz, py; some w/ clear gypsum, in places crosscutting qtz veins.
947.4		QTZ VEINS	30-60	crosscutting qtz veins w/ some py; veins clear gypsum ∥ joints.
956.6		QTZ VEINS	40-60	MASSIVE white qtz vein @ 961.6 w/ 5% moly; other qtz veins w/ TR moly.
963.6				Zones of md silicification, some 2nd kspar alt of groundmass
972.4		QTZ vein	45°	QTZ vein: 977.4-977.8, followed by BX to 978.6
981.2	MZ	"	30°-50°	qtz-moly veins bordered by ST 2nd Kspar. Alternating sil & clay alt
991.2	MZ			change in texture; alt. fewer and less alt'd phenos. Less bi'tchl brownish grey groundmass. gypsum on fractures.
999.9	MZ -1003.3			As above to 1003.3
1005.4		QTZ VEINS	40-60°	QTZ, cpy, TR moly filling fractures
1015.0				AS ABOVE w/ some moly "paint" on fract.
1024.2		QTZ VEIN	50°	MASSIVE QTZ VEIN w/ cpy & py. 2nd K-SPAR ALT. along joints.
1030.2		QTZ VEINS	70-80°	QTZ VEINS w/ some cpy & TR moly; gyp. veins filling fract.; 2ND K-SPAR ON FRACTS
1039.9		QTZ VEINS	40-70	clay & 2nd KSPAR INCREASING, sulfides in fract. of qtz.
1049.5				2ND K-SPAR CONCENTRATED ON JOINTS.; few qtz. veins.
1058.8		QTZ VEINS	50°	cpy - qtz veins w/ TR. moly. silicification MD.-ST cpy/py >>1
1067.0				[illegible] silicification to 1071, MD. 2nd K-SPAR ON joints 1071-1076.
1076.0				MD. 2ND K-SPAR [illegible] joints & along qtz. veins.
1080.8				md green clay alt, TR of dis. magnetite, md silicification
1089.6		QTZ veins	30°	Alternating silicification and clay alteration, wide spaced (2-3') joints
1098.6		Fault 1107.?	50°	No silicification, st clay alt of entire rock, moly on shears 1102.0
1107.7				silicification & clay alteration vary. 2nd Kspar in thin bands
1119.7		LINEATION @1121.7	33°	llism of sulf veins, close spaced @ 1121.7' cpy/py >>1; AS ABOVE.
1129.2		QTZ VEIN	70°	QTZ, calcite, sulf veins as joint fillings. silicification wk., clay alt MD-ST.
1138.4				clay alt & silicification vary, but locally strong., cpy/py >>1
1147.9		QTZ VEINS 1148-1150	60-80	silicification st from 1151.-1157.6.. 2ND K-SPAR, MD.
1157.6		APLITIC VEIN 1159.6-1161.0	85°	silicification MD-ST, 2ND K-SPAR MD. sulf w/ qtz. veins ∥ joints.
1167.2				silicification st.; 2ND K-SPAR MD, strongest on joints, but pervasive through rock.
1177.0		QTZ, GYP. SULF VEINS	45°	silicification varies, locally ST., TR. calcite & gyp. on 45° joints, sulf on paper-thin joints.



PRELIMINARY GEOLOGIC LOG
(Subject to Revised Logging)

ASARCO- SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4) North Silver Bell Area
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undifigneous

Hole No. D-313
Page 1 of 1 Pages
Collar Elev. 2515.02 Final Depth 209.0
Coords. N 42,936.49 E 15,957.85
Inclination Vertical
Logged by D.B.
Date: Start 4-5-69 Finish 4-10-69

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green		Cc.	Cpy.	Born	Fe (2) Lim.	Py	Mag.	Hem	Spec.	Other (2) Galena	Sphal.	Molyb.	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0	20.0	20.0																																			Rock bit, Alluvium
20.0	29.6	9.6		.70	30.6 @ 0.51 / 0.34	.39		75					.70	(No visible sulfides)				Nil	-										Nil	Nil	10	Nil		Mz			C.gr. Mz w/20% large phenos, biotite chl. grn stn throughout wk chrys on fracs.
29.6	41.4	11.8		.60		.41		57					.60	" " "				Nil											St	Nil	10	Nil			Shear	75°	Brec. Lim & Mn ox on fracs, also waxy grn clay min. Md'ly broken
41.4	50.6	9.2		.40		.20		86					.40	" " "				Nil	Tr										St	Nil	10	Nil			Shears	70-85	several high angle shears wk chrys. on fracs. partially axialized. 2% unlike
50.6	60.1	9.5		.27				82					.23		.04			wk-Nil											St	Md-St	2	12	Nil		"	"	grn staining ENDS at 57.0. wk sulfides as units & diss.
60.1	70.0	9.9		.33	3.4 @ 0.34 / Nil			[illegible]							.32	.01		Tr											St	Md	10	St-Md		Sulfides			Md-St chl alt. waxy grn clay min on fracs. wk. diss. sulfides
70.0	83.0	13.0		.23				78							.20	.03		-											Md	Md-St	10	St					st'ly sheared & broken st. chl. alt. wk-md sulfides
83.0	93.0	10.0		.27				50							.24	.03		-	1										Md	St	10	St					" " " Breccia from 91.5 to end of int wk cc
93.0	98.5	5.5		.73		Nil		78							.33	.40			Tr										Md	St	10	St		Mz			Mz bx broken & sheared cpy & cc as units & between frags.
98.5	108.0	9.5		.01				93					.01						Tr											Md		Wk		Post min Alt.	Fract. shears	45°	Pgn. Post min alt. wk chl. alt. Tr py
108.0	116.5	8.5		.01				89					.01						Tr											Md		Wk			116.3	70-50	As above st'ly sheared & broken
116.5	125.6	9.5		.38				79							.28	.10			½										Md	St	10	St		Mz			C.gr. Mz brecciated & granulated units & small blebs of cpy & cc
125.6	132.5	6.9		.27				87							.22	.05			½										Md	Md-St	10	St					" " " " st'ly broken less cpy & cc than above
132.5	140.8	8.3		.26				80							.21	.05			½										Md	St	10	St					brecciated & broken w/ local gouge cpy & cc as units & diss
140.8	148.0	7.2		.33				100							.28	.05			½										Md	St	10	St					st'ly Alt'd broken & sheared gouge 146.0-148.0 wk diss cpy & cc
148.0	156.0	8.0		.32	9.21 @ 0.40 / Nil			93							.27	.05			½										Md	St	10	St					" " " " very crumbly local gouge wk sulfides
156.0	164.5	8.5		.29				91							.24	.05			Tr										Md	St	10	St					as above wk cpy
164.5	173.0	8.5		.40		Nil		93							.25	.15			½										Md	St	10	Md-St					local Bx & gouge less broken than above units of cc & cpy
173.0	181.0	8.0		.33				92							.18	.15			½					.004					Md	Md-St	12	St					C.gr. Mz md'ly Alt'd st'ly broken wk Mo. on fracs.
181.0	191.0	10.0		.21				82							.05	.16			½						.005				Md	Md-St	15	St					As above wk'ly silicified wk diss cpy
191.0	199.9	8.9		.37				88								.37			Tr										Md	Md-St	12	St					st'ly sheared & broken breccia 196.5-199.0 Tr Mo wk cpy
199.9	209.0	9.1		1.15		Nil		77								1.15			Tr										Md	Md-St	2 12	St		Mz			" " " wk silicification 207.0-207.2 Qtz vn. w/st cpy
E.O.H.																																					

Average Recovery: 81%

PRELIMINARY GEOLOGIC LOG

(Subject to Revised Logging)

ASARCO - SILVER BELL UNIT

Note (3)
Tt - Tactite
Hf - Hornfels
Mb - Marble
Qt - Quartzite
Bx - Breccia
Da - Dacite
Mz - Monzonite
An - Andesite

Note (4) North Silver Bell Area
V - Vein
F - Fault
D - Dike
C - Contact
Ig - Undif igneous

Hole No. D-314
Page 1 of 1 Pages
Collar Elev. 2620.59 Final Depth 200.0
Coords. N 14,938.49 E 17,535.19
Inclination Vertical
Logged by R.B.
Date: Start 4-10-69 Finish 4-16-69

Depth From	Depth To	Int'vl	Elev.	% Cu Total	% Cu Avg.	% Cu NS	% Cu Avg	% Core Recov.	Sp. Gr.	Cu (1) Chrys.	Pitch	Black	Blue Green	Unknown N.S.	Cc.	Cpy.	Cov. Born	Fe (2) Lim.	Py	Mag.	Hem.	Spec.	Other (2) Galena	Sphal.	Molyb.	Calcite	Garnet	Silicates	Sericite	Clay	Vn. Qtz	QUARTZ	CHLORITE	(3) Rock Type	Structures (4) Depth	True Dip	Remarks
0	7.7	7.7																																			Rock bit, Alluvium
7.7	15.8	8.1		.08				90						.08				Md	-		St							St	wk	5 20			Dp				Dp w/ round Qtz phenos. leached sul units. sl sor. sl hem stn
15.8	25.2	9.4		.07				82						.07				St			St							St	wk	5 20							sl jarosite on fracs. md live limonite. sl Qtz-ser alt.
25.2	34.3	9.1		.17				95						.15	.02			St	-		St							St	St	4 18							st'ly altd & sl hem staining. clay on some fracs
34.3	43.5	9.2		.12				90						.12				St			St							St	wk-md	15 20				Qtz vns	50°		md'ly silicified parallel Qtz vns & units 50°. sl jarosite on fracs
43.5	52.0	8.5		.29				83							.25		.04	wk	Tr		Md							St	St	5 20							40% oxidized. st'ly altd. fract sul @ 45° wk cc as units & diss. Tr cpy
52.0	61.0	9.0		.72	26.5 @ 0.66	Nil		90							.46		.06	-	1		-							St	wk	12			sulfides				Dp st'ly sheared & broken wk-md diss sulfides concentrated as cpy.
61.0	70.0	9.0		.49		Nil		81							.46		.03		1-2									St	wk	15							" " " clay on fracs. Tr cpy
70.0	78.5	8.5		.47	Nil	Nil		70							.35	.06	.06	Tr	1-2									St	wk	3 20							As Above. Tr sec lim on fracs. wk cpy
78.5	86.2	7.7		.23		Nil		95							.10	.10	.03		1-2									St	wk	5 22				Several fracs.	60-80°		md-st'ly broken & fractured. Several parallel Qtz vns. wk-md cc
86.2	94.9	8.7		.16				94							.08	.08			2									St	wk	5 25							As Above. Numerous pyfce units
94.9	107.0	12.1		.11				79							.05	.06			1/2									St	wk	3 15			Dp				Post min AND dikes. 95.0-98.5 and 102.0-103.0. } as Above
107.0	116.0	9.0		.15				85							.04	.11			2									Md	wk	3 15	md						st'ly broken md chl. wk cc & cpy
116.0	124.0	8.0		.21				76							.06	.15			1-2									Md	wk	5 8	md			Shear	85°		md'ly sheared & broken. chl on fracs. wk sul.
124.0	133.0	9.0		.21				100							.05	.16			2									Md	wk	3 15	md						As Above. ½" py vn. @ 127.0. wk cc & cpy
133.0	146.0	13.0		.17				92							.04	.13			2									Md-St	wk	15	Md		Dp Dp Dp AND	138.9 144.6 140.0			Dp chl on fracs. post min AND dikes 138.9-139.7 and 140.0-141.6
146.0	156.5	10.5		.02				99						.02					-									-	Md	-	-		AND				Edge post min AND.
156.5	166.0	9.5		.16				84							.03	.13			-									-	Md	-	-	wk		163.0			As Above st'ly broken & sheared w/chl on fracs. 159.0-161.0 Dp from 163.0
166.0	174.0	8.0		.17				100							.03	.14			1									Md	wk	25	Md		Dp				md'ly silicified st'ly broken & fractured. md chl. wk sul.
174.0	183.5	9.5		.20				83								.20			1½									Md	wk	25	Md						Less broken than above. Numerous shears. cpy as units & diss.
183.5	192.0	8.5		.12				79								.12			1-2									Md	wk	5 25	Md						As Above. Numerous Qtz units
192.0	200.0	8.0		.17				90								.17			1									Md	wk	5 35	Md		Dp				md'ly broken. chl on fracs. Tr moly. diss. cpy

Average Recovery: 88%