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James Doyle Sell Mining Collection

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JHC
MS-2.1

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona
September 4, 1959

MEMORANDUM FOR T. A. SNEDDEN

A. C. H.
OCT 1963

MISSION ORE BODY
Analyses of Molybdenum
And Other Elements -
Composite Samples

This describes a collection of composite sample analyses for molybdenum and other metals through the entire Mission ore body. This basic information has, for the most part, already been used by you and others in your metallurgical considerations. The data is compiled here merely to get it all in one place for the record.

Sometime ago it was determined by Mr. Boss at Silver Bell that, due to the presence of tungsten, most of the molybdenum assays made during the course of the main drilling campaign were in error, or at least suspect. This was due to the obscure fact that in conventional analytical determinations of moly, any tungsten present tends to produce an erratic moly value, usually on the high side.

Early in the drilling program it was observed in the core that moly was in spotty occurrence and not in sufficient abundance to warrant systematic assaying of all individual core samples for moly. Occasionally, individual samples were assayed for moly in order to gain a general idea of the grade range. The fact that these random samples are now thought to be in error is of no particular consequence. The values for these random samples are recorded only on the "Drill Assay Logs" which are on file at the Mission Laboratory.

Eventually, a method for accurate analysis of moly was worked out by Silver Bell and checked. Composite samples then were made up to determine the average amount and distribution of moly in the ore body. These composites had the following specifications:

> All samples were inside or within a reasonable distance of the ultimate pit limit. All ore lenses of more than 30' in drillhole length were included. Each composite pulp was made up by combining weighed amounts from pulps of individual core samples, proportioned according to length of core run. Each composite consisted of ore lenses from several holes depending on area and ore type. The areas were selected as being structural units in a general sense. They are shown on the attached map (Att. A), whereon Areas A through D represent the eastern one-third of the ore body, and E through K the western two-thirds. The ore in each area was further subdivided according to the following ore types:

1. Tactite-Hornfels
2. Argillite (Papago formation, principally)
3. Mixed intercepts: tactite-hornfels with argillite and gypsum (intruded in part by thin metaporphyry sills)
4. Quartzite

The number of composite samples was limited due to the complexity and expense of the moly determinations.

Attachment B is a tabulation (1) of the individual core intervals constituting each of the 28 composite samples, (2) of the percent Cu of the composites as calculated (weighted) from original, individual core sample assays (Silver Bell), and (3) of the MoS_2-Cu-WO_3 assays of the composite samples by Silver Bell, using their revised and checked analytical procedure for moly and tungsten.

The drillhole intervals are plotted on a working set of the 100-scale Geological Sections in my office, and also on that set of 100-scale sections in Mr. Schubel's office which shows the ore blocks and yearly pit outlines.

The composite samples individually represent blocks of ore ranging in size from 0.5 to 7.8 million tons. Although the distribution of moly within each of these large blocks of ore is not known with any precision, by visual inspection of core it is erratic. The moly probably is somewhat concentrated in small zones sporadically distributed through the ore blocks. This condition is further evidenced by the fact that the above-average moly composite samples represent only one-third of the total ore body. Moly does not follow the copper; that is, higher grade copper ore does not necessarily contain better moly value, and some small occurrences of moly, up to .7 or .8% in grade, are in material which is below ore grade in copper. In some instances these small pockets of relatively high grade moly might be milled regardless of their sub-ore Cu content.

There appears to be no consistent favorability of moly for any one of the principal ore types, as shown on the following table:

Ore Type	Drillhole Length	Weighted % MoS_2
Tactite-Hornfels	7467.9	.024
Argillite	3403.9	.023
Mixed	402.2	.075
Quartzite	1246.8	.021
Total and Average	12,520.8	.025

Although the lenses of "mixed" ore types on the above tabulation are erratically high in moly content, they constitute only a small portion of the ore body.

The following table groups the composites according to the areas shown on Attachment A:

Area	Drillhole Length	Weighted % MoS2
A	1176.5	.039
B	1023.5	.024
C	1624.3	.014
D	316.2	.018
E	1202.3	.035
F	444.2	.030
G	1937.7	.014
H	1232.2	.025
I	768.4	.028
J	883.5	.044
K	1912.0	.021
Total & Average	12,520.8	.025
Eastern Area (A thru D)	4,140.5	.024
Western Area (E thru K)	8,380.3	.026
Total & Average	12,520.8	.025

The above data suggest that the higher values in area A are related to the East vein, and those in areas I and J are associated with metaporphyry sills. Otherwise, there is no clear relation between the distribution of moly and those structures which are believed to influence copper distribution.

The composite sample blocks are re-calculated to correspond to the yearly ore production intervals of the ore reserve report of March 2, 1959, as follows:

Interval	Weighted % MoS2	Weighted % Cu
Pre-Mine	.030	.96
1st Year	.020	.95
2	.025	.95
3	.023	.97
4	.027	1.09
5	.026	1.30
6	.031	1.07
7	.027	.94
8	.027	.73
Ultimate	.023	.78
Average	.025	.90

When applied to the yearly open pit outlines, each composite sample becomes subdivided, and the assay value may appear in weighted proportion in several yearly intervals. As can be noted above, this has the effect of smoothing the moly values. This would seem to indicate that the mixing effect of mining will provide a uniform moly content in mill feed. However, this applies only when averaged over large production intervals. It is important to recognize that in short intervals of days or weeks the moly content of mill feed may fluctuate radically.

All of the composite samples have been analyzed spectrographically by our Central Research Laboratories. As a matter of record these results are included as Attachment C. Mr. Courtright and I discussed these data with Messrs. Weiss and Vincent. It was concluded that, with the exception as noted below of Pb and Zn, no elements other than moly are in sufficient abundance to be of present concern from the standpoint of extractive metallurgy.

Attachment D is a tabulation of the Zn-Pb-Au-Ag values in the composite samples, as reported by Jacobs of Tucson. He told me that accurate determinations of Zn and Pb in such small amounts are difficult, but that he took all possible care with these determinations. The Au-Ag assays were made merely to confirm the opinion that no significant concentrations of these metals occur within the ore body.

With the exception of one small composite, J1, which contains 0.46% Zn, the Zn and Pb assays range from trace to 0.06%. This demonstrates that, as an average through the ore body, these metals exist neither in recoverable nor in deleterious quantities. However, there are a number of irregular pods and lenses which contain from 1.0 to 10.0% of both Pb and Zn. Most of these bodies probably are small -- up to a few thousand tons -- and only rarely contain more than 1.0 or 2.0% Pb and Zn. But there is one occurrence in the eastern part of the ore body which might consist of as much as 100,000 tons. This is penetrated by drillhole 152 which shows 40.5' with an average of 8.3% Pb and 12% Zn. (See El Paso Flotation test 612F, 10/4/57.) Also, at the bottom of the ore body in the western part there is a fairly consistent layer containing sphalerite and lesser galena which ranges from 1 to 10 feet in thickness. This layer usually contains less than 4.0 or 5.0% Zn-Pb combined, but occasionally it will carry more.

Although these various Zn-Pb occurrences are of no consequence in terms of the whole ore body, they may possibly seem big for an occasional day's or week's mill run, say, unless this material is sorted out (stockpiled?) during mining in order to avoid short-term metallurgical difficulties.

In answer to a request from the Smelting Department for chemical analyses of the various ore types, six of the composite samples were selected as being representative, and were analyzed at the El Paso Umpire Laboratory. These results have already been reported in your letter of June 12, 1959 to Mr. Pope, but they are repeated here because they provide additional information on the distribution of elements in the ore body.

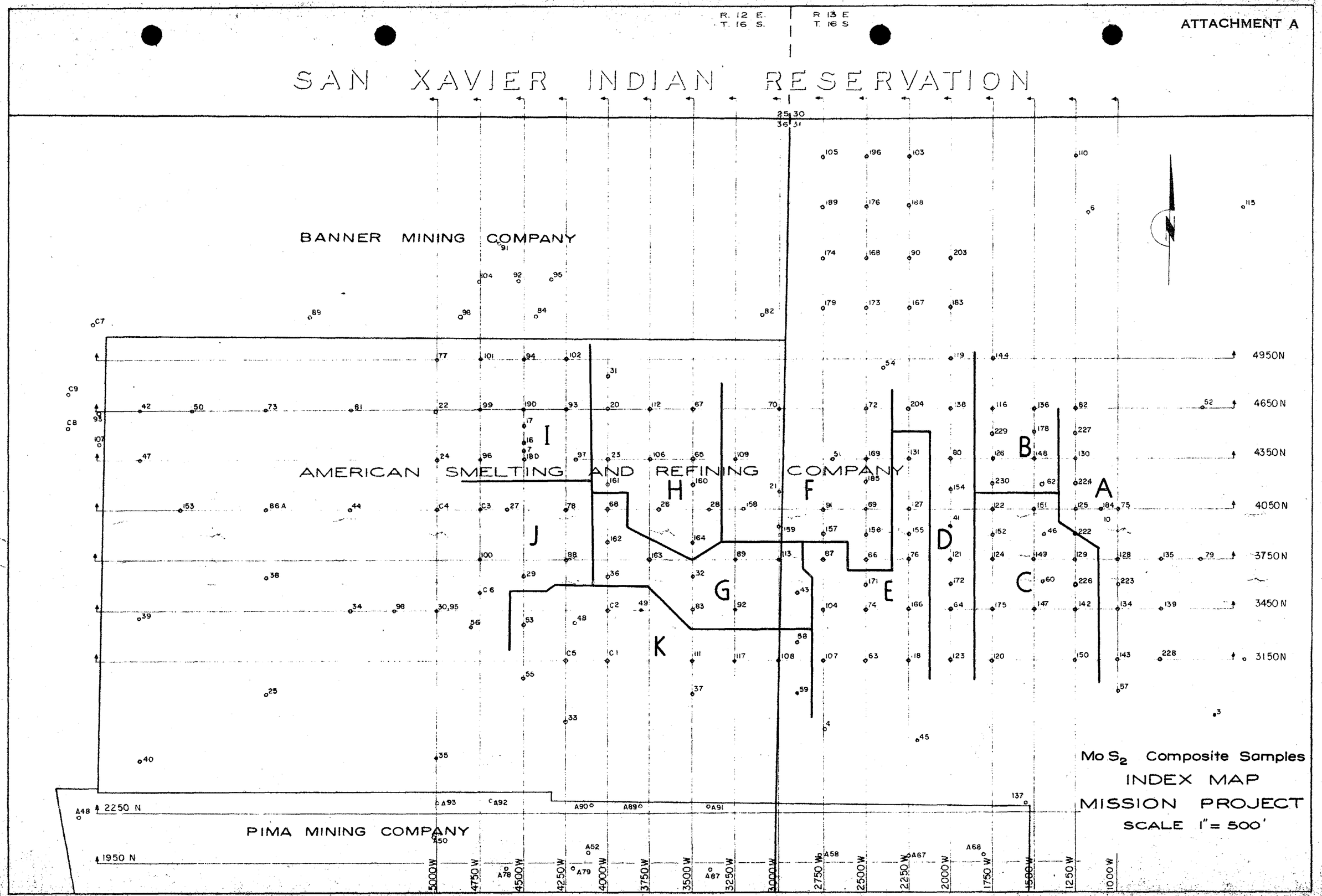
Composite No.	Cu	SiO2	Fe	CaO	Al2O3	MgO
A-1	1.61	40.68	10.15	24.26	5.53	5.35
C-1	1.01	41.06	8.66	25.82	3.93	7.70
C-4	1.35	49.27	8.04	13.85	8.23	3.51
G-2	0.84	61.34	5.14	5.45	10.09	2.88
H-1	1.10	45.35	10.13	20.0	3.43	6.65
I-3	0.48	44.18	3.17	15.08	4.83	3.45

Original Signed By
K. Richard

KENYON RICHARD

Attachments - A, B, C, D
KR/ds
cc, with attachments:
DJPope
CPPollock
NWeiss
JDVincent
ACHall
RBMeen
File Copy routed to:
WOSchubel
JHCourtright
SVFay
JEKinnison

ATTACHMENT A



MISSION COMPOSITES

No.	DDH	Interval	Length	Calculated Original % Cu	Composite % Cu	Composite % MoS_2	Composite % WO_3	% Core Recovery
A-1	125	282.4-430.5	148.1					
	125	458.4-518.5	60.1					
	125	538.5-585.7	47.2					
	128	210.8-258.2	47.4					
	128	291.4-415.5	124.1					
	128	504.1-610.8	106.7					
	130	229.3-406.8	177.5					
	134	396.1-423.5	27.4					
	134	504.0-544.7	40.7					
	134	582.5-703.8	121.3					
	143	503.3-626.2	122.9					
			1023.4	1.56	1.55	.043	.009	95
A-4	134	243.0-396.1	153.1	1.20	1.21	.015	.006	96
B-1	62	280.6-512.3	231.7					
	116	280.0-329.4	49.4					
	126	267.4-366.7	99.3					
	126	552.4-588.2	35.8					
	136	224.8-273.1	48.3					
	136	334.4-418.0	83.6					
	148	286.0-452.2	166.2					
	148	505.5-573.1	67.6					
	178	270.3-511.9	241.6					
			1023.5	1.74	1.61	.024	.005	95
C-1	46	213.2-308.9	95.7					
	46	339.7-424.2	84.5					
	60	225.6-263.8	38.2					
	60	367.6-406.9	39.3					
	122	422.7-535.2	112.5					
	124	393.6-434.3	40.7					
	124	493.6-576.8	83.2					
	129	340.5-420.0	79.5					
	129	473.7-515.1	41.4					
	142	232.2-298.1	65.9					
	142	395.3-433.3	38.0					
	142	553.5-591.0	37.5					
	142	631.8-797.2	165.4					
	149	215.2-310.4	95.2					
	149	347.1-390.1	43.0					
	151	220.8-308.9	88.1					
	151	354.0-495.6	141.6					
			1289.7	.99	1.00	.013	.003	89

Mission Composites - Page 2

No.	DDH	Interval	Length	Calculated Original % Cu	Composite % Cu	Composite % MoS_2	Composite % WO_3	% Core Recovery
C-2	120	375.6-426.5	50.9					
	124	235.3-278.1	42.8					
	175	307.1-350.2	43.1					
			136.8	1.09	1.21	.007	.003	93
C-4	129	420.0-473.7	53.7					
	129	641.0-687.9	46.9					
	142	298.1-395.3	97.2					
			197.8	1.28	1.30	.023	.006	96
D-1	54	208.0-244.0	36.0					
	80	359.2-395.7	36.5					
	121	518.3-564.6	46.3					
	138	257.9-357.2	99.3					
	154	373.8-411.9	38.1					
	204	310.5-370.5	60.0					
			316.2	1.53	1.45	.018	.010	90
E-1	63	430.5-457.2	26.7					
	63	499.8-573.7	73.9					
	74	313.2-444.6	131.4					
	76	381.2-417.7	36.5					
	76	463.3-555.3	92.0					
	87	262.7-294.0	31.3					
	104	222.5-312.7	90.2					
	107	495.1-541.0	45.9					
	118	492.0-572.9	80.9					
	127	438.4-511.5	73.1					
	155	408.0-428.2	20.2					
	155	448.8-526.3	77.5					
	166	455.1-569.5	114.4					
	171	388.4-427.6	39.2					
			933.2	1.62	1.61	.039	.005	93
E-2	63	353.1-408.9	55.8					
	74	244.0-313.2	69.2					
	87	211.1-262.7	51.6					
	131	299.4-359.3	59.9					
	166	385.3-417.9	32.6					
			269.1	.67	.65	.021	.002	94
F-1	66	361.3-400.8	39.5					
	69	337.9-384.3	46.4					
	91	309.0-335.8	26.8					
	156	317.9-354.7	36.8					
	158	304.5-380.9	76.4					
	159	305.7-344.8	39.1					
	185	357.8-405.8	48.0					
			313.0	2.46		.039	.009	92

Mission Composites - Page 3

No.	DDH	Interval	Length	Calculated Original % Cu	Composite % Cu	Composite % MoS_2	Composite % WO_3	% Core Recovery
F-2	21	238.3-285.7	47.4					
	109	262.8-290.8	28.0					
	158	235.2-291.0	55.8					
			131.2	1.07	1.06	.008	.002	82
G-1	32	389.7-460.5	70.8					
	32	513.2-570.5	57.3					
	36	533.6-635.2	101.6					
	43	347.9-383.2	35.3					
	68	352.1-498.8	146.7					
	83	481.2-514.5	33.3					
	83	588.0-623.8	35.8					
	92	388.4-454.2	65.8					
	113	323.6-385.5	61.9					
	162	454.5-578.1	123.6					
	163	419.7-450.3	30.6					
	163	477.8-509.9	32.1					
			794.8	1.01	1.00	.003	.006	94
G-2	36	244.9-434.0	189.1					
	43	236.7-305.6	68.9					
	68	232.0-314.2	82.2					
	83	244.9-352.4	107.5					
	89	232.7-266.7	34.0					
	89	281.5-330.6	49.1					
	92	230.9-268.4	37.5					
	92	310.6-388.4	77.8					
	113	220.6-323.6	103.0					
	162	250.0-345.0	95.0					
	163	365.7-419.7	54.0					
			898.1	.82	.82	.024	.002	92
G-4	36	434.0-485.3	51.3					
	68	314.2-352.1	37.9					
	68	508.0-554.1	46.1					
	162	345.0-454.5	109.5					
			244.8	.86	.83	.013	.001	93
H-1	20	278.1-335.4	57.3					
	23	281.5-336.2	54.7					
	23	375.8-505.1	129.3					
	26	286.1-336.2	50.1					
	26	382.1-433.0	50.9					
	28	270.1-334.7	64.6					
	28	366.1-453.1	87.0					
	106	263.2-325.8	62.6					
	112	225.3-280.8	55.5					
	160	312.0-345.0	33.0					
	161	327.0-411.8	84.8					
	161	436.8-514.2	77.4					
	164	380.4-430.9	50.5					
			857.7	1.02	.99	.019	.002	91

Mission Composites - Page 4

No.	DDH	Interval	Length	Calculated Original % Cu	Composite % Cu	Composite % MoS_2	Composite % WO_3	% Core Recovery
H-2	23	233.6-281.5	47.9					
	65	232.6-307.8	75.2					
	106	232.9-263.2	30.3					
	160	290.8-312.0	21.2					
	161	245.0-270.7	25.7					
	161	286.0-327.0	41.0					
	164	327.4-380.4	53.0					
			294.3	.79	.78	.043	.002	90
H-4	20	237.5-278.1	40.6					
	23	336.2-375.8	39.6					
			80.2	.50	.48	.027	.002	89
I-1	18	590.0-678.8	88.8					
	19	361.1-407.2	46.1					
	93	291.2-337.9	46.7					
	93	386.9-460.1	73.2					
	97	471.5-572.5	101.0					
			355.8	.87		.013	.002	94
I-2	18	233.9-306.9	73.0					
	19	228.3-260.4	32.1					
	96	237.4-311.0	73.6					
	96	348.5-391.9	43.4					
			222.1	.94	.95	.022	.002	79
I-3	96	391.9-488.0	96.1	.50	.47	.081	.001	91
I-4	93	337.9-386.9	49.0					
	97	302.0-347.4	45.4					
			94.4	.72	.68	.044	.001	96
J-1	78	564.4-631.3	66.9					
	78	713.3-752.5	39.2					
	88	647.7-699.5	51.8					
			157.9	1.16	1.18	.007	.003	90
J-2	27	242.8-287.7	44.9					
	78	276.5-408.6	132.1					
	88	340.0-407.4	67.4					
	88	418.8-481.3	62.5					
			306.9	1.03		.041	.003	87
J-3	27	396.7-502.8	106.1					
	56	401.0-481.0	80.0					
	C3	370.0-410.0	40.0					
	C3	490.0-520.0	30.0					
	C6	450.0-500.0	50.0					
			306.1	.84		.073	.003	54

Mission Composites - Page 5

No.	DDH	Interval	Length	Calculated Original % Cu	Composite % Cu	Composite % MoS_2	Composite % WO_3	% Core Recovery
J-4	29	460.0-501.4	41.4					
	78	493.2-564.4	71.2					
			112.6	.67	.68	.025	.002	93
K-1	48	485.8-528.2	42.4					
	49	487.9-613.8	125.9					
	53	448.0-478.8	30.8					
	53	505.4-532.0	26.6					
	108	442.8-511.9	69.1					
	111	600.3-658.7	58.4					
	117	545.0-594.5	49.5					
			402.7	.90		.027	.003	90
K-2	37	384.8-411.0	26.2					
	48	220.5-413.0	192.5					
	49	409.1-467.8	58.7					
	53	252.9-310.1	57.2					
	59	480.0-567.8	87.8					
	108	373.2-442.8	69.6					
	111	308.1-516.5	208.4					
	117	395.0-545.0	150.0					
	C-1	510.0-580.0	70.0					
	C-2	320.0-490.0	170.0					
	C-5	415.0-470.0	55.0					
			1145.4	.65		.019	.002	93
K-4	49	487.9-583.0	95.1					
	111	516.5-600.3	83.8					
	C-1	580.0-690.0	110.0					
	C-2	490.0-520.0	30.0					
	C-2	620.0-665.0	45.0					
			363.9	.67		.021	.001	93

Total Footage = 12,520.8

(Total Footage) (% Rec) = 1,142,041.3

Ave. Wtd. Rec. $\frac{1,142,041.3}{12,520.8}$ = 91.2%

ATTACHMENT C

SPECTROGRAPHIC ANALYSES

AMERICAN SMELTING AND REFINING COMPANY
CENTRAL RESEARCH LABORATORIES
SOUTH PLAINFIELD, N. J.

April 17, 1959

w/ 8e Ge

MISSION ORE BODY SAMPLES

SAMPLE No.	A-1 SC7132	A-4 SC7133	B-1 SC7134	C-1 SC7135	C-2 SC7136	C-4 SC7137	D-1 SC7138	E-1 SC7139	E-2 SC7140	F-1 SC7141
Te	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hf	FTr	Tr	FTr	L	Tr	FTr	Tr	Tr	FTr	Tr
Cd	LMC-	LMC-	LMC-	LMC-	LMC-	LMC-	LMC-	LMC-	S+	LMC-
Be	MC	MC	MC	MC	MC	MC	MC	MC	MC	MC
Bi	MC	MC	MC	MC	MC	MC	MC	MC	MC	MC
Ga	MC	MC	MC	MC	MC	MC	MC	MC	LMC	MC
Mg	MC	MC	MC	MC	MC	MC	MC	MC	MC	MC
Al	LMC	LMC	LMC	LMC	LMC	LMC	S+	LMC	LMC	LMC
Na	S	LMC	S	S	LMC	LMC	S	S	LMC	S
Tl	S-	S-	S-	S-	S-	S-	S-	S-	S-	S-
Ba	M	S	M	M	S	S	L	M	S	M
Sr	M	M	M	M	M	M	L	M	M	M
Zn	M	M	M	M	M+	M	M+	M+	M	M+
Mo	S-	S-	S-	M-	M	S-	M-	M	S-	S-
Mn	M+	M+	M+	M+	M+	M+	M+	M+	M+	M+
V	L	L	L	L	L	L	L	L	L	L
In	L	L	L	L	L	L	L	L	L	L
Ni	L	L	L	L	L	L	L	L	L	L
Zr	L	L	L	L	L	L	L	L	L	L
Cr	L	L	L	L	L	L	L	L	L	L
B	ND	ND	L	L	ND	ND	L	M	ND	L
Pb	Tr	L-	Tr	Tr	L-	L-	Tr	Tr	L-	L-
Ag	L-	L-	L-	L-	L-	L-	L-	L-	L-	L-
Sn	Tr	Tr	Tr	Tr	Tr	Tr	Tr	Tr	Tr	Tr

SPECTROGRAPHIC ANALYSES

AMERICAN SMELTING AND REFINING COMPANY
CENTRAL RESEARCH LABORATORIES
SOUTH PLAINFIELD, N. J.

ATTACHMENT C

April 17, 1959

MISSION ORE BODY SAMPLES

SAMPLE No.	F-2 SC7142	G-1 SC7143	G-2 SC7144	G-4 SC7145	H-1 SC7146	H-2 SC7147	H-4 SC7148	I-1 SC7149	I-2 SC7150	I-3 SC7151
Te	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bi	Tr	ND	FTr	FTr	Tr	FTr	FTr	FTr	FTr	ND
Cu	S+	S+	S+	S+	LMC-	S+	S+	LMC-	LMC-	S+
Fe	MC	MC	MC	MC	MC	MC	MC	MC	MC	MC
Si	MC	MC	MC	MC	MC	MC	MC	MC	MC	MC
Ca	LMC	MC	LMC	LMC	MC	MC	LMC	MC	LMC	MC
Mg	MC	MC	MC	MC	MC	MC	MC	MC	MC	MC
Al	LMC	S+	LMC	S+	S+	LMC	LMC	S+	LMC	LMC
Na	LMC	S	LMC	S	S	LMC	LMC	S	LMC	LMC
Ti	S-	S-	S-	S-	S-	S-	S-	S-	S-	S-
Ba	S	L	S	M	M	S	S	M	S	S
Sr	M	L	M	L	M	M	L	L	M	M
Zn	M	M	M	M-	M+	M	M	M	M+	M
Mo	M	M	S-	S-	M	S-	S-	M-	S-	S-
Mn	M+	M+	M+	M+	M+	M+	M+	M+	M+	M+
V	L	L	L	L	L	L	L	L	L	L
In	L	L	L	L	L	L	L	L	L	L
Ni	L	L	L	L	L	L	L	L	L	L
Zr	L	L	L	L	L	L	L	L	L	L
Cr	L	L	L	L	L	L	L	L	L	L
B	L	L	ND	ND	L	ND	ND	L	ND	ND
Pb	Tr	Tr	L-	Tr	Tr	Tr	Tr	Tr	Tr	Tr
Ag	L-	L-	L-	L-	L-	L-	L-	L-	L-	L-
Sn	Tr	Tr	Tr	Tr	Tr	Tr	Tr	Tr	Tr	Tr

SPECTROGRAPHIC ANALYSES

ATTACHMENT C

AMERICAN SMELTING AND REFINING COMPANY
CENTRAL RESEARCH LABORATORIES
SOUTH PLAINFIELD, N. J.

[illegible]

MISSION OFE BODY SAMPLES

SAMPLE No.	I-4 SC7152	J-1 SC7153	J-2 SC7154	J-3 SC7155	J-4 SC7156	K-1 SC7157	K-2 SC7158	K-4 SC7159		
Ta	ND	ND	ND	ND	ND	ND	ND	ND		
Bi	PTr	Tr	ND	ND	ND	PTr	PTr	PTr		
Cu	S+	LMC-	LMC-	LMC-	S+	LMC-	S+	S+		
Ag	MC	MC	MC	MC	MC	MC	MC	MC		
Si	MC	MC	MC	MC	MC	MC	MC	MC		
Ca	LMC	MC	LMC	LMC	LMC	MC	LMC	LMC		
Mg	MC	MC	MC	MC	MC	MC	MC	MC		
Al	S+	S+	LMC	LMC	S+	LMC	LMC	S+		
Na	S-	S	LMC	LMC	S	S	LMC	S		
Tl	S-	S-	S-	S-	S-	S-	S-	S-		
Ba	L	L	S	S	M	M	S	M		
Sr	Tr	L	M	M	Tr	L	M	Tr		
Zn	M	M+	M+	M+	M	M+	M+	M		
Mo	S-	M-	S-	S-	M	S-	S-	M		
Mn	M+	M+	M+	M+	M+	M+	M+	M+		
V	L	L	L	L	L	L	L	L		
In	L	L	L	L	L	L	L	L		
Ni	L	L	L	L	L	L	L	L		
Zr	L	L	L	L	L	L	L	L		
Cr	L	L	L	L	L	L	L	L		
B	ND	L	ND	ND	ND	ND	ND	ND		
Pb	Tr	Tr	Tr	Tr	Tr	Tr	Tr	Tr		
As	L-	L-	L-	L-	L-	L-	L-	L-		
Sn	Tr	Tr	Tr	Tr	Tr	Tr	Tr	Tr		

Code attached

SPECTROGRAPHIC ANALYSES

ATTACHMENT C

AMERICAN SMELTING AND REFINING COMPANY
CENTRAL RESEARCH LABORATORIES
SOUTH PLAINFIELD, N. J.

April 30, 1959

MISSION CORE BODY SAMPLES

SAMPLE No.	Be	Ge	W	As			Be	Ge	W	As
A-1 SC7132	ND	ND	ND	ND		J-4 SC7156	ND	ND	ND	ND
A-4 SC7133	ND	ND	ND	ND		K-1 SC7157	FTr	ND	ND	ND
B-1 SC7134	ND	ND	ND	ND		K-2 SC7158	FTr	ND	ND	ND
C-1 SC7135	FTr	ND	ND	ND		K-4 SC7159	ND	ND	ND	ND
C-2 SC7136	FTr	ND	ND	ND						
C-4 SC7137	FTr	ND	ND	ND						
D-1 SC7138	FTr	L?	ND	ND						
E-1 SC7139	FTr	L?	ND	ND						
E-2 SC7140	FTr	ND	ND	ND						
F-1 SC7141	FTr	L?	ND	ND						
F-2 SC7142	FTr	ND	ND	ND						
G-1 SC7143	FTr	ND	ND	ND						
G-2 SC7144	FTr	ND	ND	ND						
G-4 SC7145	ND	ND	ND	ND						
H-1 SC7146	FTr	L?	ND	ND						
H-2 SC7147	FTr	ND	ND	ND						
H-4 SC7148	ND	ND	ND	ND						
I-1 SC7149	FTr	ND	ND	ND						
I-2 SC7150	FTr	ND	ND	ND						
I-3 SC7151	FTr	ND	ND	ND						
I-4 SC7152	ND	ND	ND	ND						
J-1 SC7153	FTr	ND	ND	ND						
J-2 SC7154	FTr	ND	ND	ND						
J-3 SC7155	FTr	ND	ND	ND						

R81A

Code

CMC - Chief Major Constituent
MC - Major Constituent
LMC - Low Major Constituent
S - Strong
M - Moderate
L - Low
Tr - Trace
FTr - Faint Trace
VFTr - Very Faint Trace
ND - Not Detected

code attached

ATTACHMENT D

MISSION COMPOSITES

Sample Number	% Zn	% Pb	Oz. Au/t	Oz. Ag/t
A-1	0.04	0.03	Tr.	0.1
A-4	Tr.	0.03	Tr.	0.7
B-1	Tr.	0.03	Tr.	0.4
C-1	0.06	Tr.	Tr.	0.1
C-2	0.04	0.04	Tr.	0.7
C-4	0.03	0.03	Tr.	0.2
D-1	0.05	Tr.	Tr.	0.3
E-1	Tr.	Tr.	Tr.	0.2
E-2	Tr.	Tr.	Tr.	0.3
F-1	0.05	0.03	Tr.	0.2
F-2	Tr.	0.03	Tr.	0.2
G-1	0.03	Tr.	Tr.	0.1
G-2	Tr.	Tr.	Tr.	0.1
G-4	Tr.	Tr.	Tr.	0.1
H-1	0.03	Tr.	Tr.	0.1
H-2	Tr.	0.03	Tr.	0.2
H-4	Tr.	Tr.	Tr.	0.1
I-1	Tr.	Tr.	Tr.	0.1
I-2	Tr.	Tr.	Tr.	0.2
I-3	Tr.	Tr.	Tr.	0.2
I-4	0.03	0.03	Tr.	0.1
J-1	0.46	Tr.	Tr.	0.2
J-2	Tr.	Tr.	Tr.	0.5
J-3	Tr.	Tr.	Tr.	0.2
J-4	0.03	0.03	Tr.	0.2
K-1	0.04	0.03	Tr.	0.1
K-2	Tr.	Tr.	Tr.	0.1
K-4	Tr.	Tr.	Tr.	0.2

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

June 12, 1959

J. H. C.

JUL 6 1959

Mr. D. J. Pope, Assistant to Vice President
American Smelting and Refining Company
120 Broadway
New York 5, New York

MISSION PROJECT
Chemical Analysis

Dear Sir:

Your letter of May 1st requested chemical analysis on various types of ore in the Mission pit. The following tabulation shows the results on six samples handled by the Empire Laboratory in El Paso:

	Cu	SiO_2	Fe	CaO	Al_2O_3	MgO
A-1	1.61	40.68	10.15	24.26	5.53	5.35
C-1	1.01	41.06	8.86	25.82	3.93	7.70
C-4	1.35	49.27	8.04	13.85	8.23	3.51
G-2	0.84	61.34	5.14	5.45	10.09	2.88
H-1	1.10	45.35	10.12	20.0	3.43	6.65
I-3	0.48	44.18	3.17	15.08	4.83	3.45

Attached is a copy of a memorandum from Kenyon Richard dated June 10, 1959 describing the material assayed. From the above tabulation of assays and from other assays on the Mission ore body, it is doubtful that we will be able to produce anything for direct shipment the smelter will be interested in.

It will be possible to draw out a 3/8" to 3/4" product from the closed circuit proposed in the latest design of the secondary-tertiary crushing plant by elevating this material an additional 6 or 8 feet at the transfer terminal and then planning to later install a stacking belt. This would give an ideal size product but has the following complications:

1. Only the material desired could be produced from the pit while the stockpile is being replenished;

2. The intermediate storage area would have to be pulled down so that the desired material would funnel through to the secondary system;

3. All material travelling in closed circuit would have to be elevated about 6 to 8 feet in height to provide the necessary room for transfer to a stacking belt;

4. Less than 20% of the total material going through the crushing system would be in the closed circuit from the tertiaries and available in the desired size.

We feel that in view of the assays involved, no allowance should be made in the design for stockpiling.

Very truly yours,

T. A. SMEDDEN

Encl.
TAS:S
cc: DJPope

MISSION COMPOSITES

	DDH	Interval		Original Assayer
A-1	125	282.4 - 430.5	148.1	Jacobs
	125	458.4 - 518.5	60.1	"
	125	538.5 - 585.7	47.2	"
	128	210.8 - 258.2	47.4	"
	128	291.4 - 415.5	124.1	"
	128	504.1 - 610.8	106.7	"
	130	229.3 - 406.8	177.5	"
	134	396.1 - 423.5	27.4	"
	134	504.0 - 544.7	40.7	"
	134	582.5 - 703.8	121.3	"
	143	503.3 - 626.2	122.9	"
			1023.4	
A-4	134	243.0 - 396.1	153.1	Jacobs
B-1	62	280.6 - 512.3	231.7	Jacobs
	116	280.0 - 329.4	49.4	"
	126	267.4 - 366.7	99.3	"
	126	552.4 - 588.2	35.8	"
	136	224.8 - 273.1	48.3	"
	136	334.4 - 418.0	83.6	"
	148	286.0 - 452.2	166.2	"
	148	505.5 - 573.1	67.6	"
	178	270.3 - 511.9	241.6	Silver Bell
			1023.5	
C-1	46	213.2 - 308.9	95.7	Jacobs & Silver Bell
	46	339.7 - 424.2	84.5	" " " "
	60	225.6 - 263.8	38.2	
	60	367.6 - 406.9	39.3	
	122	422.7 - 535.2	112.5	
	124	393.6 - 434.3	40.7	
	124	493.6 - 576.8	83.2	
	129	340.5 - 420.0	79.5	
	129	473.7 - 515.1	41.4	
	142	232.2 - 298.1	65.9	
	142	395.3 - 433.3	38.0	
	142	553.5 - 591.0	37.5	
	142	631.8 - 797.2	165.4	
	149	215.2 - 310.4	95.2	
	149	347.1 - 390.1	43.0	
	151	220.8 - 308.9	88.1	
	151	354.0 - 495.6	141.6	
			1289.7	
C-2	120	375.6 - 426.5	50.9	Neither
	124	235.3 - 278.1	42.8	Jacobs
	175	307.1 - 350.2	43.1	Silver Bell
			136.8	

MISSION COMPOSITES

	DDH	Interval		Original Assayer
C-4	129	420.0 - 473.7	53.7	Jacobs
	129	641.0 - 687.9	46.9	"
	142	298.1 - 395.3	97.2	"
			197.8	
D-1	54	208.0 - 244.0	36.0	
	80	359.2 - 395.7	36.5	
	121	518.3 - 564.6	46.3	Jacobs
	138	257.9 - 357.2	99.3	"
	154	373.8 - 411.9	38.1	"
	204	310.5 - 370.5	60.0	Silver Bell
			316.2	
E-1	63	430.5 - 457.2	26.7	Jacobs
	63	499.8 - 573.7	73.9	"
	74	313.2 - 444.6	131.4	Jacobs and ?
	76	381.2 - 417.7	36.5	?
	76	463.3 - 555.3	92.0	Jacobs and ?
	87	262.7 - 294.0	31.3	Jacobs
	104	222.5 - 312.7	90.2	"
	107	495.1 - 541.0	45.9	"
	118	492.0 - 572.9	80.9	"
	127	438.4 - 511.5	73.1	"
	155	408.0 - 428.2	20.2	"
	155	448.8 - 526.3	77.5	"
	166	455.1 - 569.5	114.4	"
	171	388.4 - 427.6	39.2	Silver Bell
			933.2	
E-2	63	353.1 - 408.9	55.8	Jacobs
	74	244.0 - 313.2	69.2	"
	87	211.1 - 262.7	51.6	"
	131	299.4 - 359.3	59.9	"
	166	385.3 - 417.9	32.6	"
			269.1	
F-1	66	361.3 - 400.8	39.5	Jacobs
	69	337.9 - 384.3	46.4	
	91	309.0 - 335.8	26.8	
	156	317.9 - 354.7	36.8	
	158	304.5 - 380.9	76.4	
	159	305.7 - 344.8	39.1	
	185	357.8 - 405.8	48.0	Silver Bell
			313.0	
F-2	21	238.3 - 285.7	47.4	Silver Bell
	109	262.8 - 290.8	28.0	Jacobs
	158	235.2 - 291.0	55.8	
			131.2	

MISSION COMPOSITES

	DDH	Interval		Original Assayer
G-1	32	389.7 - 460.5	70.8	Silver Bell
	32	513.2 - 570.5	57.3	
	36	533.6 - 635.2	101.6	
	43	347.9 - 383.2	35.3	
	68	352.1 - 498.8	146.7	
	83	481.2 - 514.5	33.3	
	83	588.0 - 623.8	35.8	
	92	388.4 - 454.2	65.8	Jacobs
	113	323.6 - 385.5	61.9	"
	162	454.5 - 578.1	123.6	"
	163	419.7 - 450.3	30.6	"
	163	477.8 - 509.9	32.1	"
			794.8	
G-2	36	244.9 - 434.0	189.1	Silver Bell
	43	236.7 - 305.6	68.9	
	68	232.0 - 314.2	82.2	
	83	244.9 - 352.4	107.5	
	89	232.7 - 266.7	34.0	
	89	281.5 - 330.6	49.1	
	92	230.9 - 268.4	37.5	
	92	310.6 - 388.4	77.8	
	113	220.6 - 323.6	103.0	
	162	250.0 - 345.0	95.0	
	163	365.7 - 419.7	54.0	Jacobs
			898.1	
G-4	36	434.0 - 485.3	51.3	Silver Bell
	68	314.2 - 352.1	37.9	
	68	508.0 - 554.1	46.1	
	162	345.0 - 454.5	109.5	Jacobs
			244.8	
H-1	20	278.1 - 335.4	57.3	
	23	281.5 - 336.2	54.7	
	23	375.8 - 505.1	129.3	Silver Bell
	26	286.1 - 336.2	50.1	
	26	382.1 - 433.0	50.9	
	28	270.1 - 334.7	64.6	
	28	366.1 - 453.1	87.0	
	106	263.2 - 325.8	62.6	
	112	225.3 - 280.8	55.5	
	160	312.0 - 345.0	33.0	
	161	327.0 - 411.8	84.8	
	161	436.8 - 514.2	77.4	
	164	380.4 - 430.9	50.5	Jacobs
			857.7	
H-2	23	233.6 - 281.5	47.9	Silver Bell

(continued)

MISSION COMPOSITES

	DDH	Interval		Original Assayer
H-2 Cont'd.	65	232.6 - 307.8	75.2	
	106	232.9 - 263.2	30.3	
	160	290.8 - 312.0	21.2	
	161	245.0 - 270.7	25.7	
	161	286.0 - 327.0	41.0	
	164	327.4 - 380.4	53.0	Jacobs
			294.3	
H-4	20	237.5 - 278.1	40.6	Silver Bell
	23	336.2 - 375.8	39.6	"
			80.2	
I-1	18	590.0 - 678.8	88.8	Jacobs
	19	361.1 - 407.2	46.1	Silver Bell
	93	291.2 - 337.9	46.7	
	93	386.9 - 460.1	73.2	
	97	471.5 - 572.5	101.0	Jacobs
			355.8	
I-2	18	233.9 - 306.9	73.0	
	19	228.3 - 260.4	32.1	Silver Bell
	96	237.4 - 311.0	73.6	
	96	348.5 - 391.9	43.4	Jacobs
			222.1	
I-3	96	391.9 - 488.0	96.1	Jacobs
I-4	93	337.9 - 386.9	49.0	Jacobs
	97	302.0 - 347.4	45.4	"
			94.4	
J-1	78	564.4 - 631.3	66.9	Jacobs
	78	713.3 - 752.5	39.2	"
	88	647.7 - 699.5	51.8	"
			157.9	
J-2	27	242.8 - 287.7	44.9	Silver Bell
	78	276.5 - 408.6	132.1	
	88	340.0 - 407.4	67.4	
	88	418.8 - 481.3	62.5	Jacobs
			306.9	
J-3	27	396.7 - 502.8	106.1	Silver Bell
	56	401.0 - 481.0	80.0	
	C3	370.0 - 410	40.0	
	C3	490 - 520	30.0	Jacobs
	C6	450 - 500	50.0	
			306.1	

MISSION COMPOSITES

	DDH	Interval		Original Assayer
J-4	29	460.0 - 501.4	41.4	Silver Bell
	78	493.2 - 564.4	71.2	Jacobs
			112.6	
K-1	48	485.8 - 528.2	42.4	Silver Bell
	49	487.9 - 613.8	125.9	
	53	448.0 - 478.8	30.8	
	53	505.4 - 532.0	26.6	
	108	442.8 - 511.9	69.1	
	111	600.3 - 658.7	58.4	
	117	545.0 - 594.5	49.5	Jacobs
			402.7	
K-2	37	384.8 - 411.0	26.2	Silver Bell
	48	220.5 - 413.0	192.5	
	49	409.1 - 467.8	58.7	
	53	252.9 - 310.1	57.2	
	59	480.0 - 567.8	87.8	
	108	373.2 - 442.8	69.6	
	111	308.1 - 516.5	208.4	
	117	395.0 - 545.0	150.0	Jacobs
	C-1	510.0 - 580.0	70.0	
	C-2	320.0 - 490.0	170.0	
	C-5	415.0 - 470.0	55.0	
			1145.4	
K-4	49	487.9 - 583.0	95.1	Silver Bell
	111	516.5 - 600.3	83.8	Jacobs
	C-1	580.0 - 690.0	110.0	
	C-2	490.0 - 520.0	30.0	
	C-2	620.0 - 665.0	45.0	
			363.9	

Total Footage = 12,520.8

(Total Footage) (% Rec) = 1,142,041.3

Ave. Wtd. Rec. $\frac{1,142,041.3}{12,520.8}$ = 91.2%

MISSION COMPOSITES

	Interval	Original	Composite	% Core Rec.
A-1	1023.4	1.56%	1.55%	95
A-4	153.1	1.20%	1.21%	96
B-1	1023.5	1.74%	1.61%	95
C-1	1289.7	.99%	1.00%	89
C-2	136.8	1.09%	1.21%	93
C-4	197.8	1.28%	1.30%	96
D-1	316.2	1.53%	1.45%	90
E-1	933.2	1.62%	1.61%	93
E-2	269.1	.67%	.65%	94
F-1	313.0	2.46%		92
F-2	131.2	1.07%	1.06%	82
G-1	794.8	1.01%	1.00%	94
G-2	898.1	.82%		92
G-4	244.8	.86%		93
H-1	857.7	1.02%		91
H-2	294.3	.79%		90
H-4	80.2	.50%	.48%	89
I-1	355.8	.87%		94
I-2	222.1	.94%	.95%	79
I-3	96.1	.50%	.47%	91
I-4	94.4	.72%	.68%	96
J-1	157.9	1.16%	1.18%	90
J-2	306.9	1.03%		87
J-3	306.1	.84%		54
J-4	112.6	.67%	.68%	93
K-1	318.2	.90%		90
K-2	1145.4	.65%		93
K-4	363.9	.67%		93

AMERICAN SMELTING AND REFINING COMPANY
Tucson Arizona

March 18, 1959

J. H. C.
MAR 24 1959

Mr. A. A. Smith, Jr.
American Smelting and Refining Company
Central Research Laboratories
South Plainfield, New Jersey

MISSION ORE BODY
Spectrographic Analyses

Dear Sir:

By Parcel Post we are sending you 28 pulps. These are carefully prepared composites of individual core samples representing the entire Mission ore body. We would like you to make complete spectrographic analyses of these pulps.

Our principal concern would be the presence of any elements in unusual amounts such that their extraction should be considered. Of course, Bi and Te would be of interest.

These composites have been made in such a manner that the distribution of elements can be related to ore types and tonnages.

All of these pulps consist of approximately 100 grams, except K-4 which is 50 grams and F1, 20 grams. Should it eventuate that certain chemical analyses are needed, we have retained larger, duplicate pulps here.

Please send copies of your spectrographic reports to Mr. Hart and Mr. Weiss, as well as to this office.

Yours very truly,

Original Signed By
K. Richard

KENYON RICHARD

KR/ds
cc: LHHart
NWeiss
bc: JHCourtright
SCFall

PROSPECT 3411

FORM 50

COPY

SMITH-EMERY COMPANY

ESTABLISHED 1910
CHEMISTS - ENGINEERS
METALLURGICAL AND TESTING ENGINEERS
781 EAST WASHINGTON BOULEVARD
LOS ANGELES 21
CALIFORNIA

LABORATORY
No. 405425

Date July 30, 1955.

Sample Pulp

Received 7-25-55 *Marked* "East Pima No. 19"

Submitted by American Smelting and Refining Company,
813 Valley National Building,
Tucson, Arizona.

Att.: Keith G. Papke.

REPORT OF QUALITATIVE SPECTROGRAPHIC EXAMINATION

Element	*Approximate Quantity*
Silicon, Magnesium	Major Constituents.
Calcium, Iron, Aluminum, Copper	Intermediate Constituents.

Hole # 19
Wgted composite
from following:

228.3'-241.4'
241.4'-250.8'
250.8'-260.4'

K. Papke

Minor Constituents	
Manganese	0.5%
Sodium	0.5%
Potassium	0.5%
Titanium	0.1%
Strontium	0.05%
Zinc	0.05%
Barium	0.01%
Zirconium	0.01%
Lead	0.005%
Boron	0.005%
Gallium	0.005%
Vanadium	0.005%
Chromium	0.005%
Nickel	0.001%
Cobalt	0.001%
Molybdenum	0.001%
Silver	Present
Tungsten	None found
Rare Earths	None found

Respectfully submitted,

Smith-Emery Co.

CHEMISTS AND ENGINEERS

All reports are submitted as the confidential property of clients. Authorization for publication of our reports, conclusions, or extracts from or regarding them is reserved pending our written approval as a mutual protection to clients, the public and ourselves.

(See statements on reverse side regarding qualitative spectrographic examination)

COPY

SMITH-EMERY COMPANY

ESTABLISHED 1910
CHEMISTS - ENGINEERS
METALLURGICAL AND TESTING ENGINEERS
781 EAST WASHINGTON BOULEVARD
LOS ANGELES 21
CALIFORNIA

LABORATORY
No. 405426 *Date* July 30, 1955.

Sample Pulp

Received 7-25-55 *Marked* "East Pima No. 20"

Submitted by American Smelting and Refining Company,
813 Valley National Building,
Tucson, Arizona.

Att.: Keith G. Papke.

REPORT OF QUALITATIVE SPECTROGRAPHIC EXAMINATION

Element	*Approximate Quantity*
Silicon, Calcium	Major Constituents.
Iron, Aluminum, Magnesium, Copper	Intermediate Constituents.

Hole # 20

Wgted composite from following:
268.6'-278.1'
278.1'-288.9'
288.9'-297.5'
297.5'-305.4'
305.4'-315.1'
315.1'-325.4'
325.4'-335.4'

434.0'-445.4'

473.9'-484.1'
484.1'-494.4'
494.4'-504.4'
504.4'-511.7'

K.Papke

Minor Constituents	
Sodium	0.5%
Potassium	0.5%
Zinc	0.5%
Manganese	0.5%
Boron	0.1%
Barium	0.05%
Strontium	0.05%
Titanium	0.05%
Zirconium	0.01%
Lead	0.005%
Gallium	0.005%
Molybdenum	0.005%
Vanadium	0.005%
Chromium	0.005%
Nickel	0.001%
Cobalt	0.001%
Silver	Present
Tungsten	None found
Rare Earths	None found

Respectfully submitted,

Smith-Emery Co.
CHEMISTS AND ENGINEERS.
E.R.S.

All reports are submitted as the confidential property of clients. Authorization for publication of our reports, conclusions, or extracts from or regarding them is reserved pending our written approval as a mutual protection to clients, the public and ourselves.

(See statements on reverse side regarding qualitative spectrographic examination)