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Form SL-1035

**KEEP THIS ON TOP**

**File No.** Aa-16A.3.19B

**Subject:** SACATON - ORE RESERVES  
Pinal County, Arizona

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AMERICAN SMELTING AND REFINING COMPANY  
Tucson Arizona

J. H. C.  
DEC 11 1969

December 9, 1969

Memorandum for: R. B. Meen

SACATON FEASIBILITY STUDY

As requested in our letter of November 21, 1969, our New York Office Tax Section of the Comptroller's Department furnished us with cash earnings after taxes from the Sacaton Project as follows:

- Case No. 1 We assume that only the Pit will be mined.
- Case No. 2 We assume that the Pit will be mined first, followed by the Underground.

Based on the above cash earnings after taxes we have calculated the rate of return as follows:

	<u>Rate of Return</u>	
	<u>Before Taxes</u>	<u>After Taxes</u>
Case No. 1	11.0%	11.0%
Case No. 2	14.5%	13.5%

A. D. Coumides

AMERICAN SMELTING AND REFINING COMPANY  
Tucson Arizona

November 20, 1969

Memo to: R. D. Meen

Re: FEASIBILITY STUDY OF THE SACATON OPERATION

A previous feasibility study was presented March 18, 1969. That study was based upon the March ore reserve figures derived from a pit that was designed at that time. This study incorporates the figures derived from a new pit design. The March study considered only one set of conditions; this being that the pit would be mined first, followed by the underground mine. This study considers three sets of conditions:

- Condition 1: Only the pit will be mined.
- Condition 2: The pit will be mined first followed by the underground mine.
- Condition 3: The underground mine will be mined first followed by the pit.

Attached are the computerized outcome and rate of return calculations for the above three conditions. The rate of return is shown on the income before taxes only.

The capital required has been increased only slightly from the last study. The operating costs have remained the same. The major changes have been the pit ore reserves and additional capital required to collect bulk samples of both ore bodies for metallurgical testing and for further exploration.

Based on 42 cent copper the three conditions reveal the following rates of return on the investment:

	<u>Rate of Return</u>	
	<u>Less Taxes</u>	<u>Before Taxes</u>
Condition 1	8.0%	11.0%
Condition 2	11.0	14.5
Condition 3	16.5	24.5

The rate of return was first calculated with the income taxes deducted (as calculated at Tucson office), and then without the taxes deducted. A more realistic tax calculation can be conducted at the New York Office and possibly show a higher rate of return.

Carl E. Williams  
Supervisor, Technical Systems

CEW:rms  
encls.

CAPITAL REQUIREDCONDITION 1 (Pit Only)

Core Drilling and Testing of Bulk Samples	150,000
Mill and Moly Plant	10,600,000
Remaining Plant and Facilities	1,665,000
Pit Equipment	4,840,400
Pre-Mine Stripping	<u>6,500,000</u>
<u>TOTAL (Condition 1)</u>	<u>23,755,400</u>

CONDITION 2 (Pit/Underground)Before Production:

Core Drilling and Testing of Bulk Samples (Pit)	150,000
Mill and Moly Plant	10,600,000
Remaining Plant and Facilities	1,719,590
Pit Equipment	5,534,980
Pre-Mine Stripping	<u>6,500,000</u>
TOTAL	<u>24,504,470</u>

During Production:

Additional Plant Required for Underground Mine	1,064,000
Underground Development Equipment	1,105,000
Underground Production Equipment	<u>1,684,900</u>
TOTAL	<u>3,853,900</u>

<u>TOTAL (Condition 2)</u>	<u>28,358,370</u>
----------------------------	-------------------

NOTE: The Capital and the Primary underground development expenses spent during pit production are deducted from the pit cash flow at the year in which they are spent. For tax calculations, the capital is not deducted. Development expenses are \$9,282,300.

CAPITAL REQUIRED (Continued)CONDITION 3 (Underground/Pit)Before Production:

Underground Exploratory Workings	1,250,000
Underground Exploration Drilling	11,700 ✓
Underground Bulk Sample Preparation and Testing	55,000
Hill and Holy Plant	10,600,000
Remaining Plant and Facilities	2,445,600
Underground Development Equipment	1,105,000
Underground Production Equipment	1,684,900
Underground Development	9,282,300
Misc. Surface Equipment	<u>256,200</u>
<b>TOTAL</b>	<b><u>26,690,700</u></b>

During Production:

Additional Plant Required for Pit	337,990
Pit Equipment	<u>5,278,680</u>
<b>TOTAL</b>	<b><u>5,616,670</u></b>
<b><u>TOTAL (Condition 3)</u></b>	<b><u>32,307,370</u></b>

NOTE: The capital and premine stripping expenses for the pit are deducted from the underground cash flow at the year in which they are spent. Premine stripping expenses are \$6,500,000. For tax calculations the capital is not deducted.

November 20, 1969

6000 tpd  
~~9000 tpd~~

SUMMARY OF ESSENTIAL BASIC DATA

	<u>PIT</u>	<u>UNDERGROUND</u>	<u>AVERAGES &amp; TOTALS</u>
1. Ore Reserves (Tons)	27,641,000	14,558,000	42,199,000
2. Ore Grade (% Cu)	0.840	1.370	1.022
Ore Grade (% MoS <sub>2</sub> )	0.027	0.047	0.033
3. Cutoff Grade (% Cu)	0.400	0.500	0.434
4. Life of Operating (Years)	13.00	6.85	19.85
5. Mill Recovery (%)	82.0 ?	88.0	84.1
6. Concentrate Grade (% Cu)	28.0	36.0	30.8
7. Ratio of Concentration	40.6:1	29.9:1	36.1:1
8. Pounds of Cu Paid for per Ton Crude Ore	13.8	24.1	17.0
9. Copper Concentrate Production			
Tons per Day	148	201	166
Tons per Month	4,354	5,943	4,902
Tons per Year	52,250	71,314	58,829
Total Tons			1,167,757
10. Waste Tonnage (Pit)	176,406,000		
11. Overall Stripping Ratio	6.38:1		
12. Premine Stripping (Tons)	26,000,000		
13. Stripping Ratio after Premine	5.44:1		
14. Cu Price Used in Outcome Estimates	\$ .42	\$ .42	\$ .42
15. Net Smelter Return/Ton Cu Concentrate	\$ 184.39	\$ 243.73	\$ 209.22
16. Net Smelter Return/Ton Mo Concentrate	\$ 1,620.00	\$ 1,620.00	\$ 1,620.00
17. Mo Price Used in Outcome	\$ 1.50 ✓	\$ 1.50	\$ 1.50
18. Mo Recovery Used (%)	50 ✓	50	50
19. Concentrate Grade (% Mo)	90	90	90
20. Tons of Ore Treated			
Per Day			6,000
Per Month			177,000
Per Year (354 Days)			2,124,000
Total (19.85 Years)			27,641,000
			42,199,000

November 20, 1969

OPERATING COSTS

	<u>PER TON MATERIAL</u>		
	<u>PIT</u>	<u>UNDERGROUND</u>	<u>AVERAGE</u>
Mining Ore	.26 ✓	1.92 * ✓	.83
Premine Stripping	.25 ✓	--	.25
Production Stripping	.29 ✓	--	.29
Milling	1.00 ✓	1.00	1.00

\* Includes secondary development and panel preparation

All Costs Include Indirect Costs

November 20, 1969

## SACATON

RATES OF RETURN  
LESS INCOME TAXES

<u>Cu PRICE</u>	<u>PIT ONLY</u>	<u>PIT/UNDERGROUND</u>	<u>UNDERGROUND/PIT</u>
40c	6.0%	10.0%	14.5%
42	8.0	11.0	16.5
44	10.0	12.5	18.0
46	11.5	13.5]	19.5
48	13.0	15.0	21.0
50	14.0	16.0	22.5

BEFORE INCOME TAXES

40c	8.5%	12.5%	22.5%
42	11.0	14.5	24.5
44	13.5	16.5	27.0
46	16.0	18.0	29.0
48	18.0	19.5	31.0
50	20.0	21.5	33.0

November 3, 1969

Memorandum to: R. B. Meen

REVISED SACATON OPEN PIT  
ORE RESERVES

This report summarizes a new pit design and ore reserve calculation performed on the assay data of 26 holes in the pit area of the West ore body at the Sacaton property. Enclosed is a tabulation comparing the previous March 1969 calculations with the new ones. Also attached is a bench-by-bench tabulation of the new ore reserve figures.

The March calculations are based on the same 26 drill holes. Six of these holes are old ones drilled in the early 1960's; the rest were drilled during 1968 and 1969. At the time of the March calculations two sources of basic assay data were available for the six old holes - the original Jacob's assays for each individual assay interval, and the composite assay returns from Hawley and Hawley and/or Silver Bell. The Jacob's assays were used in the March calculations. These assays were not in agreement with the composite assays; therefore, a recent check was performed on the individual assay intervals and as a result it was determined that Jacob's assays were low, by as much as .25% Cu.

The new pit design incorporated the new assays which resulted in a larger and deeper pit.

The following tabulation compares the March calculations with the new ones.

NOTE: All Tons and Units x 1000; Ore Figures Refer to +.4% Cu

	<u>March 69 Estimate</u>	<u>Oct. 69 Estimate</u>	<u>Difference</u>	<u>Percent Difference</u>
Ore Tons	22,400	27,641	+ 5,241	+23%
Ore Grade	.86% Cu	.84% Cu	- .02% Cu	- 2%
Units	19,341	23,357	+ 4,016	+21%
Waste Tons	135,626	176,406	+ 40,780	+30%
Overall Strip- ping Ratio	6.05 to 1	6.38 to 1	+ .33 to 1	+ 5%
Stripping Ratio After Premine	4.89 to 1	5.44 to 1	+ .55 to 1	+11%
Total Material	158,026	204,047	46,021	+29%

Carl E. Williams

CEW:rms  
encls.

T-3.2.2  
7-4.0.6.3

AMERICAN SMELTING AND REFINING COMPANY  
Tucson Arizona

October 30, 1969

J. H. C.

NOV 13 1969

Memorandum to: R. B. Meen

SACATON ORE RESERVES

The revised open pit design and ore reserve calculation has just been completed. The results are tabulated below along with the original underground figures.

SULFIDES (tons x 1000)

	<u>+ .3% Cu</u>		<u>+ .4% Cu</u>		<u>+ .5% Cu</u>		<u>-.4% Cu</u>		<u>S. R.</u>
	<u>Tons</u>	<u>Grade</u>	<u>Tons</u>	<u>Grade</u>	<u>Tons</u>	<u>Grade</u>	<u>Waste</u>		
OPEN PIT	31,673	.78	27,641	.84	20,058	1.00	176,406		6.38
UNDERGROUND					14,558	1.37			

OXIDES (tons x 1000)

	<u>+ .2% Cu</u>		<u>+ .3% Cu</u>		<u>+ .4% Cu</u>		<u>+ .5% Cu</u>	
	<u>Tons</u>	<u>Grade</u>	<u>Tons</u>	<u>Grade</u>	<u>Tons</u>	<u>Grade</u>	<u>Tons</u>	<u>Grade</u>
OPEN PIT	5,042	.48	3,464	.59	2,098	.75		
UNDERGROUND							904	1.40

Carl E. Williams

CEW:rms

Note: The open pit oxides are included in the -.4% sulfide waste figures.

T-3.2.2  
7-4.0.6.3

J. H. C.

NOV 13 1969

AMERICAN SMELTING AND REFINING COMPANY  
Tucson Arizona

October 30, 1969

Memorandum to: R. B. Meen

SACATON ORE RESERVES

The revised open pit design and ore reserve calculation has just been completed. The results are tabulated below along with the original underground figures.

SULFIDES (tons x 1000)

	<u>+ .3% Cu</u>		<u>+ .4% Cu</u>		<u>+ .5% Cu</u>		<u>-.4% Cu</u>	<u>S. R.</u>
	<u>Tons</u>	<u>Grade</u>	<u>Tons</u>	<u>Grade</u>	<u>Tons</u>	<u>Grade</u>	<u>Waste</u>	
OPEN PIT	31,673	.78	27,641	.84	20,058	1.00	176,406	6.38
UNDERGROUND					14,558	1.37		

OXIDES (tons x 1000)

	<u>+ .2% Cu</u>		<u>+ .3% Cu</u>		<u>+ .4% Cu</u>		<u>+ .5% Cu</u>	
	<u>Tons</u>	<u>Grade</u>	<u>Tons</u>	<u>Grade</u>	<u>Tons</u>	<u>Grade</u>	<u>Tons</u>	<u>Grade</u>
OPEN PIT	5,042	.48	3,464	.59	2,098	.75		
UNDERGROUND							904	1.40

Carl E. Williams

CEW:rms

\* Note: The open pit oxides are included in the -.4% sulfide waste figures

August 25, 1969

Memorandum for R. B. Keen

SACATON PROSPECT

You advised, today, that the Sacaton Prospect is under further study. You asked that I review the water supply.

Mr. Leonard C. Halpenny kindly loaned me, among others, a large scale map of the Critical Underground Water Area corresponding to the area of interest. All of ASARCO's holdings are well within that perimeter. It appears that there would be no problem in transporting water from a well farm to a point of use outside of the critical area. The problem, then, seems to resolve to:

1. If possible, acquisition of additional farm acreage of favorable, water producing potential. Sec. 33, T-5S, R-6E has good wells; as does the S and NE Section 28, immediately to the north of said Section 33.
2. Development of required wells, with notice to State Land Department of "intent to drill" on ASARCO property in Section 34, provided counsel approves use of heretofore undeveloped land.
3. Obtain right-of-way for pipe line. Because of crossing highway (US 93, State 187) and perhaps other complications (viz State Lands Section 32, T-5S, R-6E; and Section 36, T-5S, R-5E on the latter of which ASARCO has a State Grazing Lease), legal opinion should be sought.

You will recall that, after a good deal of fumbling around on the part of the Cron's lawyers, Dr. Cron died. It is the opinion of Mr. Dolph that, under the circumstances, the Agreement with the Crons must be substituted for by one with the Estate. This requires Ancillary Probate of Dr. Cron's Estate (presumably in Pinal County). I doubt that Mrs. Cron's present lawyer has done anything toward following Mr. Dolph's advice to him in this respect. This property, the SE of Section 25, T-5S, R-5E, is the only parcel outstanding currently.

I have gone into considerable detail in the preceding paragraph, as well as in the sub-paragraph 3 of the second paragraph, because of pipe line right-of-way problems which have had much publicity with respect to the City of Tucson water supply.

Attached is a map which shows the general area and has been used in previous studies.

Kindly advise if you have any questions or want any further action on my part.

A. C. HALL

ACH/mc  
attach.

AMERICAN SMELTING AND REFINING COMPANY  
Tucson Arizona

March 21, 1969

Mr. T. A. Snedden  
Building

FEASIBILITY STUDY OF THE  
SACATON COMBINED PIT/UNDERGROUND OPERATION

Attached are three copies of the feasibility study prepared by C. E. Williams, updating the Sacaton Property whose ore reserve was changed from the 1967 estimate by more recent diamond drilling.

This estimate shows a return on investment of 13% and an ore reserve of 22,773,000 tons with an average grade of 1.27% copper. The calculations are based on a 42¢ copper price. This drilling increased the open pit ore reserve by 136.5% and the underground ore by 9.5% while their respected grades were increased 38.6% for the open pit and 16% for the underground ore. This increases the life of the property to 17.4 years which is an increase of about 63%.

In the near future, we will calculate a return on investment increasing the daily production to increased tonnages to determine outcome.

R. B. MEEN  
Manager

RDH:js  
Enclosures - 3

FEB 4 1969

SACATON OPEN PIT ORE RESERVES

BENCH	+.4 SULFIDE			+.2 NON-SUL			+.4 NON-SUL			+.4 SULFIDE WASTE		STRIP RATIO
	TONNAGE	GRADE	UNITS	TONNAGE	GRADE	UNITS	TONNAGE	GRADE	UNITS	TONNAGE	GRADE	
1430	0.	0.00	0.	0.	0.00	0.	0.	0.00	0.	0.	0.00	16510016.*****
1390	0.	0.00	0.	0.	0.00	0.	0.	0.00	0.	0.	0.00	15348000.*****
1350	0.	0.00	0.	0.	0.00	0.	0.	0.00	0.	0.	0.00	14249762.*****
1310	0.	0.00	0.	0.	0.00	0.	0.	0.00	0.	0.	0.00	13150652.*****
1270	168000.	0.86	146159.	144000.	0.18	27359.	0.	0.00	0.	0.	0.00	11951916. 71.14
1230	216000.	0.46	101519.	584000.	0.39	231759.	224000.	0.64	145599.	10933428.	50.61	10933428. 50.61
1190	0.	0.00	0.	552000.	0.34	189999.	0.	0.00	0.	0.	0.00	10197916.*****
1150	424000.	0.77	329279.	840000.	0.74	625836.	616000.	0.91	565357.	8847396.	20.86	8847396. 20.86
1110	1496000.	1.43	2148387.	848000.	0.44	381598.	480000.	0.57	275359.	6915397.	4.62	6915397. 4.62
1070	1876167.	0.91	1725875.	1079920.	0.31	344026.	144000.	0.59	86399.	5698454.	3.03	5698454. 3.03
1030	1661872.	1.11	1848877.	353712.	0.97	344832.	353712.	0.97	344832.	5131774.	3.08	5131774. 3.08
990	2043400.	0.87	1794438.	184000.	0.56	104879.	184000.	0.56	104879.	4006942.	1.96	4006942. 1.96
950	2090920.	0.67	1401384.	535624.	0.33	179025.	144000.	0.59	86399.	3255614.	1.55	3255614. 1.55
910	2108760.	0.63	1346189.	196576.	0.36	71636.	84576.	0.40	34676.	2572615.	1.21	2572615. 1.21
870	1827303.	0.86	1587352.	339720.	0.36	122412.	112000.	0.48	54879.	2227647.	1.21	2227647. 1.21
830	1659407.	0.92	1532122.	3360.	0.23	806.	0.	0.00	0.	1819311.	1.09	1819311. 1.09
790	1854263.	0.78	1450561.	427712.	0.43	185852.	171712.	0.64	111612.	1069423.	0.57	1069423. 0.57
750	1843344.	0.76	1415142.	9512.	0.64	6182.	9512.	0.64	6182.	493263.	0.26	493263. 0.26
710	1197087.	0.55	658411.	0.	0.00	0.	0.	0.00	0.	696911.	0.58	696911. 0.58
670	697487.	0.81	567382.	0.	0.00	0.	0.	0.00	0.	507647.	0.72	507647. 0.72
630	839671.	1.18	997074.	0.	0.00	0.	0.	0.00	0.	47775.	0.05	47775. 0.05
590	397231.	0.73	293031.	0.	0.00	0.	0.	0.00	0.	8895.	0.02	8895. 0.02
	22400444.	0.86	19340684.	6098117.	0.46	2816100.	2523507.	0.71	1816153.	132626112.	6.05	132626112. 6.05

PROFIT \$1.50/TON  
 MILLING \$ 0.88 DIR. & INDIR  
 MINING \$ 0.29/TON DIR & INDIR  
 RECOVERY 80%  
 COPPER #042/LB

17.16 cu x 80% rec = 13.66 nec Cu  
 13.6 x 34 = 4.62  
 less op cost - 2.91  
 1.71 net profit