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James Doyle Sell Mining Collection

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JDS

From: F. T. GRAYBEAL

To: JDSell  
Tucson Office

Attached for your information

F. T. G.

SEP 3 1993

Terms for Sale of:

Pastor Butte 320 acres  
Superior East 40 acres

# ASARCO

Exploration Department

Frederick T. Graybeal  
Chief Geologist

Mr. Alex Acosta  
Corporate Land Manager  
Magma Copper Company  
7400 N. Oracle, Suite 200  
Tucson, AZ 85704

August 16, 1993

RECEIVED

SEP 27 1993

EXPLORATION DEPARTMENT

**Poston Butte Property, Arizona**  
**Superior East 40 Acre Parcel, Arizona**

Dear Mr. Acosta:

I refer to your letter of July 26, 1993 which inquires about terms under which Magma might acquire the above properties from Asarco. Our proposals are as follows:

**Poston Butte**

- 1) \$1000/acre (320 acres)
- 2) 3% NSR on copper or other metal or minerals produced either from Asarco ground or from adjacent Magma ground which are exposed by stripping on Asarco ground.

The Poston Butte terms are those previously proposed to Magma in correspondence from Mr. Gay.

**Superior East 40 Acre Parcel (SW 1/4 NW 1/4, Sec. 5, T2S, R13E)**

- 1) \$1000/acre (40 acres)
- 2) 3% NSR on any metal or mineral produced from the Asarco ground.

The Superior East terms are the same as those proposed in your letter of July 26, 1993, but are subject to a prior review by Asarco of all drill information available to Magma within 4000 ft of the boundary of the 40 acre parcel. Please note our maps of the Superior East parcel show the Range is 13 East not 5 East.

With best regards.

Very truly yours,

*F. T. Graybeal*  
F. T. Graybeal

cc: TAscartaccini - Ray Unit

Ed John: 297-7953 - 2223

5/24

**IMPORTANT MESSAGE**

For Sell

Day 5-20 Time 10:23 A.M.  
P.M.

M Fred Krangbeal

Of \_\_\_\_\_

Phone \_\_\_\_\_  
FAX \_\_\_\_\_  
MOBILE \_\_\_\_\_

Area Code \_\_\_\_\_ Number \_\_\_\_\_ Extension \_\_\_\_\_

Telephoned	Returned your call	RUSH
Came to see you	Please call <input checked="" type="checkbox"/>	Special attention
Wants to see you	Will call again <input checked="" type="checkbox"/>	Caller on hold

Message \_\_\_\_\_

Signed [Signature]

Universe 48023 LITHO IN U.S.A.

1. Ch, SE so it doesn't get lost.

ch Ed John again  
make 808 for everyone  
many things going on.

Early Aug - get in touch

2. with Ray & get the work done.

2. SE - Magma  
possibly JV or with exchange  
+ BHP

Call TE Scutecchini —

he said he'd do it 5/25/83

FTG

BT-18-93

① TM Get out of DV

Keep selected claims concerning design & drawings  
that ASASCO operated  
WDG will find out what ASASCO uses/operates  
Flux, "Chief"

No Sunny Side, Humboldt.

② Ventura

3/4 claims by itself.

No real decisions.

③ Bookends  
OK Pat  
SE

← Send brochure to all  
ASASCO

Mining Dept OK

④ Belmont / SE

Manli<sup>®</sup> has student at Marine Services  
also want SE data — Student??

# ASARCO

JDS

Exploration Department  
Southwestern United States Division  
James D. Sell  
Manager

May 24, 1993

Ed John  
Ray Complex

Superior East Project  
Assessment Affidavits

As requested, attached are copies of the Affidavits of Labor with correspondence and acknowledgements by the Recorder and BLM for the last three years (1990-91-92) on the Superior East Project unpatented mining claims.

JDS:mek  
atts.



James D. Sell

cc: F.T. Graybeal (w/o atts.)

AGS 1984 Fall Field Trip

Struct. & Mineralogy. Kingman Area, AZ

"In 1958 the Duval Corporation acquired the Mineral Park area and production of Cu & Mo concentrates began in Oct 1964. Total production through June 1980, was 574,145,877 pounds of copper, 49,706,158 pounds of molybdenum; and approximately 5,000,000 ounces of silver.

Visitors: Lope Garza

Duval Corp. Mineral Park Property

by Luis Vega and William Wilkerson

Nov. 19, 1984. (p. 1).

AMERICAN SMELTING AND REFINING COMPANY  
Tucson Arizona

June 16, 1971

TO: W. E. Saegart

FROM: J. D. Sell

PRODUCTION - GRADE - RESERVES  
MAJOR MINES - SUPERIOR EAST  
PROJECT AREA  
PINAL - GILA COUNTIES, ARIZONA

I have recently compiled, from various sources, the production figures from the Cities Services, Inspiration, Kennecott, Newmont, and Ranchers properties in their mines surrounding the Superior East project area.

The total tonnage-grades are impressive for the district as well as the continued reserve and potential. The tonnage-grade figures for the total strip-dump-leach operations at Ox Hide and Blue Bird are not equatable since leach production from the dumps will continue long after mining has ceased and thus the actual recoverable copper per ton will increase over the figure presently given.

<u>Company and Mine</u>	<u>Ore, Tons</u>	<u>Total Copper, Lbs.</u>	<u>Ave. Prod. Grade</u>
<u>Cities Services (thru 1969)</u>			
Miami	152,702,609	2,500,073,136	0.82
Copper Cities	52,125,634	613,606,930	0.59
Castle Dome	41,442,617	578,183,368	0.70
<u>Inspiration (thru 1970)</u>			
Inspiration	231,980,858	4,159,552,910	0.90
Ox Hide	8,963,285	21,490,703	0.12
<u>Kennecott (thru 1970)</u>			
Ray	208,173,274	4,213,477,221	1.01
<u>Newmont (thru 1970)</u>			
Magma	15,986,604	1,664,480,207	5.21
<u>Ranchers (thru June 1970)</u>			
Blue Bird	<u>13,399,700</u>	<u>60,045,703</u>	0.22
TOTAL	724,774,581 tons of ore	13,810,800,178 pounds of produced copper	



Reserve figures are difficult to secure but the following notes are published figures.

### Cities Services

**Miami:** Leaching practices currently produce 13,000,000 pounds of copper per year with an anticipated gradual decrease in forthcoming years. Miami has asked ICC for the return of the Miami ground now occupied by ICC housing and with known alteration and leached capping in the area it suggests expansion of working areas in that direction. Also, Miami and Inspiration are presently stripping their common boundary for production in the pit area. *Joe Bush Mine*

**Copper Cities:** The December 31, 1968 figure of 31,000,000 tons of 0.55% copper reserves was released for both Copper Cities and Diamond H pits with a recoverable 290,000,000 pounds of copper. Approximately 18 million tons is at Copper Cities and 13 million tons of ore at Diamond H. Each pit occupies the distant ends of the same alteration zone which is known to contain values of 0.3% copper.

**Castle Dome:** Leaching has been discontinued at this area, other than the collection of extraneous water flowing from the area. The new Pinto Valley project includes the Castle Dome area and figures of 350,000,000 tons of 0.45% are reported.

### Inspiration

**Inspiration:** Expansion of the pit area between the Live Oak and Thornton pits is underway in stripping the Red Hill area with a proven reserve of 24 million tons of 0.62%. Ore production is scheduled for late 1971.

**Ox Hide:** No reserve figure has been released for this deposit. Inspiration has announced the Barney ore deposit to the west and northwest of the Live Oak pit which is similar to the Ox Hide and will also be dump leached.

Inspiration in the 1970 annual report listed total area reserves of 1,507,622,000 pounds of recoverable copper.

### Kennecott

**Ray:** Recent pit expansion east of the Ray fault has added considerable reserves but no firm figures are known.

Newmont

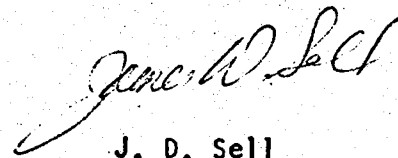
Magma: Reserves of 10,100,000 tons of 5.88% copper continued to be announced. This includes the stacked replacement ore as well as the previous known but unmined portions. The reserve is open ended to the east.

Ranchers

Blue Bird: The annual report of 1970 lists 13,500,000 tons of 0.50% copper and a potential of much more. Also, the present uncovered copper on the leach dumps will continue to produce leach copper for considerable time.

Inspiration-Miami-Occidental: The faulted segment of the massive Inspiration-Miami ore body (which has produced about one-half of all the copper listed in the tonnage-grade tabulation) has been intercepted by the three named companies. Inspiration is on the north and releases depths of 4800 - 5500 feet to mineral intercepts (5 holes drilled in the current program). Miami is in the middle and released depths of 2460 - 3300 feet with an average ore intercept of 465 feet averaging 1.51% copper, based on six holes (some 15 have now been drilled). Occidental is on the south and released depths of 1100 - 2000 feet showing 103 - 368 feet of ore running 0.56 - 1.26% copper as oxide, based on ten intercepts out of 18 holes drilled. Both Miami and Occidental are running feasibility studies and Miami is deepening their No. 5 shaft for exploration purposes.

JDS:sh



J. D. Sell

JOS

AMERICAN SMELTING AND REFINING COMPANY  
Tucson Arizona

January 6, 1972

Memorandum

TO: W. L. Kurtz

FROM: J. D. Sell

Reserve Figures - Copper  
Major Deposits

This memorandum is to upgrade and supplement my memo to W. E. Saegart (June 16, 1971) entitled: Production - Grade - Reserves, Major Mines - Superior East Project Area. The figures, by company, are based on published reports unless otherwise indicated.

Anaconda Company. Sulfide reserves Sept. 1, 1968; World Mining, vol. 4, no. 13, p. 56, December 1968.

Twin Buttes	292,000,000 tons of 0.88%
Twin Buttes	20,000,000 tons of 0.8% oxide stockpiled (Verbal)
Eisenhower (Palo Verde)	76,400,000 tons of 0.65%(?) 1962 Mineral Yearbook
Yerington	67,000,000 tons of 0.54%
Yerington	28,000,000 tons of 0.57% oxide
Butte, open pit	414,000,000 tons of 0.74%
Butte, underground	12,500,000 tons of 4.27%
Cananea *	177,000,000 tons of 0.81%
Cananea (Proposed Pit)	825,000,000 tons of 0.73% Pay Dirt, Sept. 1971

ASARCO. Prospectus, Jan. 1, 1968. See 1970 Annual Report for latest S. America & Canada reserves.

Mission	113,360,000 tons of 0.68%
Silver Bell	
Oxide Mine	21,140,000 tons of 0.68%
El Tiro Mine	27,343,000 tons of 0.73%
Leach Dumps	40,822,000 tons of 0.35%
San Xavier	
Sulfide	69,076,000 tons of 0.51%
Oxide	7,292,000 tons of 0.83%
Sacaton	
Open-pit	22,400,000 tons of 0.86% sulfide
Underground	14,558,000 tons of 1.36% sulfide

47,000,000  
(News Release Sept 5, 1972)

\* Cananea District Prod. 1899- Jan 1971 = 2,970,000,000 lbs Cu (AIMMGM Guidebook).

Bagdad Copper Company - 1969.

Bagdad	46,000,000 tons of 0.69%
"	200,000,000 tons of 0.50%
"	110,000,000 tons of 0.40%

Cities Service Company - December 31, 1968.

Copper Cities	18,000,000 tons of 0.55%	} approx 290,000,000* recover. Cu.
Diamond H	13,000,000 tons of 0.55% sulfide	
Diamond H	6,000,000 tons of 0.55% oxide	

Pinto Valley 350,000,000 tons of 0.45% (Verbal communication suggests at least twice this amount and possibly three times.)

Miami Mine -- Expansion to NW into Inspiration townsite plus common boundary area with ICC Thorton pit suggests  $\pm 100,000,000$  tons at  $\pm 0.5\%$ .

Central zone of Copper Cities - Diamond H altered area is known to contain minor chalcocite and primary values running 0.3-0.35% copper under +300 feet of leached capping. Chalcocite is not sufficient to support stripping at this time. Note in U of A Porphyry Copper Volume, p. 154, reports..... "Recent drilling to the west (of Copper Cities), outside the pit, has shown a significant increase in copper with depth. A thickness of 200 to 300 feet of material averaging +0.4 percent total copper is overlain by 700 to 1000 feet of material averaging about 0.1 percent total copper." Area and thickness of primary suggests +300,000,000 tons of +0.3%.

Also, verbal pit foreman 1969, ore continues under the shallow dipping Drummond fault northeast side of Copper Cities pit. The "barren" hanging wall material will not presently carry the stripping necessary to expose  $\pm 20,000,000$  tons of 0.5% in this area.

Miami East. From reported depths and assays of the three companies involved in the faulted offset, it is suggested that Miami's portion may be  $\pm 300,000,000$  tons of  $\pm 1.0\%$ . Also verbal, the present Miami feasibility study probably is in the best area and involves some 80,000,000 tons. Underground work is being pushed into this area.

Cactus Area. The area is underlain by a flat fault which cuts off a chalcocite-enriched mineral deposit suggested to be some 15-20,000,000 tons of  $\pm 0.5\%$ . Abundant oxide copper overlies and surrounds the sulfide body. Calculation of the size of altered schist breccia and possible grade suggests some 40,000,000 tons of +0.5% oxide copper in the block controlled by Cities Service.

January 6, 1972

CONOCO Reported in 1971 Annual Report, p. 27  
*B. Anderson, verbal March, 1972, Conoco;  
 Shallow eastern area, 200-250 million tons @ +0.4% oxide,  
 Deep western area, 75-100 " " @ +0.5% oxide.*  
 Florence (Potosi Butte) indicated total ore reserves are about 500 million tons  
*with an average grade slightly above 0.5% copper.*  
*tons of oxide @ ±0.5%; PB East has 200-250 million tons of oxide @ +0.4% copper.*  
 Duval Corporation. Reserves of January 1, 1968. Mining World, v. 5, no. 3,  
 p. 51, March 1969 and also see Prospectus.

Ithica Peak	54,538,000 tons of 0.49% Cu + 0.044% Mo
Esperanza	41,215,000 tons of 0.45% Cu + 0.032% Mo
Copper Canyon (Nev.)	18,237,000 tons of 0.74% Cu
Copper Basin (Nev.)	3,437,000 tons of 1.43% Cu
Sierrita (1971)	524,000,000 tons of 0.33% Cu + 0.033% Mo

El Paso-Hecla.

Lakeshore	207,000,000 tons of 0.71% oxide
"	241,000,000 tons of 0.7% sulfide
"	24,000,000 tons of 1.69%, tactite sulfide

Homestake Production. Verbal and visual information.

Carlotta	3,600,000 tons of 1.65% Kelly ore (fault zone)
"	5,000,000 tons of 1.03% Carlotta ore (breccia)
"	(based on property boundary and mineral location it is calculated that the Carlotta block contains some 15,000,000 tons of ore.)

Inspiration Consolidated Copper Co. Annual Report for 1970, with reserves to January 1, 1971*See Annual Report 1972 regarding reserves.*

Inspiration area	1,507,622,000 pounds of recoverable copper	<i>≈ 85 million tons of ore</i>
Christmas, underground	567,605,000 " " " "	
Christmas, open-pit	278,122,000 " " " "	
Sanchez	160,917,000 " " " "	

Kennecott Copper Corporation. "Proven" reserves as of January 1, 1971.

World Mining, vol. 24, no. 6, p. 48, June 1971.

		<i>est. Tons of Recov. Copper</i>
Ray	736,310,000 tons of 0.82% =	4,482,400
Chino	452,307,000 tons of 0.78% =	2,723,600
Nevada	63,100,000 tons of 0.79% =	372,300
Utah	1,773,000,000 tons of 0.71% =	11,011,500
Safford	1,000,000,000(?) tons of +0.4%(?) (Not published)	
<i>Copper Butte</i>	<i>10,000,000 tons of 0.6% oxide (Verbal Kennecott man).</i>	

Newmont Mining Company. January 1, 1969. Various sources.

San Manuel	496,800,000 tons of 0.728% sulfide
San Manuel	130,000,000 tons of 0.70% mixed; of which 0.47% is oxide copper
Kalamazoo	565,000,000 tons of 0.72% sulfide
Superior	10,400,000 tons of 5.7%
Vekol (51%)	107,000,000 tons of 0.55% Cu + 0.015% Mo
<i>Copper Creek (J. H. Humble)</i>	<i>Extension of known but deep-seated ones have been indicated.</i>

January 6, 1972

Occidental Minerals. Calculated from drill pattern and published reports indicates some 100,000,000 tons averaging between 0.50 and 1.2% copper as oxide.

Phelps Dodge Corporation. "Economic" ore reserves of January 1, 1971. Prospectus dated June 16, 1971.

Morenci	736,800,000 tons of 0.80%
Metcalf, open-pit	220,600,000 tons of 0.74%
Metcalf, underground	126,700,000 tons of 0.92%
Ajo	138,000,000 tons of 0.70%
Bisbee, open-pit	8,100,000 tons of 0.94%
Bisbee, underground	1,900,000 tons of 5.41%
Safford, underground	250,000,000 tons (probable) of 0.92%
Tyrone	292,200,000 tons of 0.81%

Pima Mining Company. January 1, 1969.

Pima 216,000,000 tons of 0.56%

Ranchers Exploration. Annual report, reserves of January 1, 1971.

Blue Bird	75,000,000 tons of 0.52% (open-ended)
Old Reliable	4,000,000 tons of 0.74% (expect to recover 30 million tons in 5 years).
Big Mike (Nev.)	400,000 tons of 3% (?) in place
Big Mike (Nev.)	300,000 tons of 2%, mixed, in stockpile (leach plant completed in Feb 1972. See Engr Feb.).

*James D. Sell*  
James D. Sell

JDS:lad

*US Smelting & Refining. Annual Report, Jan. 1, 1972*

*Continental Mine (Bayard), New Mexico.*

*15,300,000 tons are 1.06% Cu (open-pit to depth of 600 feet).  
w/calc. 14,000,000 tons are 2.19% Cu (between 600-1500 ft; underground).*

*Earth Resources.*

*Naciminto (Cuba), New Mexico.*

*Self reserve = 10 million tons @ 0.7% Cu. (MC Jour, vol 57, no. 12, p. 38, 1971)*

*Stockpiling and ore for later processing... ability to recover values substantially increased  
total reserve & econ life of prop. will increased to 4000 tpd. (Engr, Jan 1972) p. 134*

TABLE ONE

GLOBE SUBDISTRICT

Name of Mine	Discovery Year	Status x Year	Type of Operation	Production		Reported Reserves Tons @ % Copper	Additional Estimated Reserves Tons @ % Copper
				Tons of Ore	Pounds of Copper		
1. Defiance	1930	Closed 1948	Under- ground	1,500	Minor Pb-Zn-Ag-V Production (\$100,000.00?)		
2. Vacey Constance	1886	Closed 1886	Under- ground	250	Minor Ag Production (\$100,000.00)		
3. Highland	1929	Closed 1929	Under- ground	2,000	400,000	--	--
4. Irene	1880	Closed 1890	Under- ground	2,000	Minor Pb-Ag Production (\$15,000.00)		
5. Superior-Boston	1907	Closed 1926	Under- ground	65,000	19,556,000	(plus 1,343,000 oz.Ag)	--
6. Eureka	1906	Closed 1907	Under- ground	40,000	3,000,000	--	--
7. Iron Cap	1912	Closed 1928	Under- ground	683,000	60,000,000	(plus 1,256,500 oz.Ag)	--
8. Arizona Commerical	1906	Closed 1930	Under- ground	800,000	92,000,000	(plus 580,000 oz. Ag)	--
9. Old Dominion	1882	Closed 1931	Under- ground	8,000,000	850,000,000 JEC (1841-1881) 765,000,000	(plus 4,536,000 oz.Ag)	40,000,000 @ 1.0
10. Albert Lea	1944	Closed 1946	Under- ground	1,200	Minor Cu-Pb-Zn-Au-Ag Production \$28,500.00)		
Subtotal				9,594,950	939,956,000	--	40,000,000

TABLE ONE - Cont'd.

## COPPER CITIES-CACTUS SUBDISTRICT

Name of Mine	Discovery Year	Status x Year	Type of Operation	Production		Reported Reserves Tons @ % Copper	Additional Estimated Reserves Tons @ % Copper
				Tons of Ore	Pounds of Copper		
11. Porphyry Reserve	1929	Closed	Leaching	Surface	350,000	--	--
		1930		leaching			
12. Copper Cities	1953	Operating	Open	56,755,205	662,841,497	9,000,000 @ 0.5	20,000,000 @ 0.5
		1971	Pit				
13. Diamond H	1970	Operating	Open	Minor (Included w/Copper Cities)			--
		1972	Pit			19,000,000 @ 0.55	
14. Altered Zone	--	--	--	--	--	--	300,000,000 @ 0.3
15. Continental	1896	Closed	Under-	Development Minor -- May be partially stripped for Pinto Valley.			
		1929	ground				
16. Castle Dome	1943	Closed	Open	41,442,617	578,183,368	Now site of Pinto Valley Operations.	
		1970	Pit				
17. Pinto Valley	Announced	Under	Open	--	--	350,000,000 @ 0.45	300,000,000 @ 0.4
	1973	Development	Pit				
18. Carlota	1929	Closed	Under-	5,000	440,000	8,600,000 @ 1.3	7,000,000 @ 1.0
		1944	ground				
19. Cactus	1908	Closed	Under-	Development Minor		20,000,000 @ 0.5	20,000,000 @ 0.5
		1929	ground				
20. Black Bess	1920	Closed	Under-				
		1935	ground	1,000	Minor Cu-Zn Production (\$15,000.00?)		
Subtotal				98,203,822	1,241,814,865	406,600,000	647,000,000



TABLE ONE - Cont'd.

## MIAMI-INSPIRATION SUBDISTRICT

Name of Mine	Discovery Year	Status x Year	Type of Operation	Production		Reported Reserves Tons @ % Copper	Additional Estimated Reserves Tons @ % Copper
				Tons of Ore	Pounds of Copper		
21. Smelter	1969	Drill Holes 1972	Under-ground	--	--	--	Several deep holes in mineral.
22. Miami East	1968	Under Development 1973	Under-ground	--	--	80,000,000 @ 1.0	150,000,000 @ 0.8
23. Occidental	1969	Drilling 1973	Under-ground	--	--	--	100,000,000 @ 1.0
24. Van Dyke	1929	Closed 1945	Under-ground	70,000	11,851,700	Part of Occidental-AMAX (22) Operations.	
25. Warrior	1904	Closed 1919	Under-ground	300,000	30,500,000		
26. Miami	1911	Leaching 1971	Leaching	152,702,609	2,512,879,221	28,000,000 @ 0.8	100,000,000 @ 0.7
27. Red Hill	1967	Under Development 1972	Open Pit	--	--	64,000,000 @ 0.6	30,000,000 @ 0.5
28. Inspiration	1914	Operating 1971	Open Pit	238,843,111	4,251,951,861	85,000,000 @ 0.9	100,000,000 @ 0.7
29. Blue Bird	1962	Operating 1971	Open Pit	13,304,700	56,869,467	75,000,000 @ 0.52	20,000,000 @ 0.5
30. Barney	1970	Drilled Out 1972	Open Pit	--	--	15,000,000 @ 0.5	--
31. Montezuma	1972	Drilling 1973	Open Pit?	--	--	--	75,000,000 @ 0.7(?)

TABLE ONE - Cont'd.

MIAMI-INSPIRATION DISTRICT - Cont'd.

Name of Mine	Discovery Year	Status x Year	Type of Operation	Production		Reported Reserves Tons @ % Copper	Additional Estimated Reserves Tons @ % Copper
				Tons of Ore	Pounds of Copper		
32. North Oxhide	1968	Operating 1971	Open Pit	11,593,552	31,174,822	35,000,000 @ 0.4	10,000,000 @ 0.4
22. South Oxhide	1968	Under Development 1973	Open Pit	--	--	50,000,000 @ 0.4	35,000,000 @ 0.4
Subtotal				416,813,972	6,895,227,071	432,000,000	620,000,000

TABLE ONE - Cont'd.

TOTALS

Name of Dist.	Average	Production		Reported Reserves	Additional
		Tons of Ore	Pounds of Copper	Tons @ % Copper	Estimated Reserves Tons @ % Copper
Globe District	97.96# Cu/ton recovered	9,594,950	939,956,000	--	40,000,000
Copper Cities District	12.65# Cu/ton recovered	98,203,822	1,241,814,865	406,600,000	647,000,000
Miami District	16.64# Cu/ton recovered	416,813,972	6,895,227,071	432,000,000	620,000,000
Superior (Magma)	103.57# Cu/ton recovered				
Ray	20.02# Cu/ton recovered				
San Manuel-K	13.16# Cu/ton recovered				
TOTAL		524,612,744	9,076,997,936	838,600,000	1,307,000,000

Name of Mine	Discovery Year	Status X Year	Type of Operation				
OTHER							
Superior (Magma)	1911	Operating 1971	Under- ground	16,414,285	1,700,088,749	10,200,000 @ 5.8	10,000,000 @ 5.0
Ray	1911	Operating 1971	Open Pit	216,656,509	4,337,125,555	736,310,000 @ 0.82	200,000,000 @ 0.8
San Manuel-K	1955	Operating 1971	Under- ground	189,118,417	2,489,495,468	1,003,000,000 @ 0.7	?

Name - Owner

Daily Production

Sulfides

Oxide

Leach

Total Production

Byproducts

Present reported Reserves

Potential, estimated, Reserves

start Slide 1 Slot

James D. Sell. SUPERIOR EAST PROJECT, ARIZONA.  
Thursday Feb/ 21. 1980. 9.45 - 10.15/

SLIDE 1. SUPERIOR EAST CONCEPT.

SLIDE 2. NE MINERAL TRENDS BASIC TO ARIZONA.

Globe-Ajo Zone. ASARCO reconnaissance along trend----

SLIDE 3. POSTON BUTTE

SLIDE 4. SACATON, as well as a number of altered zones not drilled.

SLIDE 5/ GENERAL SETTING AND MINERAL ZONES OF MIAMI-SUPERIOR ZONE.

MIAMI-INSPIRATION ZONE (18,000 tpd at 0.80 % Cu.)

M prod. 152 million tons ore w/ 1.5 MILLION tons Cu metal

I prod. 287.5 million tons ore w/ 2.5 million tons Cu

I reserve 103.5 million tons ore w/ 1 million tons Cu.

543 Million tons ore with 5 Million tons Cu metal.

COPPER CITIES-PINTO VALLEY (CASTLE DOME). (50,000 tpd at 0.50% Cu).

CC prod. 76.5 million tons ore with 0.45 million tons Cu metal

CD prod. 42 million tons ore with 0.25 million tons Cu metal

PV reserve 400 million tons ore with 1.50 million tons Cu metal

578 million tons ore with 2.2 million tons Cu metal

OLD DOMINION

8 Million tons of ore w/ 0.42 million tons Cu. metal

MAGMA (3,000 tpd at 4.5% Cu.)

Produced 23 million tons ore w/ 1.1 MILLION tons Cu metal

Reserve 40 million tons ore w/ 1.5 million tons Cu metal

63 million tons ore with 2.6 million tons Cu metal.

SLIDE 6. ~~IS~~ IS THERE ALSO A PRODUCTIVE PORPHYRY SYSTEM LOCATED UNDER  
THEM VOLCANIC COVER ON THE SW SIDE OF THE INTRUSIVE MASS,?????????

SLIDE 7. EASTWARD ZONING AT MAGMA, PLUS EXPANDED RESERVES IN STACKED REPLACEMENT  
ORE BODIES ALL SUGGEST A LARGE PORPHYRY SYSTEM POSSIBILITIES.

SLIDE 8. EVALUATION.

SLIDE 9. GEOLOGY, ALTERATION-MINERALIZATION OF SE AREA. PRE-1970.

Collection of drill hole data, land status, ASARCO ~~xxxxxx~~  
aeromag data (1971); seismic data (1970-1974); Computer modeling (1971)  
~~XX~~

[76% probability of system being present, 45% prob. of hitting  
alteration zone in 5 holes. and 64% prob of hitting mineral zone  
in 10 holes].

SLIDE 10. PRESENT LAND STATUS.

4 by 6 miles

Oak Flat.

SLIDE 11. ASARCO DRILLING.

SLIDE 12. DRILL HOLES ON PLATEAU W/ 1976-1979 results.

ASARCO 16 holes (3 incomplete) (4 deepened) 1971-1979.

62 thousand feet (ave 4500).

A-4 = 3rd hole A-2 = 5th hole

competition 17 holes with 8 left incomplete.

59 thousand feet (ave 3500 feet)

SLIDE 13. A-4 DISCOVERY. 3rd hole completion.

Cu<sup>O</sup> 1060 feet at 0.56%

SLIDE 14. EXPANSION NORTH AND SOUTH.

SLIDE 15. CONJECTURE FROM MAGMA TO A-4. Cu<sup>O</sup> and REPLACEMENT.

SLIDE 16. SPECULATIVE CU<sup>O</sup> RESOURCE.

A 137 million tons.

N 175 million tons.

FS 120 million tons.

432 million tons w/ grade of 0.80% with more speculative  
of 2 to 5 times as much.

SLIDE 17. A-2 INTERCEPT (5th hole completion).

Joint venture with ICC

AI Hole

Deepening DCA.3.

Evaluation.

SLIDE 18. A-8 intercept 646 feet at 1.57%.

expansion of zone by A-9, A-10. and A-11 offset.

SLIDE 19. CORE BOX SHOWING ~~QXX~~ QTZ-BORNITE.

slide 20. CLOSE UP OF CORE.

SLIDE 21. IDEALIZED CROSS SECTION

VALUES

PRESENT ESTIMATE TONNAGE ~~43~~ MILLION 45.

SLIDE 22. FUTURE.

SLIDES 23, 24 25. Dyna-drill, confirmation

SLIDE ~~26~~ 26. OVERVIEW

A. Moved CC and blanket?

B. Main system.

C. Additional Veins

D. Cu<sup>O</sup>

E. Lms Repl.

Superior East: Porphyry Copper Lineament Concepts and  
Related Whitetail Conglomerate Study

by James D. Sell, Exploration Geologist  
Southwest Department  
For presentation at Annual Exploration Meeting  
Chandler, Arizona March 11-13, 1971

S-1 The Superior East project is a study of the geology, structure, and mineralization of an area between Globe and Superior, and north of Ray, Arizona. (SLIDE ONE, Please) The project area encompasses some one hundred twenty square miles, of which seventy square miles are covered by post-mineral conglomerates and volcanics.

The drawing of lines or lineaments has long been practiced in Arizona (3, 4, 7, 10, 11, 13, 14, 18, 22, 23, 26) and today the use of the computer for assimilation of the vast amounts of data is being utilized (1,8). The fundamental factor of deep-seated lineament structures as loci for mineral targets was expressed by Billingsley and Locke (4) as:

"The essence of a mining district is the presence of such competent rocks with long-lived, deep, penetrating breaks re-opened to permit passage of heat and associated products from depths to surface"...

As exhibited in SLIDE ONE, we might express the major porphyry copper mineral deposits of Arizona as four rather broad northwest trending belts. From left to right, they are named: (1) the Ajo, (2) the Northwest, (3) the Central, and (4) the Morenci belt.

In general, it is found that the loci for mineralized porphyry copper deposits are where these belts cut northeast-trending structures, as expressed by Landwehr (14). (SLIDE TWO, Please) Landwehr has named the major northwest belts in Arizona as: (1) the Colorado, through Jerome-Bagdad; (2) the Globe, through Globe-Ajo; and (3) the Bisbee--Morenci, through Morenci to Pima-Bisbee. As noted, these cover a wide swath. Synopsis of the trend-direction analysis has been reported in publications by Mary Barnes (1) and Lowell and Guilbert (17).

S-3 SLIDE THREE, Please, shows the Silver Bell deposit is a graphic study of the district trends mapped by Courtright (21). Here the mineralized northeast-trending fractures and fissures are enclosed in an overall northwesterly-trending alteration zone.

S-4 ASARCO geologist Blucher (5) in 1957 initiated a porphyry copper reconnaissance program in the Globe-Superior region. (SLIDE FOUR, Please) Blucher covered the area in some detail and discovered and reported on a number of mineralized areas which had not been previously reported or were little known. These deposits were not of economic importance at the

time of his study, and at present have remained in that status for the most part, although some of the areas have been drilled. Blucher was impressed, as later was N. P. Peterson (20) of the USGS, in the apparent alignment or elongation of the known ore deposits of the Globe-Miami area and the apparent fact that this trend passed under the large post-mineral cover area of our present Superior East project, and the deposits at Magma and Silver King were situated where the trend emerges from under the volcanic cover.

Further investigation verified that the northeastward trend of the older Precambrian grain of the region had been followed by the younger Precambrian diabase intrusives and subsequently by the Tertiary igneous intrusives and many of the dominantly mineralized vein deposits. Thus it was reasonably evident that the northeast trend represented deeply-rooted structures of prime importance.

Later work in the Superior area has also shown the importance of the northeast structures as recurring movement along them is evident in older Precambrian, younger Precambrian, Laramide, early Tertiary volcanic, and late Tertiary volcanic times.

Continued work along this trend to the southwest by Blucher and Kinnison (6) in the Blackwater District also indicated a strong northeast trend to the mineralization and alteration outlines. Expanded reconnaissance in the area resulted in the discovery of the Poston Butte mineralization with a known alteration-mineralization extent of three miles of strike length northeast, by one mile in width. Only a small outcrop of several hundred square feet is known but even here the fracture pattern has a dominant northeasterly to easterly trend.

Next, Kinnison and Blucher extended their reconnaissance to the southwest where the small altered and mineralized hill of the Sacaton deposit was located (12). Drilling blind through the alluvium outlined a strongly oriented northeasterly-trending alteration-mineralization area.

Beck (2) followed up the reconnaissance with more detailed work in the north Sacaton area and found a northeasterly-trending zone in which aplite dikes were cut or bordered by diabase dikes which, in turn, were cut and bordered by a swarm of dioritic-monzonitic dikes and bodies of Laramide age. Outside of this three-mile-wide zone, the Precambrian granite basement rocks are cut by only a few aplitic dikes.

Deep alluvial drilling southwest of the Sacaton deposit outlined a similar northeast-trending alteration-mineralization zone in the Santa Cruz area, as reported by Wojcik (27).

By this time some sixty-five linear miles of exposures had been examined along this apparent productive northeasterly trend, and it was my good fortune to be able to continue the investigation (24, 25)




to the southwest for another forty-five linear miles where the study was terminated somewhat inside an active Air Force bombing range. Again it was conclusively demonstrated that the northeast-trending zone was persistent and had been active from older Precambrian through Tertiary time. Several intrusive and altered areas were found but follow-up work was not encouraging.

This one hundred ten mile long zone of northeasterly-trending structures has been active over the entire geologic time span and has influenced sedimentation, intrusive activity, and alteration-mineralization. Its importance as a deep-rooted primary structure is impressive and, as elsewhere in Southern Arizona, where this structure is cut by northwest trending elements mineral concentrations tend to occur.

At present Asarco is supporting further work along this northeasterly productive trend. Compilation and integration of all previous mapping coupled with additional work will be the basis of re-evaluating an accumulation of age-dates and aeromagnetic trends.

In the evaluation of this N 10° E lineament trend and its productive mineral potential, it was readily apparent that a large area of post-mineral cover existed between the mining area at Superior and the productive area of Globe-Miami.



Compilation and integration of all the available information will enforce our hunt for an ore body in this permissive area (Lasky, 15). Drilling targets in the area are of the three known classes: (1) The Miami-Inspiration class of large tonnage of relatively high-grade secondary chalcocite ore bodies located along the Schultze granite-Pinal schist contact, and having substantial oxide copper outside the main zone; (2) the satellitic porphyry intrusive class exemplified by the large Castle Dome-Pinto Valley class which is generally located several miles from the granite-schist contact; and (3) the Magma class of limestone replacement deposit having a possible genetic relationship, with a presently poorly-understood porphyry breccia intrusive.

S-5 The relative position of the known ore bodies and alteration zones are shown on SLIDE FIVE, Please. The importance of the northeast-trending lineament zone has been established, but the productive capacity of the area is even more impressive.

The Miami-Inspiration ore body has produced through 1969 an excess of 375 million tons of ore with a recovered 3-1/4 million tons of copper. Reserves in this block is still substantial and several pit expansions are now underway. Also, the faulted segment of the same ore body, named Miami East, now being drilled by Miami and Occidental, is believed to contain an excess of 130 million tons with a grade of + 1.5% copper.

The Copper Cities deposit (Miami Copper) in fifteen years has produced 52 million tons of ore and recovered 300 thousand tons of

copper. Another pit, Diamond H, is ready for production on the southwest end of the same alteration zone, and between the two pits a large reserve of around 0.3% copper is known. Ultimate production from the zone is unknown, but large.

The Bluebird and Oxhide deposits are nonsulfide deposits of reprecipitated values probably leached from the Miami-Inspiration deposit or possibly from an undiscovered deposit lying to the northwest now covered by mid-Tertiary dacite. Production of around 65 million pounds of copper has been made to date and reserves probably amount to at least double this amount.

The Castle Dome area is a "worked out" deposit having produced 41 million tons of ore with a recovered 514 million pounds of copper from 1943-1953. Since that date, 64 million pounds of precipitate copper has been produced from leach dumps over the deposit. Under the Castle Dome area is the newly reported Pinto Valley project with a released figure of 350 million tons of 0.45% copper. Actual reserves are probably nearer 550 million tons at the same grade.

The Cactus-Carlota deposit is primarily a nonsulfide deposit in brecciated Pinal schist and is underlain by a flat, gravity type fault. Little production from the area has been made but reserves probably range between 75 and 100 million tons, half of which is commercial at the present time. The deposit is controlled by Miami and Homestake Production Company. The west end of the deposit (Carlota portion) is entirely covered by dacite.

To the southwest, a zone of nonsulfide copper is found in the schist and is underlain by a flat fault similar to Cactus-Carlota. The exotic mineralization passes under the dacite cover. Several drill holes put down in 1930-1931 were 1000 feet west of the dacite cover and all encountered values of nonsulfide copper. In 1965, a joint venture hole between Superior Oil and Miami Copper was placed some 3000 feet west of the dacite edge. It also encountered nonsulfide copper values.

This zone of exotic copper values will be further evaluated by drilling in search for the continued nonsulfide copper in the upper plate of the gravity slide fault as well as for the source area for this copper.

On the northwest side of the Superior East area are two alteration-mineralization zones. One is a Silver King where \$6.5 million in silver had been extracted at the turn of the century from a small pipe-like deposit. The Silver King intrusive is pre-Whitetail in age, and abundant clasts of the Silver King diorite porphyry are found in the conglomerate immediately in the area. An alteration zone separate from the pipe-deposit is known which passes northeasterly under the Whitetail and overlying dacite. Evaluation of this zone is in progress. The Rock House zone, to the north, occurs in both Precambrian Pinal schist and post-dacite intrusive, contains pyrite with minor values, and is probably related to solfataric activity connected with the volcanism.

In the Magma area, a blind mineralized breccia is known in the area of the new No. 9 shaft. This shaft was collared in dacite, and as of last week was at a depth of 2100 feet in Whitetail Conglomerate. The new shaft will increase the air base and hoisting capacity for exploitation of the Magma stacked replacement ore bodies. An announced reserve of ten million tons of 5.8% copper is reported but this is calculated only to the 3900 level. Mineralization in scattered holes is known to the 4300 level but no reserve calculations have been released. Total production at Magma from the vein and replacement deposits has been 15-1/2 million tons of ore with 810 thousand tons of copper recovered. Little is known of the mineralized breccia, and during a recent tour at Magma we were politely refused passage into the area where they are presently diamond drilling an up-hole at the shaft site station in the breccia. All of the replacement limestone ore is totally blind and covered by dacite.

The renewed interest in the Volcanic covered area between Globe and Superior has resulted in the accumulation of data on many facets of the problem. The present Asarco studies in the Superior East area include re-evaluation of the adjacent mineralization around the edge of the plateau, an evaluation of the Whitetail conglomerate of Oligocene age, an evaluation of the mid-Miocene volcanics, and a structural interpretation of the entire region. Dual elevation aero-magnetics has been completed over the area as well as new color photography by the Salt Lake Geophysical Division. A preliminary review of computer statistical drilling target evaluation has also been run.

32-7  
The Whitetail conglomerate is the first post-mineral unit of the district. Recent age dating of a tuff unit in the conglomerate indicated a 34 m.y. date in the Ray district. Our study is through traverses in the scattered outcrop areas. Altered fragments are sought, and where found they are collected for assay. The tuffaceous silt matrix is also sieved and sampled and being assayed for values. The type of clasts are recorded and, where possible, the transport direction is determined.

The dacite, with a dated age of 20 m.y., was subjected to a study by D. W. Peterson (18) of the USGS. Peterson suggested that the dacite mass is an ignimbrite or ash-flow tuff, and thus equidimensional pumice fragments in the column of tuff would be progressively flattened as the mass cooled and settled. The most deformed or elongated pumice would be at the base, and the least would be at the top. A phase of his study included a study of the flattening ratio. Part of our work has been to verify this method of depth determination and expand the coverage. To date it appears the dacite is more variable than suggested by Peterson, and only gross position can be determined. A photo interpretation of the fracture pattern--intensity and relative age--on the Plateau is also underway. This is being coupled with expansion of a study into the surrounding pre-mineral units and a total evaluation being made of the relative high-low position of blocks.

Thirteen relatively deep drill holes, plus two of Magma's shafts, are known to be on the Plateau. Information on these penetrations is being gathered. Four of the holes penetrated into pre-mineral units; two are reported to have penetrated, but some questions remain; and the remaining seven holes were terminated either in early volcanics or Whitetail conglomerate beneath the dacite cover.

A recent study released by USGS (16) on the trace-element of biotite in granitoid rocks of the Sierrita district points up a further approach. The excellent exposures and biotite content of the Laramide Schultze granite of the Globe-Miami district makes this unit amenable to such a study, and particular care will be taken in the area where the granite passes under the dacite cover. The copper mineralization related to the Schultze granite has recently been studied and released in a thesis by Clary (9).

Asarco is not alone on the plateau (SLIDE SIX, Please) but we have a land position along with Inspiration Consolidated Copper Company, Magma Copper Company, and Continental Materials Corporation. Other companies such as Banner Mining Company have holdings off the Plateau area in the pre-mineral exposure. Negotiations are in progress with Continental Materials Corporation on their holdings.

As mentioned previously, drilling penetrations (SLIDE SEVEN, Please) in the Plateau area is restricted to four holes into pre-mineral rock out of some thirteen attempts. The four completions are near the eastern edge of the Plateau, and three intercepted nonsulfide exotic copper, while the fourth (southern) hole was barren.

In our Superior East drilling project, it is proposed to re-enter and deepen four holes, which presently range in depth from 1500 feet to 3000 feet in depth. Two of these were thought to be in premineral units by the previous operators but re-evaluation of the core by thin-section and with increased knowledge of the geology of the area, it is firmly believed that the holes terminated in post-mineral units. Completion of these holes will provide valuable geologic information as well as testing for the western edge of the Schultze granite where an Inspiration-Miami type body is permissible along the contact in schist and the incidence of rich limestone replacement bodies in the Paleozoic units.

Several new holes are proposed to further test the contact zone and also the continuation and source area of the eastern exotic copper zone. This phase of the high cost drilling area is expected to cost \$300,000 with testing of adjacent target areas on a continuing basis to be \$150,000 or a total of \$450,000 for a two-year program in the Superior East project area.

Thank you.

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#### SLIDES

- ONE: JHC Ariz.-New Mex. Porp. Map with NW Trend overlay  
TWO: JHC Ariz.-New Mex. Porp. Map with NE Trend overlay  
THREE: KR-JHC Mineral Fissure - Alt. Trend at Silver Bell  
FOUR: JHC Ariz.-New Mex. Porp. Map updated  
FIVE: WES Orebody Map of Globe-Superior Trend updated  
SIX: Land Status of the Plateau area  
SEVEN: Drill hole locations on the Plateau area