CONTACT INFORMATION
Mining Records Curator
Arizona Geological Survey
1520 West Adams St.
Phoenix, AZ 85007
602-771-1601
http://www.azgs.az.gov
inquiries@azgs.az.gov

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GENERAL GEOLOGY OF THE MAGMA MINE & ITS APPLICATION TO MINING PRACTICE IN THE VEIN PORTION OF THE MINE

By
Russell Webster

INTRODUCTION

The purpose of this report is to give a general picture of the development of the Magma Mine, with considerations on the operation of the geology department at the present time.

The present geology department is indebted to such men as Ransome, Short, Ettlinger, Gustafson, Michell and others of equal importance who have contributed much to the general understanding of ore deposition, trends and to the complex structural problems found along the Magma Vein.

From a rather poor surface showing the Magma Mine has developed into a major producer and has operated continuously for over 40 years. Because of weak vein mineralization on various levels there have been times when it was thought that Magma had reached its lowest level of mineable ore, but each time, with careful exploration and development, its life was extended by the finding of new productive ore shoots.

Production of copper has steadily increased, except for the war years, as the mine deepened its workings and extended its development. Listed below are five sample production years.

Years	Ore Production-Tons
1915	59,219
1925	229,377
1935	259,553
1945	185,712
1952	397,546

During 1938 to 1945 the yearly production of zinc ore was approximately 80,000 tons.

Mining methods used at Magma vary according to the condition and type of wall rock with most of the ore stoped by the standard square-set cut and fill method. A few rill stopes are in operation where conditions permit.

GENERAL GEOLOGY

Age Relationship & Rock Types:

Early Pre-Cambrian	Pinal Schist	Sedimentary origin Basic lava flows
Unconformity Late Pre-Cambrian	Apache Group	Scanian conglomerate Pioneer shale -Disconformity- Barnes conglomerate Dripping Springs Quartzite Mescal Limestone -Disconformity-
Cambrian	Troy Quartzite	
Late Cambrian & Pre-Devonian	Intrusive Diabase Sills	Over 3000' in thickness crossing Pinal schist, Apache group and Troy Quartzite
Devonian	Martin Limestone	
Mississippi	Escabrosa Limestone	
Penn	Naco Limestone	
Tertiary	Dacite	

Structural Movements

Late Cretaceous & Early Tertiary	Thrust Faulting & Folding East-West faulting Dikes of quartz monzonite porphyry Ore Deposition

Structural Movements (Cont'd.)

Early & Middle Tertiary	Oxidation & Enrichment Deposition of the White Tail conglomerate Flows of Dacite (1200' in thickness) Regional Tilting
Late Tertiary	Dacite conglomerate Extensive Faulting Concentrator fault North-West strike Dips about 70°SW Vertical displacement at least 2000 feet Various postdacite and post ore faults Basalt dikes and flows.

GENERAL CONSIDERATIONS

Magma Vein Mineralization: The Magma Vein is an east-west mineralized fault fissure dipping about 80° south. The south wall or hanging wall has moved down approximately 300 feet and west approximately 375 feet relative to the north or footwall. Zoning of the ore is quite apparent with primary zinc and silver minerals in the upper levels down to the 2550 level in the east-central portion of the vein. Primary chalcocite, bornite and chalcopyrite occurs down to approximately the 4200 level where the high temperature mineral enargite begins to appear along with bornite and chalcopyrite. The ratio of enargite to the other copper minerals increases down to and including 4600 level.

FAULTING

The Magma Vein has been cut and sometimes offset by a series of post-ore faults. Low angled (flat) faults were more evident in the western portion of the mine between the 4000 and 4200 levels, offsetting the vein to the north on the average of 20 feet. Strike

faults, locally known as slicers and cross-faulting, are not localized but can be found throughout the mine. Two of the major cross faults in the mine are the Main and the Concentrator Faults. Both faults occur in the extreme western portion of the mine. The Main fault strikes nearly north and has a west dip of about 45°. The Concentrator fault strikes N43°E and dips west at about 60°. The stratigraphic throw of the Main fault is about 1500 feet with horizontal displacement of approximately 1200 feet south. West of the main fault is the larger fault (Concentrator) with an unknown vertical displacement. The Magma Vein is completely cut off and it has never been located on the down-throw side. A sizeable body of mineable ore was located between the Main and Concentrator Faults. This is considered to be a faulted segment of the Magma Vein.

HISTORY

The history of the Magma Mine can be conveniently divided into three periods of time, based, more or less, on the extent of its development.

The First Period: The first period begins with the location of the first claim, "The Hub", in 1875 by W. Tuttle. Soon afterwards, Irene Vail located the "Irene Claim" west of the "Hub". These two claims were located on the surface exposed portion of an east-west north-dipping vein-filled fissure. This vein was named the "Silver Queen".

By 1882, the "Silver Queen" shaft (Magma No. 1) was sunk to 400 feet with short cross-cuts north and south on the 100, 200, 300 and 400 foot levels. During this early period native silver was the most sought-after mineral leaving copper in the form of chalcocite

practically unwanted. In 1893, the price of silver dropped and production virtually stopped at the "Silver Queen".

The Second Period: The second period of activity for the "Silver Queen" began approximately in 1906. With the location and development of replacement ore on the Martin Limestone and Troy Quartzite contact in the nearby Lake Superior and Arizona Mine, engineers Andrus, Flindt, Gunn, Thompson and Krumb were of the opinion that this same contact had good possibilities of producing ore. In exploring this contact, it became evident that the "Silver Queen" vein and not the Martin and Troy contact was going to be the chief producer. Rich ore shoots of supergene chalcocite, bornite and chalcopyrite were encountered with the deepening of No. 1 shaft. During this time (1910) Magma Copper Company was formed. By 1912, the operating staff consisted of W. C. Browning, General Manager, E. H. Lundquist, Mine Superintendent, and I. A. Ettlinger, Chief Engineer. With this staff Magma began to explore, develop and produce zinc, copper, gold and silver. When shaft sinking passed the 800 foot level the ore in the Magma Vein (Silver Queen) instead of occurring in lenses and pockets, became more continuous. Because of this, and from thin-section studies by Short and McLaughlin, it was shown that the bornite and chalcopyrite were of a primary nature. Thus exploration and development were advanced.

By 1925, when William Koerner became General Manager, No. 2, 3 and 4 shafts were being sunk and the mine was down to the 2250 level. Improvements in transportation, milling and smelting continued.

In 1940 Ed Dentzer succeeded Mr. Koerner as General Manager. By this time No. 5, 6, 7 and 8 shafts had been collared and the mine was

now down to the 4000 foot level.

In drilling for water an ore-producing fault zone, known as the Koerner Vein, was located about 1200 feet south and nearly parallel to the Magma Vein. From drifting and raising on the 3600, 3800 and 4000 levels in this vein, the ore appeared to be of similar character to the Magma Vein. Bornite and chalcopyrite were the major ore minerals with lesser amounts of tennantite and hypogene chalcocite.

Mr. W. P. Goss became General Manager in 1944. With the shortage of manpower during the war, extensive development was lost with a subsequent decline in production.

The Third Period: The third period in Magma's history began with renewed interest in the Troy Quartzite-Martin Limestone Contact to the east and in the possibility of finding replacement ore at the intersection of the Martin Limestone and the Magma Vein. Drifting east was started on the 2550, 3000 and 3400 levels along the Magma Vein to check this intersection. A report on the East Replacement beds will be given by Mr. Ward.

At the present time the deepest producing level is 4600 with explorational drifting on the 4800 level. Because of the demanding requirements of ventilation (161° rock temperature on 4800), ore production and exploration are dependent on an adequate supply of air. Due to the extreme rock temperature, it is necessary to group together stoping and development wherever a working temperature can be maintained.

ORGANIZATION OF GEOLOGY DEPARTMENT

The primary function of any department in a mining organization is to aid in the winning of mineable ore. This is especially true in

regard to the geology department. Often, if not carefully supervised, the geology department will assume a more or less passive role in its operation and in time become just a record keeper. It is the ambition of Magma to maintain an active and functional organization which should be a direct aid to the mining department.

There are three main functions of equal importance assumed by the geology department at Magma: geologic mapping, sampling and directing the diamond-drill program.

GEOLOGIC MAPPING

With the use of base maps constructed by the engineering department all drifts and cross-cuts are mapped in detail in regard to faults, type of wall-rock and general grade of ore. Raises are located with the help of preliminary sections showing projected fault-zones, vein position and wall-rock type. Each floor of the raise is mapped as it is driven. Stope geology is undertaken only whenever necessary. If a particular section of the mine becomes quite complicated with vein branching or complex faulting, then a series of floor-plans and sections are constructed to aid in stope planning. Most mapping of the mine is recorded on 10-20-50 and 100 scale. The 10 scale is primarily used for geologic and assay sections of raises. Twenty scale is used for drifts, cross-cuts and east-west sections along the vein. Fifty scale is a convenient scale for an over-all picture of the operation. A complete set of 50-scale level plans are maintained in cooperation with the engineering department. One hundred scale maps were used by Dr. J. K. Gustafson in his very comprehensive geological survey of the Magma Mine. This series of maps has proven to be valuable in the intrepretation of the geology of the mine.

SAMPLING

The question may arise as to why the Geology Department concerns itself with the actual process of sampling. It is believed by this department that there can be a close relationship between sampling and geologic mapping. As a sample is taken, much information about structure and the character of the vein can be determined. All development such as drifts, raises, cross-cuts, etc. are sampled if any mineralization or vein is exposed. Stopes are sampled if the Mining Department requests it. Horizontal channel sampling is used primarily because of the nearly vertical attitude of the vein. In outlining mineable ore in stopes the taking of sludge samples from extension steel drilling has proven effective up to a length of about 30 feet. Assay returns are plotted on assay plans and sections and made available to the mining department as soon as possible.

DIAMOND DRILL PROGRAM

The Diamond Drill Program consists of two phases in its operation. The first phase would be its use in aiding the mining department in solving immediate problems such as drilling from stopes and raises to get detailed information and the drilling for the extension of known ore shoots. The second phase would be long range exploration. This would include location of long scout holes and investigation of problems requiring extensive drilling.

The recovered diamond drill core is logged according to type of rock, mineralization and percent of recovery. All cores showing mineralization is split lengthwise and a half is sent to the assay office and the other half is saved. This saved core and a skeltonized portion of the remaining core is stored in numbered trays for future reference.

MAGMA MINE (F)

Triple Nichol, Inc.

Rural Route 1, Box 123N
1750 North Broad Street

Globe, Arizona 85501
Monty Nichols, Contractor

Telephone 425-7006
425-8116 / 425-8117

STATE MINE INSPECTOR

OCT 12 1989

October 10, 1989

MSAH
Phoenix Field Office
3221 North 16th Street
Suite 300
Phoenix, AZ 85016

Dear Sir:

This letter will serve as our official notification that Triple Nichol, Inc. will be working for Magma Copper Company, Superior Operation. We will be mining, hauling and crushing limestone at their #5 Shaft Site.

Working on this project should begin on October 23, 1989 and will last approximately six weeks. We will have six employees of Triple Nichol, Inc. working on this project. Also we will have subcontractors working on this project.

If you need any other information you may call our office at 602-425-7006.

Sincerely,

Jackie Hesketh
Secretary

JH/jh

CC:MSHA
P. O. Box 25367
Denver, CO 80225

State Mine Inspector
1616 West Adams Suite 411
Phoenix, AZ 85007-2627

Magma Mine (A)

FOR IMMEDIATE RELEASE
February 22, 1990

SAN MANUEL, ARIZONA -- John L. Dorsey, 36, Tucson, Arizona, has been appointed General Manager of the Superior (Arizona) Division of Magma Copper Company (AMEX-MCU).

Magma President and CEO, J. Burgess Winter, said Dorsey is being assigned to the Superior Division to bring on-stream, in the 3rd quarter of this year, the historic underground Magma mine which has been shut down since 1982.

Dorsey joined Magma in 1976 as a mine planning engineer following graduation from the University of Arizona, Tucson, where he earned the B.S. Degree in Systems Engineering.

At Magma's San Manuel operations, Dorsey has served as Chief Planning and Geological Engineer, Planning Director and, since 1989, has been Corporate Planning Director.

The company is presently dewatering the mine and rehabilitating the shafts, underground openings, and the concentrator in preparation for resuming production at the planned rate of approximately 1,000 tons of ore per day at the unusual high grade of 5.9% copper.

# # #

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DEPT OF MINES & MINERAL RESOURCES

NEWS FROM MAGMA
MAGMA COPPER COMPANY
P. O. Box M, San Manuel, Arizona 85631
Public Relations Officer—Frank Harris (602) 385-3256/385-2153

Notes from AZ Geological Society 1995 Fall field trip to the Superior District.
Nyal Niemuth, AZ Dept. of Mines and Mineral Resources, October 1995

Brief history of the Magma area.

1875	Discovery.
1910	Property optioned by Thompson.
1912	Magma Copper Co. was formed.
1948	The first replacement deposit, the A bed, was discovered.
1965	The B, C, and D replacement beds were discovered. Hosted in the Mississpian Escabrosa and Permian Naco Formations.
1966	The Magma vein was abandoned, ore was left in the vein but at 4800' below the surface the Pinal schist was near plastic with the high temperature conditions present.
1977	The Magma #9 shaft, 22' diameter, 2 compartment was constructed in 1973.
1982	The mine was closed and allowed to flood.
1986	The decision to dewater and reopen was made.
1987	Magma was spun off from Newmont.
1990	Production resumed.

Misc. notes

Present production is 1300 to 1800 tons per day at 5% copper. Total reserve at 5% was about 28 million tons. Less than 1 ppm Au and less than 1 oz per ton Ag. Present production is 1300 to 1800 tons per day at 5% copper. Total reserves at 5% were about 28 million tons. Less than 1 ppm Au and less than 1 oz per ton Ag.

A large zinc sulfide resource remains east and above the main Magma ore body (approximately east of the #3 shaft and west of the #6 shaft). An estimate for the resource is 1 million tons of 5-7% zinc.

The main period of post mineral faulting in the Superior area began 55 MA.

8 months known reserves remain in the Magma replacement of ore bodies. Plans are to close the mine but to leave the pumps that dewater the mine running.

Some manganese oxide mines are present east of the Magma mines also some thin silica hematite gold replacement deposits like the LSA mine. The transition to sulfides in the Magma replacements is not seen in the underground workings.

Replacement Stratigraphy

Bed A	in bottom of Martin, wide spread dolomite horizon
Bed B	top of Martin, generally not mined a lot
Bed C	main replacement bed, 10 M ton at 5%, Replace up to middle, sometimes entire Escabrosa
Bed D	Top Escabrosa
Bed E	Bottom Naco, dolomite with chert and limestone, some Karst at the base of the Escabrosa

Feeder may have been North boundary fault. lots of mineralization between fault and Magma vein

Ore mineral types : 1) < 1% copper 2) specularite, pyrite, chalcopyrite 3) Pyrite, chalcopyrite, bornite 4) Massive bornite

There are mantos within mantos, sulfide replacing hematite

Talc alteration in Limestone sometimes replaces chert, is sometimes is a local and regional effect.

FOR IMMEDIATE RELEASE
December 18, 1990

MAGMA Contact: Richard Johnson
(602) 575-5670
Alta Contact: Bruce Whitehead
(801) 531-9768

MAGMA COPPER AND ALTA GOLD
PURCHASE ROBINSON MINING DISTRICT

TUCSON, Arizona - Magma Copper Company (AMEX:MCU) and Alta Gold Co. (NASDAQ:ALTA) have purchased the 12,000-acre Robinson Mining District from Kennecott Corp. following multiparty transactions.

Magma Copper has acquired and consolidated a 51% interest in the property ownership and mineral interests in the property, and Alta Gold now holds a 49% interest in the mining district.

Magma has paid $10.2 million to Kennecott to acquire the 51% interest in the Robinson copper property and $10.5 million to Alta Gold and Echo Bay, Inc. to acquire a 51% interest in the existing gold operation. The $10.5 million includes $5.5 million paid to Alta Gold for 1.67 million shares of Alta Gold stock which Magma had previously purchased and has now returned.

Alta Gold, for its 49% interest, paid approximately $2.0 million, having received credits for royalties totalling approximately $8.0 million paid to Kennecott from gold mining operations conducted on the property.

Future development and operating activities will be conducted in a joint venture with Alta Gold Co.

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NEWS FROM MAGMA
MAGMA COPPER COMPANY
7400 North Oracle Road, Suite 200
Tucson, Arizona 85704 (602) 575-5600

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MINE

Feasibility studies completed to date indicate potential to develop nearly 200 million tons of ore containing 0.68% copper and 0.012 ounces of gold per ton of ore. The deposit could yield over 2.5 billion pounds of copper and over 1.2 million ounces of gold over an 18 year mining life. According to the study, development costs in excess of $200 million would be required to re-establish copper mining in the district. Continuing feasibility and development work is planned for 1991.

The existing shallow gold deposits have adequate known reserves to support operations for approximately four to five more years at a rate of 50 - 70 thousand annual ounces. The property is considered to have additional gold exploration potential.

Burgess Winter, Magma's CEO, sees this acquisition fitting perfectly into Magma's strategic plan. "One of my concerns was the lack of long term copper reserves to ensure that concentrates produced by Magma controlled mines supplied the majority of the feedstock for our large smelting/refining complex for the long term. The development of the Robinson property, apart from being a low cost copper producer and a significant gold producer, could supply quality feedstock for the smelter for twenty years."

Magma is a major primary copper producer with underground, and open pit mines at San Manuel, Superior, Miami, and Prescott, Arizona and a large smelter, refinery, and rod casting plant in San Manuel.

more---

Dan S. Bushnell, Chairman and Chief Executive Officer of Alta Gold, indicated the joint venture with Magma Copper is a major milestone accomplishment which will position his company for long-term growth as a diversified mining company.

Alta Gold, in addition to operations at the Robinson District, also has three other open pit gold mines and an underground zinc-copper-silver-lead-cadmium mine, all in Nevada. Alta Gold also is a 33.3% partner in the recently commissioned Cyanco sodium cyanide manufacturing facility near Winnemucca, Nevada.

# # #

Magma Company Tr 12-1663

Contact - Richard P. Johnson, Corporate Treasurer (602) 575-5670

MAGMA COPPER RECEIVES UNION RATIFICATION FOR 15 YEAR LABOR AGREEMENT

TUCSON, Arizona, October 22, 1991 - Magma Copper Company (AMEX: MCU) today announced that late last night its labor unions ratified an unprecedented, fifteen-year labor agreement eight months before the expiration of the Company's present labor contract.

This long-term agreement commits Magma and the Unions, representing the Company's San Manuel and Pinto Valley operations, to a fifteen-year contract, with established economic terms and conditions for an initial contract period commencing November 1, 1991, and ending June 30, 1997. The contract calls for Magma and the Unions to establish new economic terms in the fifth year. A particularly unique feature of the agreement is that, if the parties are unable to reach a collective agreement on new economic terms by July 1, 1997, they will agree to submit to mutually binding arbitration for a one-year period. If at the end of that year the parties still fail to reach a collective agreement on future economic terms, the binding arbitration process can be invoked by either party for a second one-year period.

Marsh Campbell, Vice President, Human Resources, commented, "In essence, the initial five-year contract terms and the provision for the arbitration panel eliminate the possibility of a strike or lockout for close to eight years. In addition, the Company is committed to retaining the gainsharing programs, which were implemented July 1, 1991, throughout the initial five-year term of the agreement."

more---

NEWS FROM MAGMA
MAGMA COPPER COMPANY
7400 North Oracle Road, Suite 200
Tucson, Arizona 85704 (602) 575-5600

Contact - Richard P. Johnson, Corporate Treasurer (602) 575-5670

MAGMA COPPER COMPANY
REPORTS RECORD NET INCOME OF $84.4 MILLION FOR 1990

TUCSON, Arizona, January 31, 1991 - Magma Copper Company (AMEX-MCU) today reported record net income for the year ended December 31, 1990 of $84.4 million or $2.02 per common share, a 44% increase over the 1989 net income of $58.5 million or $1.43 per common share.

Net income for the fourth quarter of 1990 was $20.4 million or $0.49 per common share, compared to $5.9 million or $0.14 per common share for the fourth quarter of 1989. Per common share amounts are based on weighted average shares outstanding on a fully diluted basis for the respective periods.

Net cash provided by operating activities in 1990 was $145.4 million compared to $92.8 million in 1989, an increase of 56%, resulting in a cash balance of $113.6 million as of December 31, 1990.

"Magma employees should feel proud of the achievement of record net income despite slightly lower copper prices during 1990.", said J. Burgess Winter, Magma President and Chief Executive Officer, "The record results were primarily due to the attainment of full-capacity smelter performance and increases in productivity which in turn resulted in significant production cost reductions

more---

NEWS FROM MAGMA
MAGMA COPPER COMPANY
7400 North Oracle Road, Suite 200
Tucson, Arizona 85704 (602) 575-5600

throughout the year. Our cash position remains strong despite using $37.5 million to repay all bank debt and another $20.7 million for the acquisition of a 51% interest in the Robinson Mining District in Nevada during 1990. These events further demonstrate our progress towards achieving our strategic plan by increasing financial stability and profitability and acquiring high quality copper reserves to ensure the long-term supply of smelter feedstock," added Winter.

Sales were $767.3 million for 1990 and $178.0 million for fourth quarter 1990, compared to $650.0 million and $190.0 million for the same periods in 1989, respectively. The average price realized per pound of refined copper sold, including rod conversion premiums, was $1.19 for 1990 and $1.18 for fourth quarter 1990, compared to $1.22 and $1.15 for the same periods in 1989, respectively.

Magma sold 588.1 million pounds of copper, including copper purchased from third parties, during 1990 and 133.8 million pounds of copper during fourth quarter 1990, compared to 461.6 million pounds and 146.4 million pounds for the same periods in 1989, respectively.

Magma's refined copper production, excluding custom smelting and refining operations, was 469.8 million pounds for 1990 and 122.1 million pounds for fourth quarter 1990, compared to 349.9 million pounds and 84.7 million pounds for the same periods in 1989, respectively.

more---

Magma produced a record 115.7 million pounds of refined copper from lower-cost leaching/solvent extraction-electrowinning processes during 1990, a 24% increase from 93.1 million pounds produced in 1989.

Magma Copper Company is one of the largest primary copper producers in the United States. Magma produces high-quality copper cathode and rod for sale to customers worldwide. Corporate headquarters are in Tucson, Arizona with operations in San Manuel, Miami, Superior and Humboldt, Arizona and in the recently acquired Robinson Mining District near Ely, Nevada. Magma's smelter represents approximately 21% of the United States' smelting capacity.

Financial and operating results follow.

MAGMA COPPER COMPANY

Selected Financial and Operating Data
(In millions, except per pound amounts)

	Three Months ended December 31,		Twelve Months ended December 31,	
	1990	1989	1990	1989
Electrolytic pounds produced from:				
Magma sources-				
Electrorefined	93.0	61.9	354.1	256.8
Electrowon (SXEW)	29.1	22.8	115.7	93.1
Total Magma source	122.1	84.7	469.8	349.9
Puchased concentrates	7.9	23.7	77.8	27.1
Other purchases	.7	3.9	8.1	12.9
Toll customers	46.2	33.8	119.8	146.4
Total electrolytic production	176.9	146.1	675.5	536.3
Pounds sold from:				
Magma sources	119.1	115.5	489.8	405.6
Purchased concentrates	7.9	23.7	77.8	27.1
Other purchases	6.8	7.2	20.5	28.9
Total sales quantities	133.8	146.4	588.1	461.6
Sales of copper	$157.4	$168.6	$697.1	$565.4
Price realized per pound	$ 1.18	$ 1.15	$ 1.19	$ 1.22
Cost of products sold:				
Cost of copper sold-				
Magma sources	$100.5	$100.7	$413.3	$344.5
Purchased concentrates	8.9	26.5	85.0	29.9
Other purchases	7.5	8.1	23.2	35.8
Tolling	5.8	7.7	18.6	30.5
Other	4.0	7.1	16.8	24.6
Total cost of products sold	$126.7	$150.1	$556.9	$465.3
Per pound cost of products sold:				
Magma sources				
Before credits	$ .84	$ .87	$ .84	$ .85
Credits (1)	(.13)	(.09)	(.10)	(.13)
Net	$ .71	$ .78	$ .74	$ .72
Purchased concentrates	$ 1.12	$ 1.12	$ 1.09	$ 1.10
Other purchases	$ 1.11	$ 1.13	$ 1.13	$ 1.24

(1) Deductions for rod premiums and profits on by-products, custom processing and toll conversion.

MAGMA COPPER COMPANY
Summary Satement of Consolidated Income
(In thousands, except per share amounts)

	Three Months ended December 31,		Twelve Months ended December 31,	
	1990	1989	1990	1989
Sales	$177,993	$189,998	$767,324	$649,963
Cost of sales:				
Cost of products sold	(126,669)	(150,068)	(556,941)	(465,298)
Depreciation, depletion and amortization	(8,518)	(8,462)	(33,366)	(30,735)
General and administrative	(3,076)	(2,785)	(11,393)	(10,066)
Marketing and delivery	(3,377)	(4,937)	(14,704)	(13,436)
Provision for asset write-down	--	(3,500)	--	(3,500)
Income from operations	36,353	20,246	150,920	126,928
Other income (expense):				
Interest expense	(13,995)	(14,775)	(58,037)	(59,854)
Interest Income	2,878	872	8,024	2,367
Other	88	293	7,766	741
Income before income taxes and extraordinary item	25,324	6,636	108,673	70,182
Income tax provision	(5,754)	(874)	(28,243)	(21,168)
Income before extraordinary item	19,570	5,762	80,430	49,014
Extraordinary item:				
Utilization of net operating loss carryforward	814	97	3,994	9,478
Net income	$ 20,384	$ 5,859	$ 84,424	$ 58,492
Preferred stock dividends	(1,535)	(1,547)	(6,468)	(6,702)
Net income available for common stock	$ 18,849	4,312	$ 77,956	$ 51,790
Earnings per share of common stock, primary	$ .64	$ .15	$ 2.65	$ 1.82
Average common shares outstanding, primary	29,362	28,431	29,362	28,431
Earnings per share of common stock, fully diluted	$ .49	$ .14	$ 2.02	$ 1.43
Average common shares outstanding, fully diluted	41,717	40,787	41,717	40,787

# # #

MAGMA COPPER COMPANY
Consolidated Balance Sheets
(In thousands)

	December 31 1990	December 31, 1989
Assets		
Current Assets:		
Cash & short-term investments	$ 113,626	$ 49,361
Accounts receivable	52,392	50,684
Inventories:		
Metals	72,862	95,215
Materials and supplies	29,669	34,451
Prepaid expenses	2,282	795
Total current assets	270,831	230,506
Property, Plant and Mine Development, net:		
Mining claims and land	33,069	30,615
Equipment and buildings	484,777	497,954
Deferred mine development costs	195,179	169,338
Net property, plant and mine development	713,025	697,907
Other	20,360	25,723
Total Assets	$1,004,216	$954,136
Liabilities and Stockholders' Equity		
Current Liabilities:		
Accounts payable	$ 10,543	$ 14,937
Accrued liabilities	51,671	61,036
Current portion of long-term debt	--	13,750
Income taxes payable	6,956	--
Total current liabilities	69,170	89,723
Accrued Pension, Retirement and Facility Abandonment Costs	15,647	19,138
Deferred Income Taxes	22,305	11,017
Long-Term Debt	362,852	384,929
Stockholders' Equity:		
Series B Cumulative Convertible Exchangeable Preferred Stock	9	9
Class B common stock	291	282
Capital in excess of par value	418,634	411,982
Retained earnings	117,023	39,067
Dividend payable in common stock	1,075	1,192
Unearned stock grant compensation	(2,790)	(3,203)
Total stockholders' equity	534,242	449,329
Total Liabilities and Stockholders' Equity	$1,004,216	$954,136

MAGMA COPPER COMPANY

Consolidated Statements of Operations
(In thousands, except per share amounts)

	Three months ended December 31,		Twelve months ended December 31,	
	1990	1989	1990	1989
Sales	$177,993	$189,998	$767,324	$649,963
Cost of sales:				
Cost of products sold	(126,669)	(150,068)	(556,941)	(465,298)
Depreciation, depletion and amortization	(8,518)	(8,462)	(33,366)	(30,735)
General and administrative	(3,076)	(2,785)	(11,393)	(10,066)
Marketing and delivery	(3,377)	(4,937)	(14,704)	(13,436)
Provision for asset write-down	--	(3,500)	--	(3,500)
Income from operations	36,353	20,246	150,920	126,928
Other income (expense):				
Interest expense	(13,995)	(14,775)	(58,037)	(59,854)
Interest Income	2,878	872	8,024	2,367
Other	88	293	7,766	741
Income before income taxes and extraordinary item	25,324	6,636	108,673	70,182
Income tax provision	(5,754)	(874)	(28,243)	(21,168)
Income before extraordinary item	19,570	5,762	80,430	49,014
Extraordinary item: Utilization of net operating loss carryforward	814	97	3,994	9,478
Net income	$ 20,384	$ 5,859	$ 84,424	$ 58,492
Preferred stock dividends	(1,535)	(1,547)	(6,468)	(6,702)
Net income available for common stock	$ 18,849	$ 4,312	$ 77,956	$ 51,790
Earnings per share, primary:				
Income before extraordinary item	$ .66	$ .20	$ 2.73	$ 1.72
Extraordinary item: Utilization of net operating loss carryforward	.03	--	.14	.34
Net income	$ .69	$ .20	$ 2.87	$ 2.06
Preferred stock dividends	(.05)	(.05)	(.22)	(.24)
Earnings per share of common stock	$ .64	$ .15	$ 2.65	$ 1.82
Earnings per share, assuming full dilution:				
Net income	$ .49	$ .14	$ 2.02	$ 1.43

MAGMA COPPER COMPANY

Computation of Per Share Earnings
(In thousands, except per share amounts)

	Three months ended December 31,		Twelve months ended December 31,	
Primary	1990	1989	1990	1989
Weighted average common shares outstanding	29,362	28,431	29,362	28,431
Earnings used in per common share computation:				
Net income	$20,384	$ 5,859	$84,424	$58,492
Preferred stock dividends	(1,535)	(1,547)	(6,468)	(6,702)
Net income available for common stock	$18,849	$ 4,312	$77,956	$51,790
Earnings per share:				
Income before extraordinary items and preferred stock dividends	$ .66	$ .20	$ 2.73	$ 1.72
Extraordinary Items:				
Utilization of net operating loss carryforward	.03	--	.14	.34
Net income	$ .69	$ .20	$ 2.87	$ 2.06
Preferred stock dividends	(.05)	(.05)	(.22)	(.24)
Earnings per share of common stock	$ .64	$ .15	$ 2.65	$ 1.82
Assuming full dilution				
Weighted average common shares outstanding	41,717	40,787	41,717	40,787
Earnings used in per common share computation:				
Net income	$20,384	$ 5,859	$84,424	$58,492
Earnings per share:				
Net income	$ .49	$ .14	$ 2.02	$ 1.43
Computation of weighted average shares outstanding-fully diluted				
Primary weighted average shares outstanding	29,362	28,431	29,362	28,431
Assuming full dilution:				
Conversion of Series B Preferred Stock (930,000 shares at 14.2857 conversion rate)	13,285	13,286	13,285	13,286
Preferred stock dividends payable in common stock	(930)	(930)	(930)	(930)
Fully diluted weighted average shares outstanding	41,717	40,787	41,717	40,787

MAGMA COPPER COMPANY

Consolidated Statements of Cash Flows
(In thousands)

	Three months ended December 31,		Twelve months ended December 31,	
	1990	1989	1990	1989
Net income	$ 20,384	$ 5,859	$ 84,424	$ 58,492
Adjustments to reconcile net income to net cash provided by operating activities:				
Depreciation, depletion and amortization	8,518	8,462	33,366	30,735
(Gain) loss on sale of assets	60	178	(1,983)	198
Other	521	492	2,162	2,495
Change in certain assets and liabilities:				
(Increase) decrease in:				
Accounts receivable	5,648	3,142	(1,708)	19,023
Inventories	(3,438)	7,015	26,682	(20,507)
Prepaid expenses	904	1,337	(1,487)	185
Increase (decrease) in:				
Accounts payable and accrued expenses	(3,765)	16,059	(10,809)	2,400
Income taxes payable	525	(1,414)	6,956	(1,111)
Accrued pension and facility abandonment costs	(1,591)	(362)	(3,491)	(9,556)
Deferred income taxes	1,615	685	11,288	10,440
Total adjustments	8,997	35,594	60,976	34,302
Net cash provided by operating activities	29,381	41,453	145,400	92,794
Cash flows from investing activities:				
Capital expenditures	(32,134)	(8,274)	(54,358)	(46,647)
Proceeds from sale of assets	132	(33)	8,880	237
Other	6,366	(1,160)	1,843	(642)
Net cash used in investing activities	(25,636)	(9,467)	(43,635)	(47,052)
Cash flows from financing activities:				
Long-term borrowing	--	--	--	33,000
Long-term debt repayment	--	(6,900)	(37,500)	(132,400)
Issuance of Reset Debentures	--	--	--	100,000
Debt issuance costs	--	--	--	(3,526)
Preferred stock dividends - cash portion	(459)	(354)	(1,673)	(1,397)
Issuance of non-interest-bearing notes	459	354	1,673	1,397
Net cash provided (used) by financing activities	--	(6,900)	(37,500)	(2,926)
Net increase in cash	3,745	25,086	64,265	42,816
Cash at the beginning of the period	109,881	24,275	49,361	6,545
Cash at the end of the period	$113,626	$ 49,361	$113,626	$ 49,361
Supplemental disclosure of cash flow information:				
Cash paid during the year for -				
Interest	$ 16,985	$ 16,913	$ 55,762	$ 56,187
Income taxes	$ 2,800	$ 3,348	$ 10,815	$ 12,849

Magma Cu Co, Superior Div (F)
1C

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
215 Fremont Street
San Francisco, Ca. 94105

Certified Mail: 007796748

12 JUL 1988

Eldon D. Helmer
Environmental Director
Magma Copper Company
P.O. Box 37
Superior, AZ 85273

Dear Mr. Helmer:

Enclosed is a copy of the draft permit, statement of basis and public notice of our proposed action on your application for a National Pollutant Discharge Elimination System (NPDES) permit for:

Magma Copper Company
Superior, Arizona
NPDES Permit No. AZ0020389

The public comment period is from July 13, 1988 to August 13, 1988. Comments on the proposed action, or a request for a public hearing pursuant to 40 CFR 124.12, may be submitted to this office within 30 days following the date of this public notice.

If the Regional Administrator finds a significant degree of public interest exists with respect to the proposed permit, a public hearing shall be held. If no hearing is held, we expect to forward the permit containing the final determinations of the Regional Administrator shortly after the close of the 30-day comment period.

If you have any questions regarding the draft permit, please call Jon Hangarnter of my staff at (415) 974-8299.

Sincerely,

Kenneth D. Greenberg

Kenneth D. Greenberg, Chief
Permits Issuance Section

RECEIVED
JUL 18 1988

Enclosure

cc: ADEQ, Water Permits Unit

18 JUL 1988

JOINT NOTICE OF PROPOSED ACTION

by the

U.S. Environmental Protection Agency
Region 9 (W-5-1)
215 Fremont Street
San Francisco, CA 94105
Telephone: (415) 974-8299

Arizona Department of Environmental Quality
2005 N. Central Avenue
Phoenix, AZ 85004
Telephone: (602)257-2270

On Application for a National Pollutant Discharge Elimination System (NPDES) Permit to Discharge Pollutants to Waters of the United States

On Application for Certification for Compliance with Applicable Effluent Limitations and Appropriate Requirements of the State of Arizona

The Environmental Protection Agency (EPA), Region 9, San Francisco, California and the Arizona Department of Environmental Quality (ADEQ) are jointly issuing the following notice of proposed action under the Clean Water Act.

The Environmental Protection Agency, San Francisco, California, has received a complete application for a National Pollutant Discharge Elimination System (NPDES) Permit and has prepared tentative determination regarding the permit.

On the basis of a preliminary review of the requirements of the Clean Water Act, as amended, and implementing regulations, the Regional Administrator, Environmental Protection Agency, Region 9, proposes to issue an NPDES permit to discharge to the following applicant, subject to certain effluent limitations and special conditions:

Magma Copper Company
Superior Division
P.O. Box 37
Superior, Arizona 85273

NPDES Permit No. AZ0020389

The applicant mines and concentrates copper ore for smelting and refining at other facilities. The proposed permit allows discharge of process wastewater, mine drainage, and stormwater runoff to an unnamed ditch tributary to Queen Creek at Latitude 33°17'15"N, Longitude 111°06'54"W. Queen Creek has protected uses of Aquatic and Wildlife, Domestic Water Source and Agriculture Livestock Watering. The proposed permit is based on Best Available Technology for the Ore Mining and Dressing Point Source Category, and allows no discharge from this facility except overflow from wastewater control facilities in the event of a precipitation event greater than a 10-year 24-hour storm. If such discharge occurs, the permit contains water quality based effluent limitations for Arsenic, Cadmium, Copper, Lead, Mercury, Selenium, Zinc, and pH. Monitoring is also required for flow and Suspended Solids, but no limits are set.

The State of Arizona is considering a request to certify the discharges described above, pursuant to Section 401 of the Clean Water Act. The certification will set forth any limitations and monitoring requirements necessary to assure compliance with water quality standards under Section 303, areawide waste treatment management plans under Section 208(e), effluent limitations under Sections 301 and 302, standards of performance under Section 306, or prohibitions, effluent standards or pretreatment standards under Section 307 of the CWA, and any other appropriate requirement of State law.

The State may certify a draft permit and specify conditions which are more stringent than those in the original draft permit, where the State finds such conditions necessary to meet the requirements of the CWA. For each more stringent condition, the certifying State agency shall cite the CWA or State law references upon which that condition is based. Review and appeals of limitations and conditions attributable to State certification shall be made through the applicable procedures of the State.

The ADMINISTRATIVE RECORD for the DRAFT PERMIT, which includes the APPLICATION, DRAFT PERMIT, STATEMENT OF BASIS, and all data sent by the applicant may be viewed Monday through Friday from 9:00 A.M. until 4:00 P.M. at the EPA address below. A copy of these documents may be obtained by calling or writing to the addresses below:

U.S. Environmental Protection Agency, Region 9
Attn: Patrick Chan, (W-5-1)
215 Fremont Street
San Francisco, CA 94105

Telephone: (415)974-8299

Arizona Department of Environmental Quality
Attn: Wayne H. Palsma - Room 202
2005 North Central Avenue
Phoenix, AZ 85004

Telephone: (602)257-2270

Persons wishing to comment upon or object to the proposed determinations or request a public hearing pursuant to 40 CFR 124.12 should submit their comments or request in writing within thirty (30) days from the date of this notice, either in person or by mail to the addresses shown above.

All comments or objections submitted within thirty (30) days from the date of this notice will be considered in the formulation of the final determinations regarding the application. If the response to this notice indicates a significant degree of public desire for a public hearing, the Regional Administrator shall hold one in accordance with 40 CFR 124.12. A public notice of such hearing will be issued at least thirty (30) days prior to the hearing. A request for a public hearing shall be in writing and shall state the nature of the issues proposed to be raised in the hearing.

If this DRAFT PERMIT becomes final, and there are no appeals, discharge from and operation of the identified facility may proceed or continue, subject to the conditions of the permit and other applicable permit and legal requirements.

A final decision to set the conditions and to issue the FINAL PERMIT, or to deny the APPLICATION for the permit, shall be made after all comments have been considered. Notice of the final decision shall be sent to each person who has sent or delivered written comments or requested notice of the final permit decision. The decision will become effective 30 days from the date of issuance unless:

1. a later effective date is specified in the decision; or
2. an evidentiary hearing is requested pursuant to 40 CFR 124.74. Any person may send or deliver, in writing, a request for an evidentiary hearing. Requests for an evidentiary hearing must state each legal or factual question alleged to be at issue, and its relevance to the permit decision. If the request is sent or delivered by a person other than the applicant. the person will simultaneously send a copy of the request to the applicant. A request for an evidentiary hearing must be sent or delivered to Patrick Chan at the address shown above within 33 days following the mailing of the final decision. If an evidentiary hearing is granted, applicable provisions of the permit will be stayed pending the outcome of the hearing; or
3. there are not comments requesting a change to the DRAFT PERMIT, in which case the final decision shall become effective immediately upon issuance.

Please bring the foregoing to the attention of all persons you know would be interested in this matter.

Date: 1 3 JUL 1988

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
215 Fremont Street
San Francisco, Ca. 94105

July 5, 1988

Supplemental Fact Sheet

Magma Copper Company, Superior Division
NPDES Permit No. AZ0020389

This Fact Sheet is a supplement to the Fact Sheet previously prepared by the Arizona Department of Environmental Quality on June 22, 1988. This supplement addresses changes made by EPA to the draft permit prior to public notice. Facility background information will not be repeated in this supplement.

EPA's proposed effluent limits for this facility are derived from the effluent limitations for the Ore Mining and Dressing Point Source Category at 40 CFR Part 440 Subpart J. At this facility process wastewaters (when operating), mine drainage, and stormwater runoff are commingled in a single wastestream. Best Available Technology (BAT) for controlling such discharges has been defined as no discharge. 40 CFR 440.131(c) provides for exemption from the no discharge requirement during storm flows if the facility is designed, constructed and maintained to contain the runoff from a 10-year 24-hour precipitation event and all process and mine drainage waters. The facility must also take all reasonable steps to minimize such overflow, and comply with permit notification requirements. However, this exemption from BAT requirements does not exempt the discharge from water quality based effluent limits required to protect Arizona Water Quality Standards. Such limits have been set for the following parameters: Arsenic, Cadmium, Copper, Lead, Mercury, Selenium, Zinc, and pH. Monitoring is also required for flow and Suspended Solids, but no limits are set.

Water Quality Standards for the waters impacted by this discharge are discussed in the previous fact sheet.

Fact Sheet - NPDES Permit No. AZ0020389

JUN 2 2 1988

Magma Copper Company
Superior Division
Post Office Box 37
Superior, Arizona 85273

I. Background

The Magma Copper Company has applied for a new National Pollutant Discharge Elimination System (NPDES) permit to allow the discharge of excess process water, mine drainage water and stormwater runoff. The new permit will replace their existing permit which expires August 31, 1988. The permit is drafted pursuant with Section 402 of the Clean Water Act.

II. Nature of Discharge - Standards - Limitations

Magma Copper Company, Superior Division, mines and concentrates copper ore for smelting and refining at other facilities. The operations are presently shut down. However, the operations may be reactivated at some time in the future. The proposed permit allows this facility to discharge routinely, subject to the limitations listed in the attached table. Stormwater runoff, mine drainage water and process water overflow may be discharged from waste control facilities without being subject to the limitations listed in the attached table if: (1) The waste control facilities are designed, constructed and maintained to contain the maximum volume of wastewater which would be generated by the facility during a 24-hour precipitation event (3.05 inches in 24 hours); (2) The facility takes all reasonable steps to maintain treatment of the wastewater and minimize the amount of overflow; and (3) The facility complies with the notification requirements listed in their permit. However, they are required to monitor all discharges for the items listed in the attached table. If a discharge does occur, it will be to an unnamed wash tributary to Queen Creek in the Middle Gila River Basin. Queen Creek has protected uses of Aquatic and Wildlife, Domestic Water Source and Agriculture Livestock Watering (R9-21-Appendix A). The corresponding criteria for pollutants of concern are listed in R9-21-Appendix B. The proposed discharge limits are listed in the attached table.

III. Additional Information

Additional information relating to this proposed permit may be obtained at either of the following locations:

Jon Hangartner (W-5-1)
U.S. Environmental Protection Agency
Region 9
215 Fremont Street
San Francisco, California 94105
Telephone: (415) 974-8336

JUN 2 2 1988

Wayne H. Palsma, Room 202
Office of Water Quality
Arizona Department of Environmental Quality
2005 North Central Avenue
Phoenix, Arizona 85004
Telephone: (602) 257-2270

WHP:mm

EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS based on a maximum flow of 5,677.5 m^3/day (1.5 mgd)

The permittee is authorized to discharge from outfall serial number 001.

Such discharges shall be limited and monitored by the permittee as specified below:

EFFLUENT CHARACTERISTICS	DISCHARGE LIMITATIONS Other Units(Specify) Monthly Average	Daily Max	MONITORING REQUIREMENTS Measurement Frequency	Sample Type
Flow (m^3/day)	**	**	Continuous	N/A*
Total Suspended Solids	20 mg/l	30 mg/l	Once/month	Composite
Arsenic (as As)	N/A	0.05 mg/l	Once/month	Composite
Cadmium (as Cd)	N/A	0.01 mg/l	Once/month	Composite
Copper (as Cu)	N/A	0.05 mg/l	Once/month	Composite
Lead (as Pb)	N/A	0.05 mg/l	Once/month	Composite
Mercury (as Hg)	N/A	0.0002 mg/l	Once/month	Composite
Selenium (as Se)	N/A	0.01 mg/l	Once/month	Composite
Zinc (as Zn)	N/A	0.05 mg/l	Once/month	Composite
pH	Not less than 6.5 standard units nor greater than 9.0 standard units. The discharge shall not cause the pH of the receiving water to change more than 0.5 standard units.		Once/month	Discrete

* N/A = Not Applicable

** Monitoring and reporting required. No limit set at this time.

ATTACHMENT

JUN 22 1988

STATE OF ARIZONA
DEPARTMENT OF MINERAL RESOURCES
MINERAL BUILDING, FAIRGROUNDS
PHOENIX, ARIZONA 85007

July 20, 1976

COPY

Mr. W. L. Parks
Executive Vice President
Magma Copper Company
P. O. Box M
San Manuel, Arizona 85631

Dear Mr. Parks:

Thank you very much for furnishing the Department of Mineral Resources with the 1975 production data for your Arizona mining operations.

Enclosed is a copy of the completed 1974-1975 tabulations for all large Arizona copper producers.

If the Department, or I, can be of assistance to you at any time, please contact us.

Sincerely,

Glenn A. Miller
Mineral Resources Specialist

Enclosure

GAM:pp

File: Magma Copper, Pink Reading, Yellow Alpha "M"
Copper Report, GAM File

COPPER PRODUCTION COSTS AT THREE LARGE ARIZONA MINES

Source: Companies' Annual Reports to Stockholders for Years 1951 and 1956

Note: These copper producers have no fabricating plants to affect their actual costs of copper production.

INSPIRATION:	1951	1956
Sales of Metals	$ 19,157,566	$ 29,654,403
Pounds copper and copper equivalent.	78,238,000	70,380,000
Costs-All except federal income taxes, depreciation and depletion.	$ 11,490,535	$ 15,627,155
Cost per lb. of copper before depreciation, depletion and federal income taxes.	$ .14687	$.22204
% Increase 1951 to 1956	51.18%	

MIAMI:		
Sales of Metals.	$ 24,345,106	$ 39,824,863
Pounds copper and copper equivalent.	100,600,000	95,234,000
Costs-All except federal income taxes, depreciation and depletion.	$ 16,868,850	$ 23,651,238
Cost per lb. of copper before depreciation, depletion and federal income taxes.	$ .16768	$ .24835
% Increase 1951 to 1956	48.11%	

MAGMA:		
Sales of Metals.	$ 11,922,198	$ 43,838,580
Pounds copper and copper equivalent.	49,265,000	104,833,000
Costs-All except federal income taxes, depreciation and depletion.	$ 9,375,620	$ 28,451,657
Cost per lb. of copper before depreciation, depletion and federal income taxes.	$ .19031	$ .27140
% Increase 1951 to 1956	42.61%	

Arizona Department of Mineral Resources

May 9, 1956

DEPARTMENT OF MINERAL RESOURCES
STATE OF ARIZONA
FIELD ENGINEERS REPORT

Mine MAGMA COPPER COMPANY Date 10/19/66

District PIONEER DISTRICT, PINAL COUNTY Engineer Lewis A. Smith

Subject: VISIT and Conference with Earnest Pitschel, Gen. Supt. 10/19/66.

Mr. Pitschel said that Mr. Wise, General Manager, was away for the day. Magma currently is employing 1116 persons. They are managing to break even despite short work time, logistic problems with ore and supply hauls, and heavy ground (partly caused by wet tailing gob and the orebody character).

Silica (Balsa Quartzsite) and limestone (Naco Limestone) quarry are now established on the ridge north of the mill. The haul to the smelter is about 2 miles. The Guzmans', of Superior, are hauling and mining both commodities under a contract, with Magma Copper Co.. This averages 150-200 tons of limestone and 200 to 250 tons of silica per week. (Guzman has several miscellaneous trucks and a Cat loader as well as a RD 8 Cat, wagon drills, etc.) According to Pitschel both products are very good. He was asked if, as in the case of Spreckles Sugar Co. who is seeking good lime, Magma could furnish this to outsiders. Pitschel said they preferred not to since they were not in that business, (however, some other good areas possibly could be leased to them if approved by the "Top Brass"); anyway they had not been approached.

MEETING OF THE PHOENIX COUNCIL ASMOA

March 17, 1959

MINERAL BUILDING, FAIRGROUNDS, PHOENIX, ARIZONA

Chairman Mackenzie called the meeting to order at 8:00 P.M. with 23 in attendance.

The minutes of the previous meeting were read and approved.

Mr. Mackenzie discussed the unfavorable implication of the proposed bill to establish a National Wilderness preservation system and called for a motion to name a representative of this Council to testify adversely at the hearing to be held by the sub-committee of the Senate Interior and Insular Affairs Committee.

Lewis Smith moved that Mr. Mackenzie be so designated and following seconding the motion was carried unanimously. Mr. Smith made additional comment upon the Wilderness Bill and its restrictive effect upon the natural resources industries of the nation and particularly upon the expanding economy of the western states.

Mr. Smith, as Program Chairman, introduced the speaker of the evening, Mr. Hugh Steele, Asst. Mine Supt. of the Magma Mine of Magma Copper Corporation. The subject of Mr. Steele's talk: "Mining Methods at Magma and San Manuel." Mr. Steele announced that he would confine himself principally to the Magma Mine since he had transferred from his position as assistant engineer for San Manuel over a year ago. Following is a brief summary of his talk.

The Magma Company was organized in 1910 and has operated the Magma Mine continuously since that time. The San Manuel Mine was acquired in 1944 and the project recently attained its production goal of 30,000 TPD.

The Magma vein strikes N 80°E, and to a depth of 800' dips north at 70°. It then is vertical to 1000', and from 1000' to the 4800' level which is the lowest working level in the mine the vein dips south 70°. No 5 shaft is currently sinking from 4800' to 4900' and the dip of the vein is becoming flatter (57 to 58°). The vein has been explored, and developed and mined, for a strike length of 9000'.

The east ore body was discovered some 6 or 7 years ago and it now accounts for approximately 60% of the mine's ore production. It is not an ore shoot along the vein but instead is a replacement in Devonian limestone under quartzite and extends 50 to 900' out into the beds away from the vein in both directions. The ore dips 30° west with the enclosing beds. Maximum thickness is 30 feet and average is 10 to 15 feet. The ore is mined by a modified long wall system which achieves an extraction of 95% or more of the ore. The level interval is 100' and 50' stope panels are carried upslope. Practically complete recovery of the pillars is realized. The greatest mining depth is 2900'. Exploration is now in progress on the 3400' and 3600' levels.

The stoping method is different in the west, the central and the east divisions of the mine.

In the west end of the mine the walls are chiefly Pinal schist which is rather incompetent and requires timber support. Shrinkage stoping was tried in the upper workings, but was not successful because of excessive dilution with waste from the walls. The method now in use is a square set cut and fill slot system (a modified form of the Mitchell slice system). The level interval is 200 feet and working raises are put up generally at 105' intervals along the strike of the vein. The usual stope length is 45'. Slots are cut across the full width of the vein for 3 sets in length on the vein. After a slot is carried up 3 or 4 floors a second slot is started and then a third slot when the second slot is 3 to 5 sets up and the first slot correspondingly higher. Fill is introduced when needed, usually when the first slot is up five floors, the second 3 floors and the third just beginning. Fill is derived principally from a glory hole in country rock. The glory hole is connected to the 4600' level by a raise and waste fill is drawn from the raise at various levels for use throughout the mine.

In the central division of the mine the walls are chiefly quartzite with some diabase. The walls here are more competent than in the schist area of the west end but not sufficiently firm to permit shrink stopes or stull timbering. The rock decrepitates especially when ventilation is poor. Mining in this central section is by rill stopes with floor slope of 20° and level intervals of 200'. Generally two incline cuts are taken between working raises and the ore slushed down slope. Then fill is placed and a floor of 2" x 10" lagging laid on the fill and another two cuts taken, etc. The walls and roof are controlled with bolts when needed. Where the ore widens to more than 12' or where looser than average ground is encountered square setting is resorted to. Also the rill stopes are finished at the top by square set method.

The mine was in its heyday, when mining was carried on in the depth interval 1800 to 2800'. The vein here reached widths up to 60' and some bornite stopes averaging 20 to 25% copper. For many years the ore has averaged 5½ to 6% Cu, above 2 oz. Ag and about .03 oz. Au. Currently 4 to 4½% Cu is considered the economical grade cut off and material of lesser grade is left in the mine.

There is no evidence to date of bottoming of the ore. The management believes that the depth limit will be determined by increased costs of mining rather than decline in grade of ore. Rock temperature on the 4800' level is 160°F and records indicate that a uniform increase of 1½° per 100' of depth is to be expected.

The Magma Mine and the San Manuel Mine offer a striking contrast in the types of ore deposit and method of mining. While both are underground mines Magma is a moderately high grade vein deposit and San Manuel is a very large low grade. (.80% Cu) porphyry deposit.

Unusual features of the San Manuel deposit are the great vertical thickness of ore and of the cap material, these being 1800' and 600' respectively. A Block

caving system is used and this is more or less conventional in most respects. However, because of the extreme thickness of the ore it will be caved in 3 vertical blocks each 600' thick. Mining of the upper third of the ore body is now in progress with the grizzly level laid out on the 1415' horizon. The first caving blocks were developed with very large areal dimension and they proved to be too large because of the excessive weight of ground to permit orderly control of caving. Present blocks are of smaller more manageable size. The original large blocks accomplished their prime purpose however which was to quickly initiate movement throughout the full thickness of the blocks.

Five main shafts were sunk: No. 1 for exploration and development and a twin shaft (No. 4) as a manway; No. 2 shaft, sunk in about the heart of the main ore body and served for planning and testing; the two twin shafts, A & B, were sunk on one end just outside the perimeter of the main ore body. These are the ore hoisting shafts.

The talk was followed by questions and comment from the floor ably monitored by Mr. Steele.

The meeting adjourned at 9:30 P.M.

Travis P. Lane, Secretary

MAGMA COPPER COMPANY: Taken from MINING WORLD-June, 1959 - Page 74

The No. 5 shaft, serving the western part of Magma Copper Company's Main Vein, will be deepened about 100 feet during the current year for development of the 4,900-foot level. Diamond drilling has indicated a substantial tonnage of good grade ore between the 4,800- and 4,900-foot levels. Magma's mine production in 1958 totaled 391,084 tons of ore assaying 5.66 percent copper, 0.03 ounce gold, and 1.46 ounce of silver per ton, compared to 442,134 tons assaying 5.36 percent copper, 0.03 ounce gold, and 1.37 ounces silver in 1957. Metal production in 1958 totaled 41,315,344 pounds copper, 12,623 ounces gold, and 552,009 ounces silver.

Information from MINE INSPECTOR'S OFFICE - August 15, 1957

MAGMA, Pioneer Dist. PINAL CO. 2-16-57
Superior

MAGMA CU CO. - New York,N.Y. CU, S, ZN
W.P. Goss, Pres. - Superior. Zn Shut down
W. P. Schmid, Sec. - New York
Supt - Augustad, Superior

38,500 tons - 866 men

L.A.S.

(1958) DARRELL GARDNER, Gen. Mgr., Superior, Ariz.

GARVIN L. AUGUSTADT, Gen. Supt. (AMC 1959)
24 Magma Heights, Superior, Ariz.
MAGMA COPPER COMPANY PINAL COUNTY
PIONEER DIST.

Mr. Van Vohries, of Magma, stated that they were mapping the geology south and east of Magma and were now about 3 miles to the south. The map, thus far compiled, shows a very intricate fault pattern, with major faults running north south at small angles to the east and west. These faults are closely disjointed by EW transverse faults giving the area the appearance of a checker board. A few spots of mineralization appeared to them as being of future interest.

L. A. SMITH
9-25-59 WR

COPPER PRODUCTION COSTS AT THREE LARGE ARIZONA MINES

Source: Companies' Annual Reports to Stockholders for Years 1951 and 1956

Note: These copper producers have no fabricating plants to affect their actual costs of copper production.

I N S P I R A T I O N:	1951	1956
Sales of Metals	$ 19,157,566	$ 29,654,403
Pounds copper and copper equivalent.	78,238,000	70,380,000
Costs-All except federal income taxes, depreciation and depletion.	$ 11,490,535	$ 15,627,155
Cost per lb. of copper before depreciation, depletion and federal income taxes.	$ .14687	$ .22204
% Increase 1951 to 1956	51.18%	

M I A M I:		
Sales of Metals.	$ 24,345,106	$ 39,824,862
Pounds copper and copper equivalent.	100,600,000	95,294,000
Costs-All except federal income taxes, depreciation and depletion.	$ 16,868,850	$ 23,651,238
Cost per lb. of copper before deoreciation. depletion and federal income taxes.	$ .16768	$ .24835
% Increase 1951 to 1956	48.11%	

K E N N E C O T T:		
Sales of Metals.	$ 11,922,198	$ 43,838,580
Pounds copper and copper equivalent.	49,265,000	104,833,000
Costs-All except federal income taxes, depreciation and depletion.	$ 9,375,626	$ 28,481,657
Cost per lb. of copper before depreciation, depletion and federal income taxes.	$ .19031	$ .27140
% Increase 1951 to 1956	42.61%	

Arizona Department of Mineral Resources

May 9, 1956

DEPARTMENT OF MINERAL RESOURCES
MINERAL BUILDING, FAIRGROUNDS
PHOENIX, ARIZONA

April 9, 1959

COPY

Mr. Hugh Steele, Assistant Superintendent
Magma Copper Company
Superior, Arizona

Dear Hugh:

The ASMOA group here, wishes to thank you for your fine talk on mining methods at Magma and San Manuel. Despite your protestations your talk was excellent and we all learned much. Please pass this on to Mr. Gardner and Mr. Goss.

Hoping to see you on my next trip through, I remain

Sincerely,

LEWIS A. SMITH
Field Engineer

LAS/H

STATE OF ARIZONA
DEPARTMENT OF MINERAL RESOURCES
MINERAL BUILDING, FAIRGROUNDS
PHOENIX, ARIZONA 85007

Magma

August 6, 1973

T. G. Chilton,
Assistant to the President,
Magma Copper Co.
P. O. Box 37
Superior, Arizona 85273

COPY

Dear Jerry:

I talked to Mark Gemmill. He did not realize he was still on the WGMAC Board. He said he should be replaced with someone. I did not visit him because he had a prostrate operation about a month ago and is still not feeling too well. He is in his middle eighties or so.

I had a telephone conversation with Andy Corcoran. He is quite concerned that WGMAC members will not be invited to the Governors' Conference. If they happen to be on the Governor's personal staff of course they will be invited. He wanted us to make sure one or two WGMAC members were part of the Governor's staff so they could come.

Can you start necessary action to recommend that Jim Richardson be appointed to replace Pep?

I was wondering about suggesting a coal representative to replace Mr. Gemmill. Peabody Coal has an office in Phoenix and perhaps could provide a good addition. When their addition comes on stream I think they will be the largest coal mine in the U. S.

Andy did say the Governor of Oregon was setting up for energy only on the minerals and energy crisis problem. This was apparently justification to omit WGMAC. A coal company representative is acknowledged as much energy oriented as well as mining.

Best Regards,

JOHN H. JETT,
Director.

JHJ:p
(dictated but not reread)

Magma Copper Company

SUPERIOR DIVISION
SUPERIOR, ARIZONA

March 11, 1967

ANNOUNCEMENT OF SPRING MEETING

Dear Member:

The Annual Spring Meeting of the Underground Division, Arizona Section of AIME will be held at the Superior Division of Magma Copper Company, Wednesday, April 26, 1967, in Superior, Arizona. It will be a one-day meeting.

Automobile parking is available at the Magma Copper Company, Superior Division, just back of the general office.

The program is as follows:

8:00 A.M.	Arrive Superior	Dress for Underground
9:00 A.M.	Proceed Underground	Tour Underground
12:30 P.M.	Leave Underground	Change for Lunch
2:00 P.M.	Luncheon	St. Mary's Center
3:00 P.M.	Technical Discussion Period	St. Mary's Center
5:00 P.M.	Cocktail Hour only with Dinner following	St. Mary's Center

Spring Meeting Adjourned.

Those planning on underground tour are requested to bring suitable clothing. Change room facilities are available.

Please return enclosed card by April 17th.

Meeting will be stag as is customary.

Some Hotel and Motel facilities available in Superior area:

Magma Hotel	689-2371	15 or 20 Units
El Portal Motel	689-2886	7 "
B & B Motel	689-2671	6 "
Copper Motel	689-5451	13 "
King James	689-2465	8 "
Copper Hills	473-2481	(Miami)(Available by prior reservation only)

Ernest Pitschel

E. O. Pitschel, Chairman
Underground Division
Arizona Section, A.I.M.E.

EOP:mk

STATE OF ARIZONA
DEPARTMENT OF MINERAL RESOURCES
MINERAL BUILDING, FAIRGROUNDS
PHOENIX, ARIZONA 85007

February 17, 1966

COPY

Mr. Fred Crosby, Chief Engineer
Magma Copper Co.
Superior Division
Superior, Arizona

Dear Fred:

I am sending you under separate cover three copies of our latest edition of Laws and Regulations Governing Mineral Rights in Arizona.

I enjoyed talking with you and we all hope the Superior Division continues to do well.

With kindest personal regards, I remain

Sincerely,

LEWIS A. SMITH
Field Engineer

LAS/H

Taken from - Ransome's Report, Contributions to Economic Geology, 1912
Pt. I, "Copper Deposits near Superior, Arizona"

p 143

The most noted mine in the vicinity of Superior is the Silver King, which was opened in 1875 and for many years produced high-grade silver ore from a deposit of the form commonly called by miners a "chimney." The mine ceased to be regularly productive about 1888 and has been continuously idle since 1898. In 1912 the ground was relocated, on the contention that it had been abandoned by its former owners. The production of the Silver King is variously reported as between $10,000,000 and $15,000,000. The lower figure is probably too high, but the Silver King Mining Co. is known to have paid dividends up to July, 1887, amounting to $1,950,000. The mine was worked through three shafts. The main shaft and large, compact compact stopes worked by square setting extend to a depth of 800 feet, below which a winze connects with the 950-foot level of the No. 2 shaft, which was used for pumping. The workings are now full of water.

pp 155-158

The Silver King mine was well described by W.P. Blake 30 years ago, but his original publication is not readily accessible. Accordingly, although the present paper is concerned mainly with the copper deposits, and although the old mine, being full of water could not be reexamined, a brief descriptive summary of the conditions under which the ore occurred will perhaps be of sufficient interest to warrant its inclusion here.

The eruptive mass which incloses the ore is a quartz diorite porphyry or closely related rock. It presents some rather noticeable variations, which Blake distinguished as "porphyry", "sienite," and "granite," although they appear to be merely facies of one intrusive body which is probably of Mesozoic age.

The ore body formerly cropped out at the top of a little hill about 75 feet high, composed of much-altered yellowish-brown to greenish gray porphyry. Stoping was carried to the surface and a crater-like pit from 100 to 125 feet in diameter marks the side of the former outcrop. Here and there in the porphyry walls of the pit may be found small veinlets of rich, partly oxidized silver ore, but, so far as can be seen from the surface, the ore body was not part of a vein, and there is nothing to suggest that it was determined by the intersection of two or more persistent fissures. It apparently was a compact plexus of veinlets inclosed in comparatively unfissured porphyry.

Blake's description and the maps of underground workings show that the ore body was a stockwork about 130 feet in maximum diameter, with a general dip of 70° W. The stockwork was disposed about an irregular core or axis of milk-white quartz, containing some bunches of rich ore but as a whole comparatively barren. This material is abundant and conspicuous in the mine dump and evidently constituted at times the bulk of the waste. The ore consisted of altered porphyry traversed in all directions by innumerable veinlets carrying stromeyerite, tetrahedrite, galena, sphalerite, chalcopyrite, and pyrite in a gangue of quartz with some barite. The minerals named were noted in 1912 on the dump, but

Blake lists and describes also native silver, argentite, bornite, calcite, and siderite. Bornite, chalcopyrite, and pyrite are said to have been comparatively rare. Blake makes the interesting observation that stromeyerite and high argentiferous tetrahedrite with more or less argentite were the most important constitutents of the ore on the upper levels, whereas argentiferous sphalerite had become the principal ore mineral on the seventh level. Native silver, associated with stromeyerite and sphalerite, was abundant on that level, according to the same observer. He also describes the metallic minerals as occurring generally along the medial plane of the veinlets, a characteristic that is verifiable in specimens collected on the dumps in 1912. Apparently the deposit was not deeply oxidized and veinlets seen in the open pit in 1912 showed sulphides present with cerargyrite, malachite, and azurite. Blake notes also native copper, cuprite, "oxides and carbonates of lead and possibly embolite, the chlorobromide of silver; also the argentite, in pure black lumps."

From the fact that water is now flowing from the collar of the No. 2 shaft the original water level was probably close to the surface. The quantity of water pumped to keep the mine clear near its maximum development in 1887 was 10,941 gallons a day. Blake states that at the time of his visit (1882 or 1883), when the mine was 714 feet deep, only 2,000 gallons a day was pumped, all of which entered the mine at the first or 114-foot level.

In the early stages of development, before there was a railroad in Arizona, some rich ore was shipped under great disadvantages. Blake states that some of this carefully sorted ore averaged $1,000 a ton, and as late as 1887 the superintendent, Mr. Arthur Macy, reported assays up to 447 ounces of silver to the ton in ore consisting chiefly of tetrahedrite. Subsequently two 20-stamp mills were built at Pinal, 5 miles from the mine. Some idea of the character of the ore during a rather late stage in the activity of the mine is obtainable from the company's report for 1887, wherein it is stated that mill No. 1, employing wet crushing and concentration, treated 2,698.75 tons of ore with an average content of 21.08 ounces of silver to the ton. The product was 577,813 tons of first-class concentrates averaging 834,135 ounces of silver to the ton and 31 per cent of lead. Of the total silver contents, 53.95 per cent was native silver. In addition the mill turned out 1,261.55 tons of second-class concentrates carrying 31.77 ounces of silver to the ton, chiefly combined in zinc blende and galena. Mill No. 2, in which chloridizing, roasting, and pan amalgamation were employed, treated 4,840.08 tons of first-class ore, averaging 32.47 ounces of silver to the ton of roasted pulp, 1,913.51 tons of second-class concentrates, and 3,875.34 tons of old tailings with an average content of 12 ounces of silver to the ton. The superintendent states that whereas previously the ore treated in this mill had carried 50 per cent of its silver in native condition, the proportion for the year covered by the report had fallen so notably and the bullion, not withstanding an extraction of over 96 per cent of the total silver, had become so base that he had stopped this method of treatment and was experimenting with an old lixiviation plant previously used.

Various explanations are given locally for the failure of this interesting deposit below the 800-foot level, some stating that the ore body was

STATE OF ARIZONA
DEPARTMENT OF MINERAL RESOURCES
MINERAL BUILDING, FAIRGROUNDS
PHOENIX 7, ARIZONA

September 19, 1961

COPY

Mr. B. Van Voorhis
Magma Copper Company
Box 37
Superior, Arizona

Dear Van:

Thank you for your letter which was what I expected. I will suggest to them that they make the contact suggested. My letter was merely a feeler as I had some doubts as to whether you would be at all interested. Your deposit is by far the nearest to Arkota's plant.

I will see you early Thursday morning.

Incidentally Tom Bryant called me about some clay and mentioned that they plan to drill a 750 foot hole out at their property west of Superior.

With kindest regards to Webster, I remain

Sincerely,

Lewis A. Smith
Field Engineer

LAS/H

Magma Copper Company
SUPERIOR, ARIZONA

September 16, 1961

Mr. Lewis A. Smith
Department of Mineral Resources
Mineral Building, Fairgrounds
Phoenix 7, Arizona

Dear Mr. Smith:

This is in answer to your letter I received today regarding mining limestone for the Arkota Steel Company of Coolidge. I showed your letter to our General Manager and it was his opinion to wait until the Arkota people contacted us before making any commitment.

Very truly yours,

B. Van Voorhis

B. Van Voorhis

BVV/ae

Write Fenton

STATE OF ARIZONA
DEPARTMENT OF MINERAL RESOURCES
MINERAL BUILDING, FAIRGROUNDS
PHOENIX 7, ARIZONA

February 26, 1962

COPY

Bernard A. Van Voorhis, Chief Engineer
Magma Copper Co.
Superior, Arizona

Dear Van:

Herewith is a copy of the Arizona Senate Bill 99, which refers to locations of mining claims. This has, as far as we know, been reported out of the Senate Mining Committee, but has not been considered in the House.

I enjoyed my visit with you and Mr. Webster and am gratified that the smelter is about ready to go.

With kindest regards, I remain

Sincerely,

LEWIS A. SMITH
Field Engineer

LAS/H

Enc.

STATE OF ARIZONA
DEPARTMENT OF MINERAL RESOURCES
MINERAL BUILDING, FAIRGROUNDS
PHOENIX 7, ARIZONA

August 9, 1962

COPY

W.P. Goss, President
Magma Copper Company
San Manuel Division
San Manuel, Arizona

Dear Mr. Goss:

Thanks for your letter of July 30th regarding a replacement for Travis Lane, who was one of our field engineers.

"Red" Williams, mine superintendent for Miami Copper when the mine shut down, has taken the job and we are well pleased.

Sincerely yours,

FRANK P. KNIGHT
Director

FPK/H

STATE OF ARIZONA
DEPARTMENT OF MINERAL RESOURCES
MINERAL BUILDING, FAIRGROUNDS
PHOENIX 7, ARIZONA

September 13, 1961

COPY

Van Vohries, Chief Engineer
Magma Copper Company
Superior, Arizona

Dear Van:

I was down at Arkota Steel Co.'s mill at Coolidge yesterday and they want a local source of limestone for electric furnace flux. The grade should be between 44 & 50 per cent CaO. Since the haul by truck to Coolidge would be about 41 miles, Superior would seem to be their best bet. They are now obtaining it from Paul's Quarry, near Bisbee. Could you let me know if Magma would sell them some from your quarry, as well as the grade and local price? They will use at least 100 tons per month for the time being and possibly more as time goes on. Since the road would be paved, it is possible to contract the haul for 3.5 to 4 cents per ton mile.

In the meantime I will write them to contact you.

Please remember me to Webster. I heard that Darrell Gardner was returning.

With kindest personal regards, I remain

Sincerely,

LEWIS A. SMITH
Field Engineer

LAS/H

STATE OF ARIZONA
DEPARTMENT OF MINERAL RESOURCES
MINERAL BUILDING, FAIRGROUNDS
PHOENIX, ARIZONA

September 2, 1960

COPY

Mr. F. H. Buchella, General Manager
Magma Copper Co.
San Manuel, Arizona

Dear Mr. Buchella:

The Department of Mineral Resources semiannually compiles a list of the active mines and mining plants for the state. Your company has obligingly furnished the total employment figures for San Manuel. Last February it was estimated that your normal employment average would approximate 2800. We would appreciate this data once more for our October 1st report. These help greatly in Mr. Tuck's statistical studies.

Trusting that your operation has by now fully recovered from the strike, I remain

Very truly yours,

LEWIS A. SMITH
Field Engineer

LAS/H

STATE OF ARIZONA
DEPARTMENT OF MINERAL RESOURCES
MINERAL BUILDING, FAIRGROUNDS
PHOENIX, ARIZONA

March 24, 1959

COPY

Mr. Darrell Gardner, General Manager
Magma Copper Company
Superior, Arizona

Dear Mr. Gardner:

In behalf of the Phoenix A.S.M.O.A. group, I wish to express our appreciation for Hugh Steele's fine talk from which we learned much.

On the Wilderness Bill, I have reserved a place on the agenda for Magma. Inspiration, Kennecott and the Mining Congress are furnishing spokesman thus far, and we hope you can go along also. Thirty-five copies of your paper will be required for the Washington Committee to mull over. Jack Pullen expressed the hope that everyone would participate.

Thanking you for your help, I remain

Sincerely,

LEWIS A. SMITH
Field Engineer

LAS/H

STATE OF ARIZONA
DEPARTMENT OF MINERAL RESOURCES
MINERAL BUILDING, FAIRGROUNDS
PHOENIX, ARIZONA

March 4, 1959

COPY

Mr. Darrell Gardner, General Manager
Magma Copper Company
Superior, Arizona

Dear Mr. Gardner:

The local ASMOA is very much pleased that Mr. Hugh Steele will be here to talk on Mining Methods. We know of no one more qualified to handle the subject. If Mr. Steele has any requests as to projecting equipment, etc., let us know.

By way of verification, the date is March the 17th, at the Mineral Building, Fairgrounds, at 8 P.M. Please let us know if this is still alright, since we wish to get adequate publicity out.

Thanking you and Mr. Goss for this fine courtesy, I remain

Sincerely,

LEWIS A. SMITH
Field Engineer

LAS/H

Magma Copper Company
SUPERIOR, ARIZONA

RECEIVED
NOV 21 1958
DEPT. MINERAL RESOURCES
PHOENIX, ARIZONA

November 20, 1958

Arizona Department of Mineral Reserves
Mineral Building
Arizona State Fair Grounds
Phoenix, Arizona

Dear Sirs:

Please advise when we may expect shipment of our order #58-138 dated January 20, 1958 covering 10 copies only, Stories of Arizona Copper Mines, by Frank J. Tuck, @ 50¢ per copy.

Yours very truly,

MAGMA COPPER COMPANY

Ray L. Medlock

Ray L. Medlock,
Purchasing Agent

RML/mmb

We have a note in our files of having mailed ten copies on Jan. 21, 1958. However, we shall be glad to send you ten more copies if you are unable to verify the receipt of the first ten. Please let us know your wishes. F.T.

STATE OF ARIZONA
DEPA MENT OF MINERAL RESOURCES
MINERAL BUILDING, FAIRGROUNDS
PHOENIX, ARIZONA

November 21, 1958

Mr. Ray L. Medlock,
Purchasing Agent
Magma Copper Company
Superior, Arizona

COPY

Dear Mr. Medlock:

With reference to your letter of November 20th, 10 copies of Stories of Arizona Copper Mines were mailed to you on January 21. If you are unable to verify their receipt, we will be glad to send you ten more copies.

Yours very truly,

FRANK P. KNIGHT,
Director.

FK:lp

RECEIVED
DEPT. MINERAL RESOURCES
PHOENIX, ARIZONA

Magma Copper Company

SUPERIOR, ARIZONA

May 14, 1960

Librarian
North Phoenix High School
1101 E. Thomas Road
Phoenix, Arizona

Dear Sir:

This will acknowledge receipt of your postal card requesting pamphlets or folders on the mining industry in Arizona. Enclosed is a descriptive brochure on San Manuel and the San Manuel Copper Corporation, however that is all the printed material I have available to give you.

It is suggested that you contact Mr. Frank P. Knight, Director, Department of Mineral Resources, Minerals Building, Fairgrounds, in Phoenix. Mr. Knight and his organization have developed excellent materials on the mining industry in Arizona.

Yours very truly,

T. G. Chilton
Secretary to the President

tgc
cc: Mr. Frank P. Knight

Best regards to you and the family
Jerry

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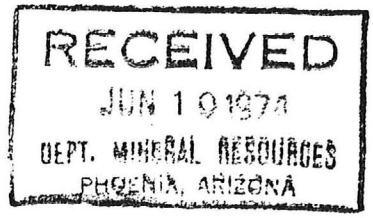
CABLE: CLARKSONCO

THE CLARKSON COMPANY

735 LOMA VERDE AVENUE
PALO ALTO, CALIFORNIA
U.S.A. 94303



K

June 6, 1974

Mr. John H. Jett, Director
State of Arizona
Department of Mineral Resources
Mineral Building, Fairgrounds
Phoenix, Arizona 85007

Dear Mr. Jett:

Responding to your request dated May 28, I'm pleased to send our Bulletin 6.0-10 on the Miller Sand Fill process.

Also enclosed is another of our latest bulletins that may be of interest showing the KG Valve. This one was developed especially for tailing line spigotting and, in a very short period, has proved to be very acceptable to several Arizona operators.

Any time we can be of assistance in providing literature on our products or services, please do not hesitate to let us know.

Yours very truly,

THE CLARKSON COMPANY

Bob Clarkson

J. R. Clarkson

JRC:bcw

Enclosures