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PRINTED: 06/24/2002

ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES AZMILS DATA

PRIMARY NAME: SAN MANUEL LIMESTONE QUARRY

ALTERNATE NAMES:
CAMP GRANT QUARRY

PINAL COUNTY MILS NUMBER: 521A

LOCATION: TOWNSHIP 7 S RANGE 16 E SECTION 5 QUARTER SW
LATITUDE: N 32DEG 50MIN 48SEC LONGITUDE: W 110DEG 43MIN 59SEC
TOPO MAP NAME: LOOKOUT MTN - 7.5 MIN

CURRENT STATUS: PAST PRODUCER

COMMODITY:
STONE LIMESTONE CB
SILICON QUARTZITE
CALCIUM LIMESTONE
SILICON SMELTER FLUX

BIBLIOGRAPHY:
ADMMR SAN MANUEL LIMESTONE QUARRY FILE

T. 6 S.
T. 7 S.

3636

3635

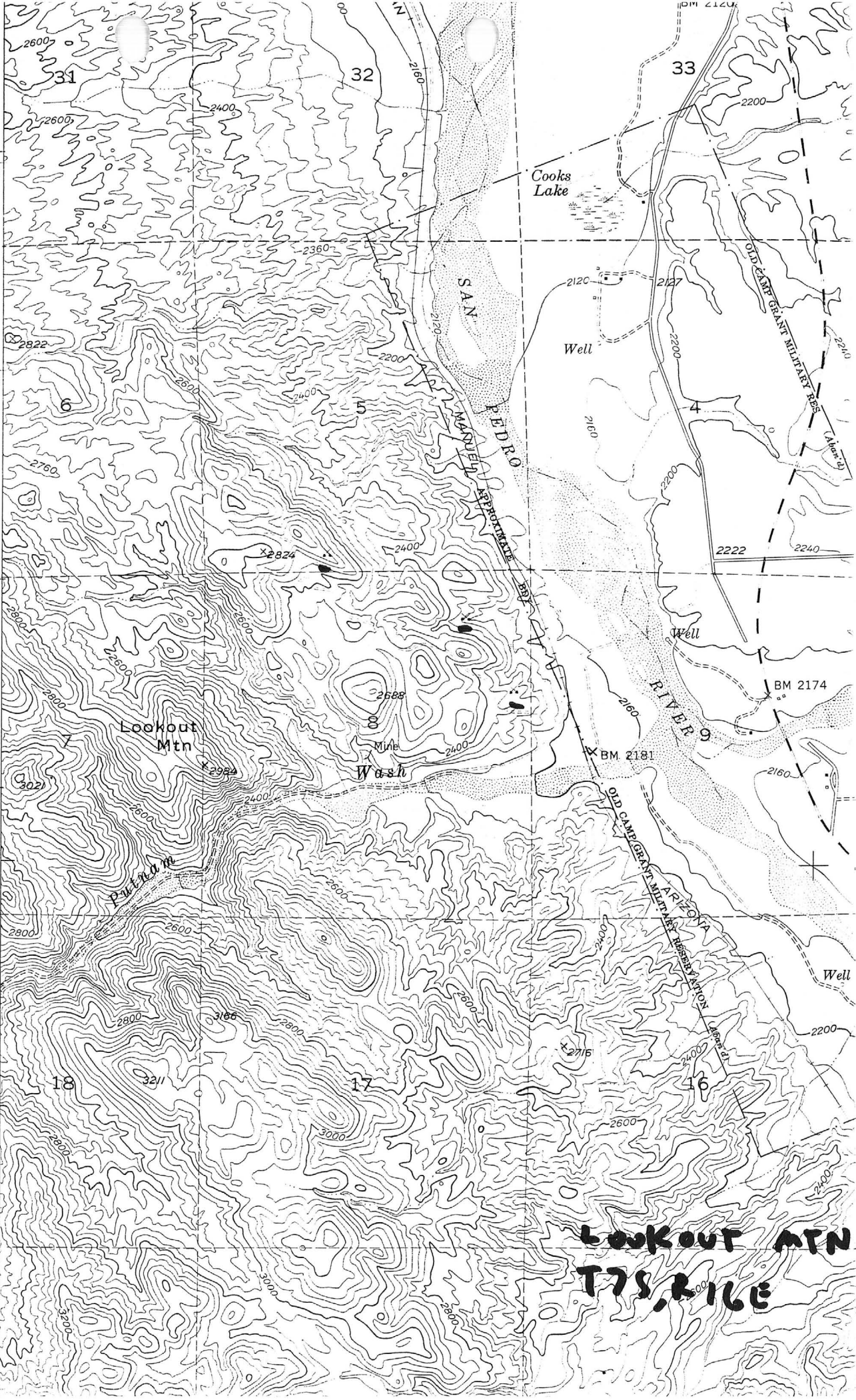
3634

50'

3632

3631

3849 IV SE
UTNAM WASH)



**LOOKOUT MTN
T7S, R16E**

RECNO TC10197
REC_TYPE S
USER_FIELD *U93/11
REP_DATE 89 12
FIL_LINK IMS, CIMRI
REP BOLM, KAREN S.
REP_AFF USGS
COUNTY PINAL
STATE_CODE AZ
CTRY_CODE US
PHYS 12 BASIN AND RANGE
DRAIN 15
LAND_ST 30
UTM_N 3633175.
UTM_E 525190.8
UTM_Z +12
ACC EST; USED A MINE SYMBOL ON THE TOPO MAP
TOWNSHIP 007S
RANGE 016E
SECTION 08
MERIDIAN GILA AND SALT RIVER
SITE CAMP GRANT LIMESTONE AND SILICA QUARRY
LAT 32.8381
LONG -110.7308
CTRY_NAME UNITED STATES
COMMOD SIL LST
ORE_MAT LIMESTONE, QUARTZITE
MAJOR SIL LST
CLH_USE 94/01/20
PROD Y
STATUS 6
OWNER MAGMA COPPER COMPANY
OPER GILBERT CONSTRUCTION COMPANY
DEP_TYPE SEDIMENTARY, METASEDIMENTARY
DEP_SIZE S
QUAD250 TUCSON
HRU_AGE MISS|PREC
HRU_NAME ESCABROSA LIMESTONE|TROY QUARTZITE
NAME BOLM, KAREN S.|ORRIS, GRETA J.
DATE 12/01/89|06/01/93
ED_COM |
CONT_CODE NA
GEN_COM INFO.SRC : 1 PUB LIT; 2 UNPUB REPT
REF PHILLIPS, K.A., 1987, ARIZONA INDUSTRIAL MINERALS: ARIZONA
DEPARTMENT OF MINES AND MINERAL RESOURCES MINERAL REPORT 4,
185 P.|USGS, AZ BUREAU OF MINES, AND U.S. BUREAU OF
RECLAMATION, 1969, MINERAL AND WATER RESOURCES OF ARIZONA:
ARIZONA BUREAU OF MINES BULLETIN 180, 638 P.|PEIRCE, H.W.,
1990, ARIZONA GEOLOGICAL SURVEY INDUSTRIAL MINERALS CARD
FILE.
CONT_NAME NORTH AMERICA
STATE_NAME ARIZONA
WORK_TYPE S
ECON_COM LIMESTONE AND QUARTZITE USED FOR SMELTER FLUX
ENV_COM HYDROLOGIC UNIT CODE CALCULATED 3-94 USING GIS OVERLAY
ANALYSIS WITH 1:1000000 (EST) SCALE FEDERAL OWNERSHIP
BOUNDARIES.
UPD_DATE 93 06
UPDATER ORRIS, GRETA J.
COMMOD_TYP N

(WINKELMAN)

USGS GQ 670

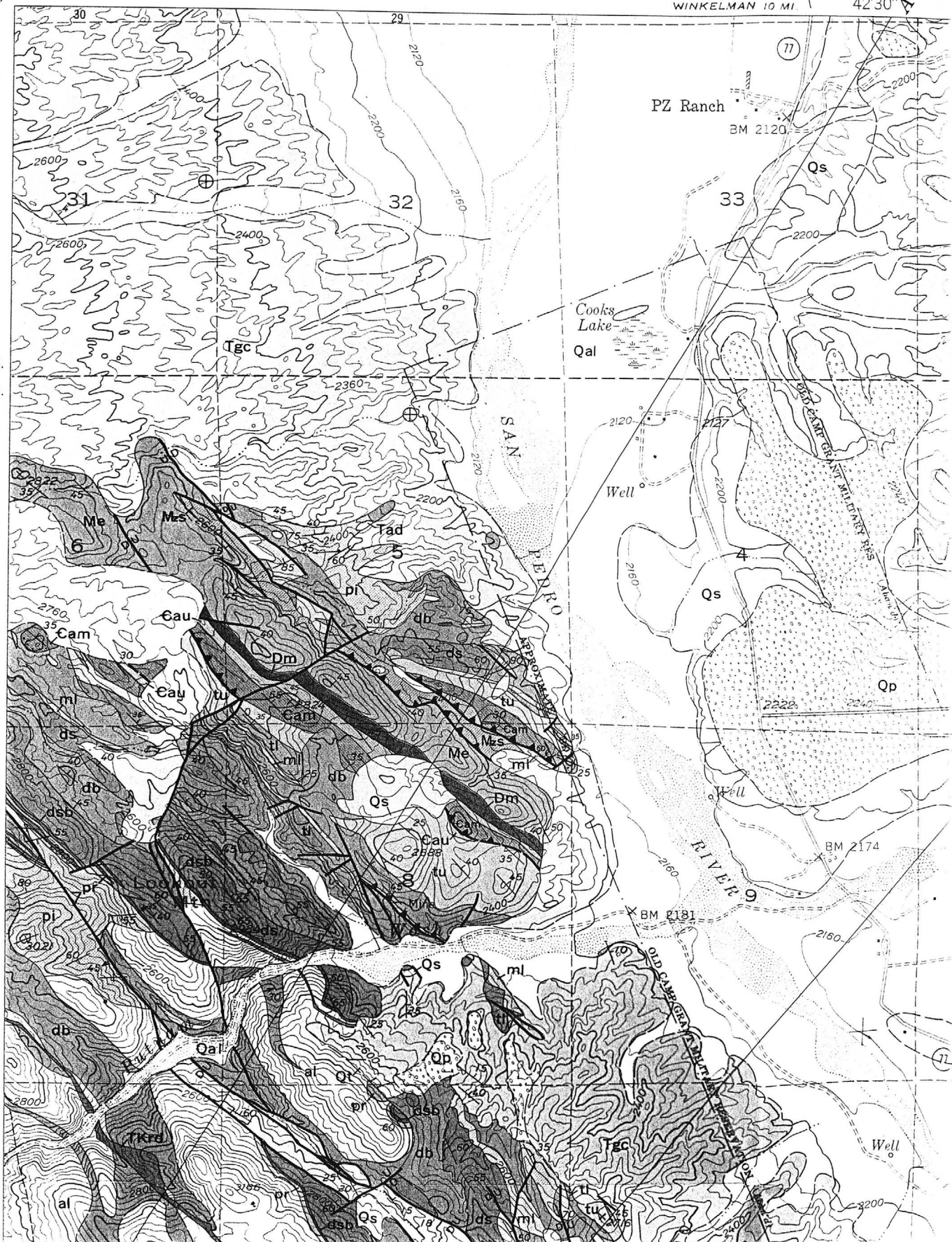
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

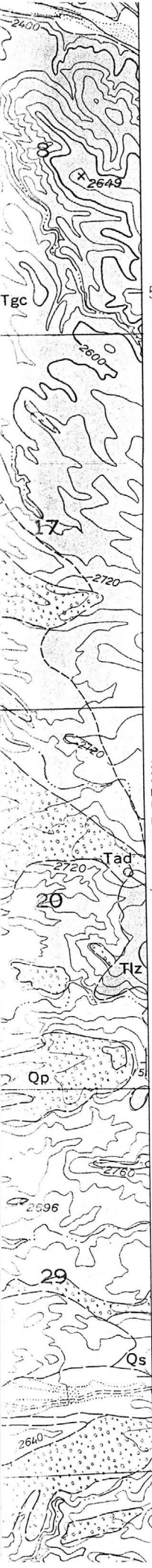
110°45'
32°52'30"

GLOBE 53 MI.
WINKELMAN 10 MI. 42'30"

T. 6 S.
T. 7 S.

50'





USGS
GQ 670

Intrusive rhyolite
T plug
T dike

CRETACEOUS
AND
TERTIARY

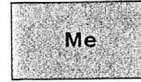
DISCONFORMITY



Sedimentary rocks

MESOZOIC(?)

DISCONFORMITY

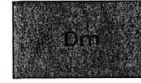


Escabrosa Limestone

MISSISSIPPIAN

CARBONIFEROUS

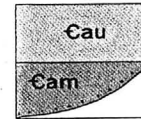
DISCONFORMITY



Martin Formation

DEVONIAN

DISCONFORMITY

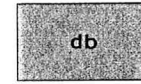


Abrigo Formation

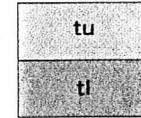
Cau, upper (or brown sandy) member
Cam, middle (sandstone) member
Dots indicate basal cobble conglomerate

CAMBRIAN

REGIONAL DISCONFORMITY



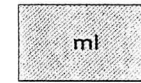
Diabase



Troy Quartzite

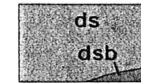
tu, upper unit
tl, lower unit

DISCONFORMITY



Mescal Limestone

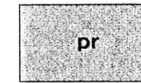
DISCONFORMITY(?)



Dripping Spring Quartzite

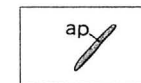
ds, upper and middle members
dsb, Barnes Conglomerate Member

DISCONFORMITY(?)



Pioneer Formation

ANGULAR UNCONFORMITY



Aplite dikes

PRECAMBRIAN

SAN MANUEL LIMESTONE QUARRY

PINAL COUNTY

MG WR 4/2/82: Visited Gilbert Construction Company in Bisbee. Informed that the Camp Grant Quarry, Pinal County, is owned by Magma Copper Cp.; Gilbert is contracted to mine limestone and silica from the quarry and ship to Magma's San Manuel operation. Gilbert Construction is only working 3 days per week.

NJN WR 7/10/87: Bill Trenders with Triple N Enterprise (card) called regarding the Camp Grant Quarry (San Manuel Limestone Quarry - file) Pinal County. He reported there are fines stockpiled there which they wish to obtain the mineral rights to (State minerals?) and then ship to Magma's San Manuel Smelter (file) Pinal County.

MINERAL PROPERTY ABSTRACT

Mineral Lease Renewal Applications

11-229; 11-250; 11-251

**Sections 5, 6, 8; T7S-R16E
Pinal County, Arizona**

**BHP Copper, Inc. (Magma Copper Company)
7400 North Oracle Road, Suite 200
Tucson, Arizona 85704**

By

**Michael Rice
Minerals Section
Natural Resources Division
Arizona State Land Department**

For

**M. J. Hassell, Commissioner
Arizona State Land Department**

As required by A.R.S. §27-234, Subsection C

November 7, 1996

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I. SUMMARY

Mineral Lease(s): 11-229; 11-250; 11-251

Lessee: BHP Copper, Inc. (Formerly Magma Copper Company)
7400 North Oracle Road, Suite 200
Tucson, Arizona 85704

Location: Sections 5, 6, 8 Township 7 South-Range 16 East

Lease Term: 20 years

Commodity(s): Limestone and Quartzite (Smelter Flux)

Current Status: Producing

Historical Production: 3,509,554 Tons
SLD Royalties: \$531,466

Type: B

Ownership: State Minerals and Surface

Total Leased Acreage: 558.66 **Number of Leases:** 3

Lease Rental: \$0.75 per acre

Date of Inspection: December 10, 1996

II. LOCATION

Situated near equal distances between the towns of Mammoth and Winkleman, the subject property is located approximately 40 miles north-northeast of Tucson (Figure 1). Lying in southeastern Pinal County, the property is more particularly described as being situated in Sections 5, 6 and 8, Township 7 South, Range 16 East. A legal description of individual claims and mineral leases is shown in Exhibit I.

Affidavits of Assessment submitted by BHP Copper, Inc. refer to the mineral claims as being situated in the Old Hat Mining District. Encompassing several distinct metallogenic systems, the Old Hat Mining District has been subdivided into Mineral Districts by the Arizona Geological Survey¹. In accordance with the refinement into Mineral Districts, the mineral leases will be referred to as being located near the Mammoth Mineral District.

¹ Bureau of Geology and Mineral Technology, Bulletin 194 (Former name of the Arizona Geological Survey).

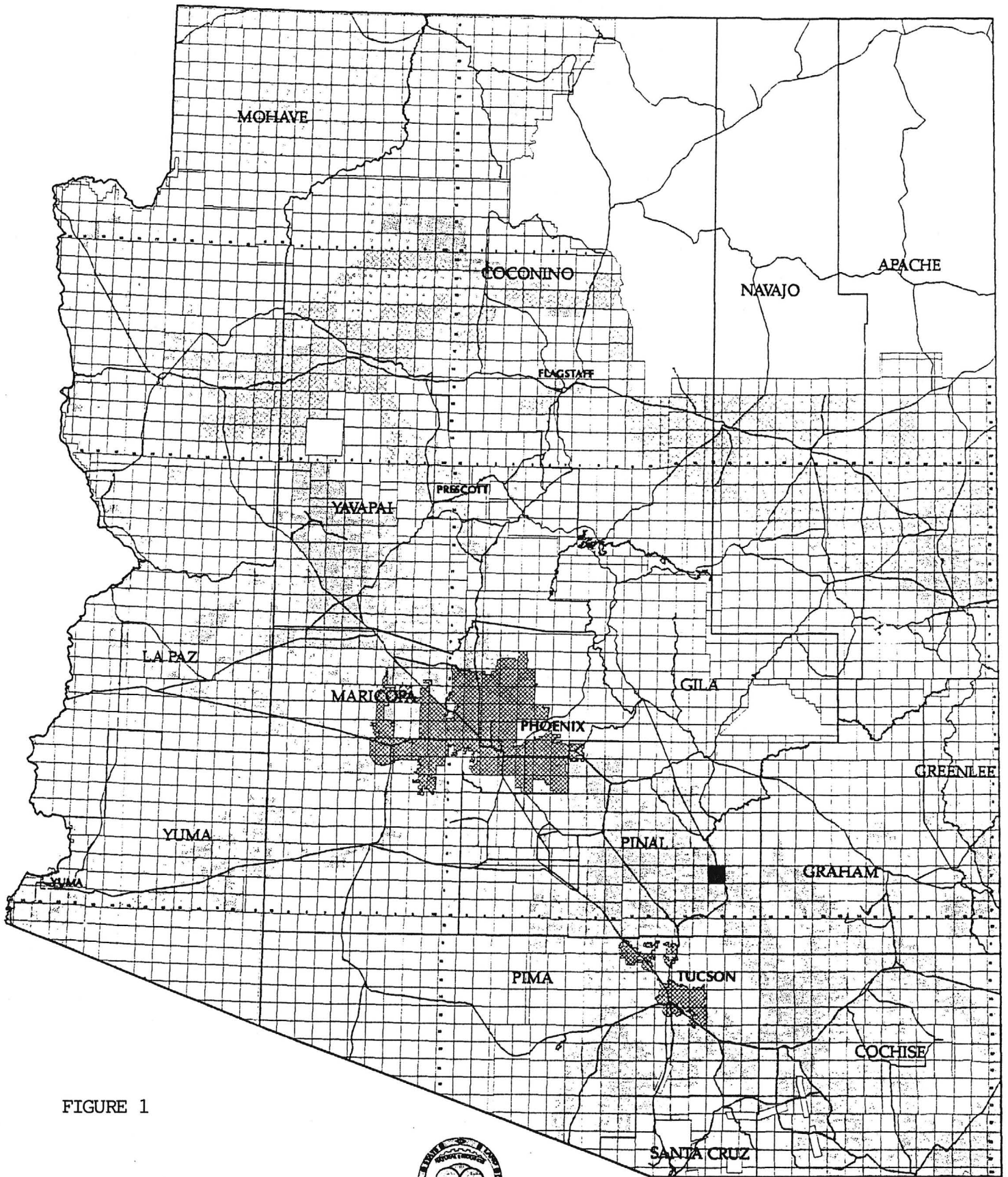


FIGURE 1

General Location Map



Produced by Arizona State Land Department GIS
November 1996

III. DESCRIPTION OF PROPERTY

Access to the property is across the San Pedro River in the vicinity of Aravapai Road. Paved for only a short distance, access to the property is primarily along an unimproved dirt road (Figure 2).

A review of Department records indicates non-mining use of the land to be limited to grazing. Though there exists agricultural uses in the vicinity of the subject property, the topography and lack of soil development restricts any such development to the lower elevations along the San Pedro River.

IV. LEASE HISTORY

The subject property is held under Mineral Lease Agreements 11-229, 11-250, and 11-251. Respectively issued on October 30, 1953, March 18, 1954, and March 18, 1954, the leases were originally issued to San Manuel Copper Corporation. On June 14, 1962, by virtue of the voluntary dissolution of San Manuel Copper Corporation, the leases were assigned to Magma Copper Company, a corporation and sole stockholder of San Manuel Copper Corporation. On May 22, 1969 under a plan and agreement of merger effective May 6, 1969, Newmont Mining Corporation assigned to Magma Copper Company all right, title and interest in the mineral leases. On January 18, 1996, Broken Hill Proprietary and Magma Copper Company were merged to form the world's second largest copper producer.²

According to Land Department records, production from the property was first reported from mineral lease 11-229 (Exhibit II). Commencing in late 1955, production from mineral lease 11-229 continued until January 1975. After an approximate 16 year hiatus in which there was no production from mineral lease 11-229, production again resumed from the property in January of 1991 (Table I). Production from mineral leases 11-250 and 11-251 has been solely limited to mineral lease 11-250 (Exhibits III and IV). Beginning production in June 1957, mineral lease 11-250 has for the most part continuously produced since the middle of 1972 (Table I).

² Platt's Metals Week, December 4, 1995.

**TABLE I
MINERAL LEASE PRODUCTION
(TONS)**

Fiscal Year ¹	Lease 11-229	Lease 11-250
'55-56'	8,692	None
56-57	41,376	535
57-58	53,995	5,746
58-59	73,307	490
59-60	50,203	None
60-61	65,515	2,855
61-62	59,475	1,862
62-63	66,382	14,876
63-64	88,274	1,107
64-65	71,024	None
65-66	86,675	None
66-67	81,659	None
67-68	23,177	None
68-69	73,094	None
69-70	72,416	None
70-71	86,022	None
71-72	132,420	None
72-73	178,536	55,097
73-74	111,663	71,312
74-75	43,169	49,362
75-76	None	79,980
76-77	None	89,635
77-78	None	49,552

**TABLE I
MINERAL LEASE PRODUCTION
(TONS)**

Fiscal Year¹	Lease 11-229	Lease 11-250
78-79	None	44,292
79-80	None	114,435
80-81	None	None
81-82	None	84,745
82-83	None	49,200
83-84	None	None
84-85	None	85,028
85-86	None	23,160
86-87	None	66,842
87-88	None	109,999
88-89	None	61,661
89-90	None	137,335
90-91 ²	42,882	183,297
91-92	15,430	190,953
92-93	36,618	207,198
93-94	39,009	127,987
TOTALS	1,601,013	1,908,541

¹ Year is fiscal year July through June.

² Resumed production in January 1991.

V. GEOLOGY

The subject leases are located in the Basin and Range Physiographic Province which is structurally characterized by large scale block faulting. Situated along the north slope of the Black Hills, the lease area lies along the margin of the Black Hills elevated fault block described by Creasey.³ Though not clearly lying within the boundaries of the aforementioned fault block, Figure 3 shows the general lease area to be bound on the west by a fault which cuts undifferentiated Tertiary and Quaternary sediments.⁴ Most likely representing a boundary fault, the lease area may be located on a similarly elevated fault block if not on a part of the same block.

As shown in Figure 4, the geology of the lease area is predominantly characterized by steeply dipping Precambrian and Paleozoic strata.⁵ Striking in a northwesterly direction, the strata dip to the northeast between 25 and 55 degrees. Approximating an average dip of 40 degrees, the strata dip beneath the Gila Conglomerate of Pliocene age. Along with the attitude of bedding most likely the result of Laramide deformation, there also exist several northwest trending normal and thrust faults. Though stratigraphic relationships do not allow one to distinguish between Laramide or earlier and Basin and Range faulting, the type of faulting indicates influence from both compressional and tensional forces. Respectively dominant during Laramide and Basin and Range time, the lease area appears to reflect deformation during both periods of time.

³ Creasey, S. C., 1967, U.S.G.S. Bulletin 1218, pg. 74.

⁴ Wilson, E. D. et al., 1959, Geologic Map of Pinal County, Arizona.

⁵ Krieger, 1968, U.S.G.S. Map GQ-670.

Of specific interest in the lease area are the Precambrian Troy Quartzite and Mississippian Escabrosa Limestone. Mined for use as smelter flux, the quartzite and limestone are of metallurgical grade in quality and are lithologically described as follows:⁶

Troy Quartzite: Upper Unit - White to very light gray, somewhat lenticular, thin to thick bedded, feldspathic to nonfeldspathic sandstone, quartzite, and granule to small-pebble conglomerate. Pebbles are composed largely of quartz. Unit contains local slump structures and large scale crossbedding. Surficial silicification obscures bedding features.

Escabrosa Limestone: Massive, cliff-forming, thick bedded, mostly coarse grained limestones in shades of gray and yellowish to greenish gray; chert nodules common in some beds. Some slope-forming, thin-bedded, medium to fine grained, gray limestone and brown silty and dolomitic limestone.

Mineralization

As a result of faulting within the subject lease area along with limestones of the Martin and Escabrosa Formations as possible host units, there exists potential for a skarn or replacement type mineral deposit. Conspicuously absent from the lease area, however, are any intrusive bodies or volcanics of Cretaceous-Tertiary age. According to Creasey, the San Manuel and Mammoth deposits are respectively Cretaceous or early Tertiary and early to middle Tertiary in Age.⁷

⁶ Kreiger, 1968, U.S.G.S. Map GQ-670.

⁷ Creasey, S. C., 1967, U.S.G.S. Bulletin 1218, pg. 80.

There does exist, however, an unnamed mine in the NW¼, NW¼, SE¼, Section 8, Township 7 South-Range 16 East. Located just west of mineral lease 11-250, the geologic map shows mine workings to be along a thrust section of the Precambrian Mescal limestone. Thrust over younger Precambrian diabase, stratigraphic relationships indicate that faulting occurred sometime during or after the late Precambrian.

According to Hillebrand, mineral deposits in the Putnam Wash area are of two types.⁸ Asbestos deposits in the Mescal limestone which are genetically related to the intrusion of the diabase during Cambrian time and manganese vein deposits filling northwest striking faults of Tertiary age. Because the manganese ores show evidence of brecciation, there is direct evidence to indicate fault movement during the mineralizing event. Based then upon the age of faulting and brecciation of manganese ores, there is suggested mineralization of probable Tertiary age.

In addition to asbestos and manganese, there is also suggested by Hillebrand that gold mineralization may occur in the Putnam Wash area. As noted by Hillebrand, quartz veins cutting the Pinal schist in the W½, NE¼, SW¼ section 5, have been prospected and were probably prospected for gold. Inasmuch however as most veins occurring in the Pinal schist were described as lateral secretion veins paralleling schistosity, any gold mineralization in the area of interest is most likely insignificant.

⁸ Hillebrand, James R., 1953, University of Arizona, Masters Thesis, pg. 72.

VI. PRODUCTION AND RESERVES

Production from the property was commenced in late 1954 and, as of July 1994, had produced a total of 3,509,554 tons of limestone and quartzite. Having produced 1,601,013 tons from mineral lease 11-229 and 1,908,541 tons from mineral lease 11-250, the two mineral leases have over the last 38 years produced an average of 92,357 tons per year. According to information received by the Department in December of 1989, there was anticipated a production rate of 135,000 tons per year. Based on a production rate of 135,000 tons per year and geologic reserves of 7 million tons, BHP Copper, Inc. projected a mine life of 50 years for mineral lease 11-250.

As determined by the Department, there is estimated an additional 20 million ton geologic reserve located on mineral leases 11-229 and 11-251. Because of the geology of the area and the fact that the bedded units dip steeply in the area of these two mineral leases, the minable reserves on this part of the property are most likely considerably less than the estimated geologic reserve. Based then on a stripping ratio of 1:1, there is estimated a reserve of 10 million tons on mineral leases 11-229 and 11-251.

Inasmuch as the reserve estimate for mineral lease 11-250 is also an estimate of geologic reserves, the reserves on the entire property are estimated to range from 10 to 15 million tons.

VII. MINING IMPROVEMENTS

Since August of 1979, BHP Copper, Inc. has utilized an independent contractor to mine, crush, stockpile, and load the material produced from state land. Having made no capital investment in mining and processing equipment, the only improvements considered are a 20,000 gallon steel water tank and an approximate 7,400 feet of 3 and 4 inch steel pipe. Placed on the property in 1959, and used for drilling operations and dust control, the value of the improvements is considered negligible. Based on an estimate made in 1990, the value of the improvements is estimated to be less than \$2,000 (Table II).

In conjunction with the improvements placed on state land, the lessee has constructed several improvements on adjacent private property. Used to provide transportation of mined material as well as water to the mineral leases, the lessee has constructed a 1,300 foot railroad spur and a 100 foot deep steel cased water well (Figure 5). In addition to these improvements, the lessee has also constructed an approximate 400 square foot repair shop (Figure 6). Set on a concrete floor, the repair shop is of a wood frame and metal siding construction. Because the replacement or reproduction costs of these improvements are not costs which would be incurred by a potential lessee in acquiring the state leases, the improvements located on private property were not given further consideration.

**TABLE II
IMPROVEMENTS**

Item	Reproduction Cost New	Estimated Original Cost Cost (1959)	Residual Value
Steel Tank ¹	\$10,000	\$2,600	\$ 500
Steel Pipe ²	25,000	6,500	1,400
3 inch Steel		\$2.80/ft.	
4 inch Steel		3.90/ft.	
Average		3.35/ft.	

¹ 20,000 Gallon Steel Tank

² 7400 Linear Feet of 3½" steel pipe at 3.35/linear foot.

Residual value estimates made utilizing Arizona Department of Revenue Appraisal Manual (Tax Year 1990).

VIII. MARKET DISCUSSION

As shown in Figure 7 there are five quarries which are located in close proximity to both the ASARCO smelter in Hayden and the BHP smelter in San Manuel. Being respectively located closest to the Hayden and San Manuel smelters, the McFarland-Hollinger and Little Hills quarries are situated so as to provide a strong competitive market position with the Camp Grant quarry located on State land. Like the market for industrial mineral commodities, the production of smelter flux requires that the source be located nearby or if located any significant distance from the smelter, that the source material contain other metals. In the latter instance, the smelter will normally make payment only for the precious metals which are recovered (Exhibit V). There exists as such two distinct market values. In either case, however, the gross market value can be no less than the cost to mine and transport the material.

Beginning in 1958 and continuing since that time, BHP has transported mined material by railroad. Hauled an approximate 17 miles to the smelter in San Manuel, historical costs have ranged from \$0.70 per ton to \$2.25 per ton in 1979 (Table III). Beginning in 1980, BHP ceased reporting transportation costs as a result of a change in the basis for royalty calculations. Being unable to obtain cost figures since that time, a projected cost of \$3.35 per ton was calculated based on a Transportation Cost Index maintained by the Bureau of Mines (Tables IV & V).

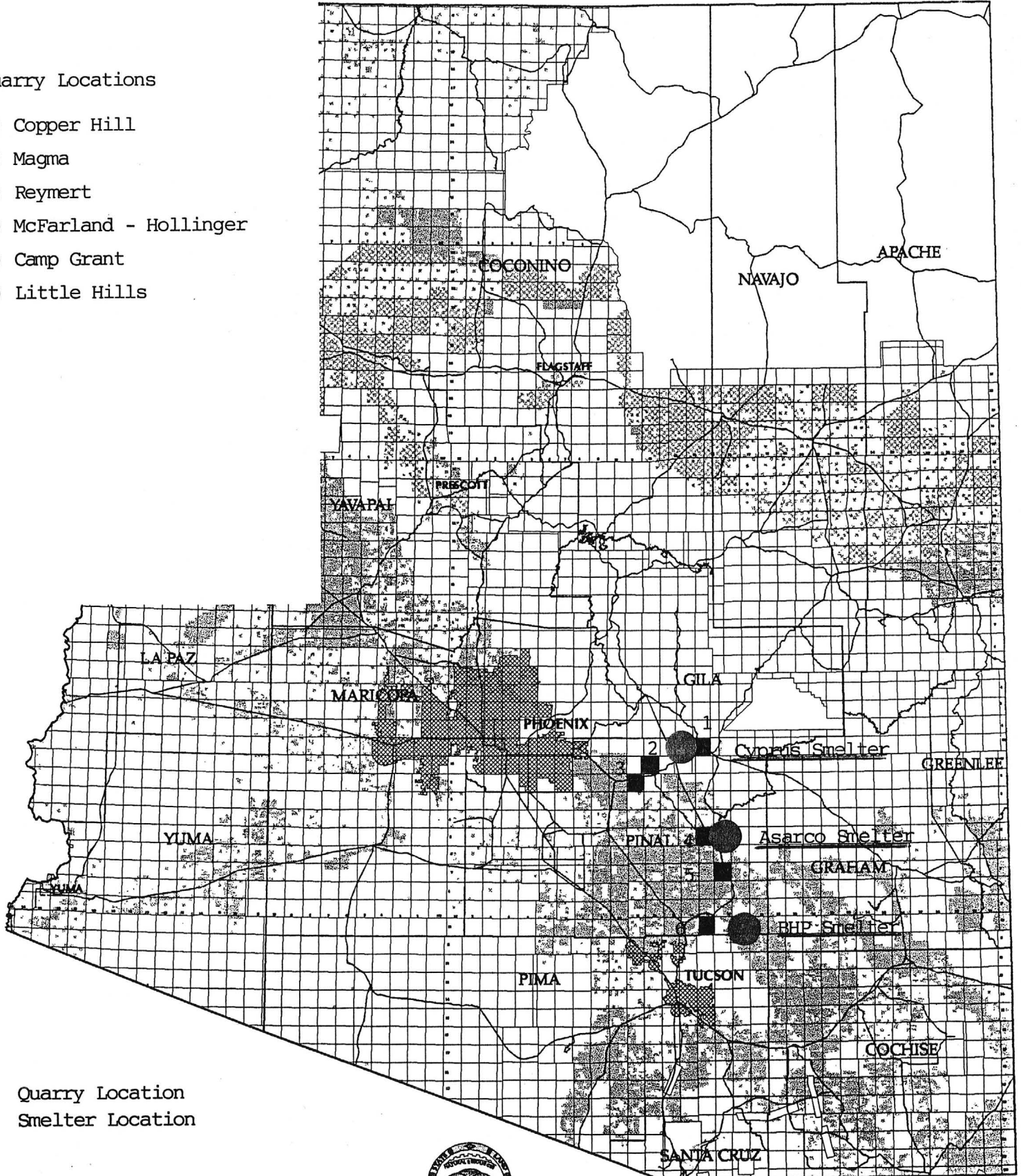
First initiated in August 1979, and continuing to the present, BHP has utilized an independent contractor to mine the limestone and quartzite produced from State land. Contract mining costs have, in all but two years, ranged from \$4.50 to \$8.00 per ton. Though there was reported costs of \$9.47 and \$16.20 per ton in 1980 and 1991, the costs are considered high and most likely represent the added cost of removing overburden. As previously noted, limestone beds located on mineral lease 11-229 dip steeply to the northeast

FIGURE 7

QUARRY AND SMELTER LOCATIONS

Quarry Locations

- 1) Copper Hill
- 2) Magma
- 3) Reymert
- 4) McFarland - Hollinger
- 5) Camp Grant
- 6) Little Hills



- Quarry Location
- Smelter Location



TABLE III
MAGMA RAIL COSTS

YEAR	DOLLARS/TON
1968	\$0.70
1969	0.98
1970	1.03
1971	1.18
1972	1.23
1973	1.30
1974	1.47
1975	1.64
1976	1.77
1977	2.00
1978	2.12
1979	2.25

Cost figures are those reported to State Land Department by Magma Copper Company. In some instances the yearly average is a weighted average.

TABLE IV
BUREAU OF MINES TRANSPORTATION COST INDEX
(1984 INDEX YEAR)

YEAR	INDEX
1968	21.92
1969	24.02
1970	26.33
1971	29.86
1972	30.97
1973	32.15
1974	37.47
1975	43.13
1976	47.96
1977	51.04
1978	54.95
1979	63.92
1980	75.26
1981	85.90
1982	93.64
1983	95.60
1984	99.37
1985	100.19
1986	100.50
1987	99.00
1988	103.90
1989	105.80
1990	106.50
1991	106.70
1992	108.55
1993	106.73
1994	105.45

TABLE V
PROJECTED RAIL COSTS
(Based on Transportation Cost Index)

YEAR	PERCENTAGE CHANGE	DOLLARS/TON
1979 ¹		2.25
1980	11.34	2.51
1981	10.64	2.77
1982	7.74	2.99
1983	1.96	3.05
1984	3.77	3.16
1985	0.82	3.19
1986	0.31	3.20
1987	(1.50)	3.15
1988	4.90	3.30
1989	1.90	3.36
1990	0.70	3.39
1991	0.20	3.39
1992	1.85	3.46
1993	(1.82)	3.39
1994	(1.28)	3.35

¹Last year in which rail costs were reported to Department

**TABLE VI
MINING COSTS**

YEAR ¹	LEASE 11-229	LEASE 11-250
1980 ²	No Production	2.30-9.47
1981	No Production	5.50
1982	No Production	5.50
1983	No Production	5.50
1984	No Production	6.10
1985	No Production	6.10
1986	No Production	6.10
1987	No Production	No production
1988	No Production	4.57
1989	No Production	4.90
1990	No Production	5.49 - 5.95
1991	4.48 - 16.20	5.95 - 6.10
1992	4.48	5.65 - 6.10
1993	4.48 - 8.00	5.25 - 5.65
1994	8.00	5.15 - 5.25

¹Year shown is calendar year

²Range of mining costs indicates low and high contract mining costs during calendar year.

and where in contact with other bedded units, the mining of limestone would require the removal of overburden. (Figure 8) As such, mining costs are considered in this report to range from \$4.50 per ton to \$8.00 per ton. Based then on an average of the aforementioned mining costs and estimated transportation costs of \$3.35 per ton, there is suggested a market value of \$9.60 per ton for State land production.

In order to further define the market value on the basis of cost, there was also completed an estimate of costs for production from the McFarland - Hollinger and Little Hills quarries. Based on an average mining cost of \$6.25 per ton and truck transportation costs of \$0.25 per ton-mile, there is indicated a range of market values from \$10.00 per ton to \$15.50 per ton (Tables VII & VIII). Based upon the estimated costs of the McFarland - Hollinger and Little Hills quarries, there is suggested that the market value of state land production should be adjusted upward to \$10.00 per ton.

In addition to estimates of value based upon mining and transportation costs, there was also considered the prices obtained by other limestone, silica, and sand and gravel producers. As shown in Table IX, there exists a range of prices from \$6.00 per ton to a high of \$18.00 per ton for the production of limestone and silica. Excluding the price of \$18.00 per ton for kiln dust, the range of prices for similarly sized material is estimated to range from \$6.00 to \$16.00 per ton.

Based then on a mid-range of prices for limestone and silica, there is indicated an average price of \$11.00 per ton for state land production. In confirmation of the estimate is the \$8.50 to \$13.00 per ton range of aggregate prices shown in Table X. Being of quality suitable for higher value aggregate, a mid-range price of \$10.75 per ton is suggested by sand and gravel prices.

FIGURE 8

MINERAL LEASES 11-229 AND 11-250



VIEW TO THE WEST-NORTHWEST SHOWING DIP
OF STRATA.

PHOTOGRAPH TAKEN 12/10/96

**TABLE VII
TRUCKING DISTANCE (MILES)**

Mine Owner/Operator	San Manuel	Hayden
Little Hills Mines	15	33
Magma (St. Leases)	21	12
McFarland-Hollinger	37 (39.5)	7.5 (17.0)
ESTIMATED TRUCKING COST (DOLLARS/TON)		
Mine Owner/Operator	San Manuel	Hayden
Little Hills Mines	\$3.75	\$8.25
Magma (St. Leases)	5.25	3.00
McFarland-Hollinger	9.25 (9.88)	1.88 (4.25)

There are two access routes from the McFarland-Hollinger quarry located in Section 12, T5S-R14E. The distance and cost of the longer access route is shown in parentheses. Because of a bridge which was damaged in 1993, it is sometimes necessary to transport material along the longer access route.

**TABLE VIII
ESTIMATED MARKET VALUE
(COST PER TON)**

Mine Owner/Operator	San Manuel	Hayden
Little Hills Mines	\$10.00	\$14.50
Magma (St. Leases)	11.50	9.25
McFarland-Hollinger	15.50 (16.13)	8.13 (10.50)
Average Cost	\$12.33 (12.54)	\$10.63 (11.42)
Combined Average = \$11.48 (11.98)		

Costs shown in parentheses are those costs which are associated with the longer of two access routes from the McFarland-Hollinger quarry. The average and combined average costs shown in parentheses are those averages which were calculated using the higher transportation costs.

TABLE IX
Limestone and Silica Flux Prices
(F.O.B. Mine)

Company Name	Mineral Commodity	Price
A ¹	Limestone	\$16.00 - \$18.00
B ¹	Limestone	\$ 6.00 - \$10.00
C ¹	Limestone	\$10.50
D	Silica Flux	\$10.00 - \$12.00
E ²	Silica Flux	\$ 9.00

- 1) Limestone production is utilized in the manufacturing of cement, for flue gas desulfurization, and for alkalinity control. (Price is F.O.B. Mine.)
- 2) Price F.O.B. mine for silica flux quarry located in New Mexico.

Tucson Rock & Sand, Inc.

P.O. Box 36030 • Tucson, AZ 85740-6030 • Telephone 602-744-3222 • FAX 602-744-4394

TUJSSON ROCK & SAND PRICE LIST

Prices per Ton F.O.B. Plant 64 (Valencia Rd. at Pantano Wash) and F.O.B. Plant 66 (Orange Grove Rd. at I-10).

Effective Date: April 1, 1995

<u>Commodity Code</u>	<u>Material</u>	<u>Price per Ton</u>
000100 Series	ABC	\$ 6.00
000115	Screened Fill	3.50
000120	Pit Run	4.50
000125	Engineered Fill	4.50
000200 Series	M.A. Rock	8.50
000235	ADOT / PAG Chips	12.00
000300	Pea Gravel (standard)	9.55
000340	Concrete Rock (1" minus)	11.00
000355	Concrete Rock (2 1/2" minus)	13.00
000360	Concrete Sand	8.00
000365	Coarse Washed Sand	4.50
000366	Pipe Bedding Backfill	4.50
000380	Mortar Sand	12.00
000440	Birdseye	4.50

All products are subject to availability.

Delivery Charge: 10 Tons or less \$65.00

Delivered Material and Large Orders: Individual price quotations may be obtained by calling the office.

Terms: A 2% discount is offered to our customers when their bill is paid by the 15th. of the month following purchase. In the event the bill for said materials has not been paid within 30 days following month of purchase, all special quoted prices will revert to this list price.

As shown in Table XI, sand and gravel royalties in Pinal County range from \$0.55 to \$0.81 per ton. Excluding Treasure Chest Mining, whose property is located within the incorporated boundaries of Apache Junction and is otherwise located so as to be at a competitive advantage, royalty rates are considered in this report to range from \$0.55 to \$0.65 per ton. Utilizing a 5% royalty, there was calculated a value of \$11.00 to \$13.00 per ton for sand and gravel aggregate. Being consistent with the prices shown in Table X, royalty rates in Pinal County suggest an average value of \$12.00 per ton for sand and gravel aggregate.

In summary of the previously noted price information, Table XII shows an average range of prices from \$10.50 to \$12.00 per ton. Based then on an overall average price of \$11.06 per ton, Arizona Flux prices from \$10.00 to \$12.00 per ton, and the cost estimated value of \$11.50 per ton shown in Table VIII, it is concluded that state land production should accordingly be valued at \$11.00 per ton.

**TABLE XI
 PINAL COUNTY SAND AND GRAVEL ROYALTIES
 (STATE LAND LEASES)**

COMPANY	LEGAL DESCRIPTION	ROYALTY (DOLLARS/TON)
1) Cashway Concrete & Materials	T2S-R10E-8	0.65
2) Red Rock Sand & Gravel	T10S-R9E-12	0.55
3) Central Ariz. Material Co.	T5S-R9E-18	0.55
4) Treasure Chest	T1N-R8E-3	0.81

TABLE XII

SUMMARY OF MARKET PRICES

PRICE BASIS	PRICE RANGE	AVERAGE PRICE
Silica Flux	\$9.00 - \$12.00	\$10.50
Limestone	\$6.00 - \$16.00	\$11.00
Aggregate Prices	\$8.50 - \$13.00	\$10.75
Royalty Based Prices	\$11.00 - \$13.00	\$12.00

IX. REFERENCES

- Creasey, S. C., 1967, General Geology of the Mammoth Quadrangle Pinal County, Arizona: U. S. Geological Survey Bulletin 1218, pgs. 66-87.
- Hillebrand, James R., 1953, Geology and Ore Deposits in the Vicinity of Putnam Wash, Pinal County, Arizona: Tucson, University of Arizona unpublished Masters Thesis, pgs. 72-87.
- Keith, Stanley B. et al., 1983, Metallic Mineral Districts and Production in Arizona: Arizona Bureau of Geology and Mineral Technology Bulletin 194, p. 58.
- Krieger, Medora H., 1968, Geologic Map of the Lookout Mountain Quadrangle, Pinal County, Arizona: U. S. Geological Survey Map GQ-670.
- Platts Metals Week, December 4, 1995, BHP and Magma Merge to Form Copper Giant: Volume 66, Number 49, McGraw-Hill, Inc.
- Wilson, Eldred D. et al., 1959, Geologic Map of Pinal County, Arizona: Tucson, Arizona Bureau of Mines, University of Arizona.

3849 IV NE
(WINKELMAN)

UNITED STATES DEPARTMENT OF THE INTERIOR GEOLOGICAL SURVEY

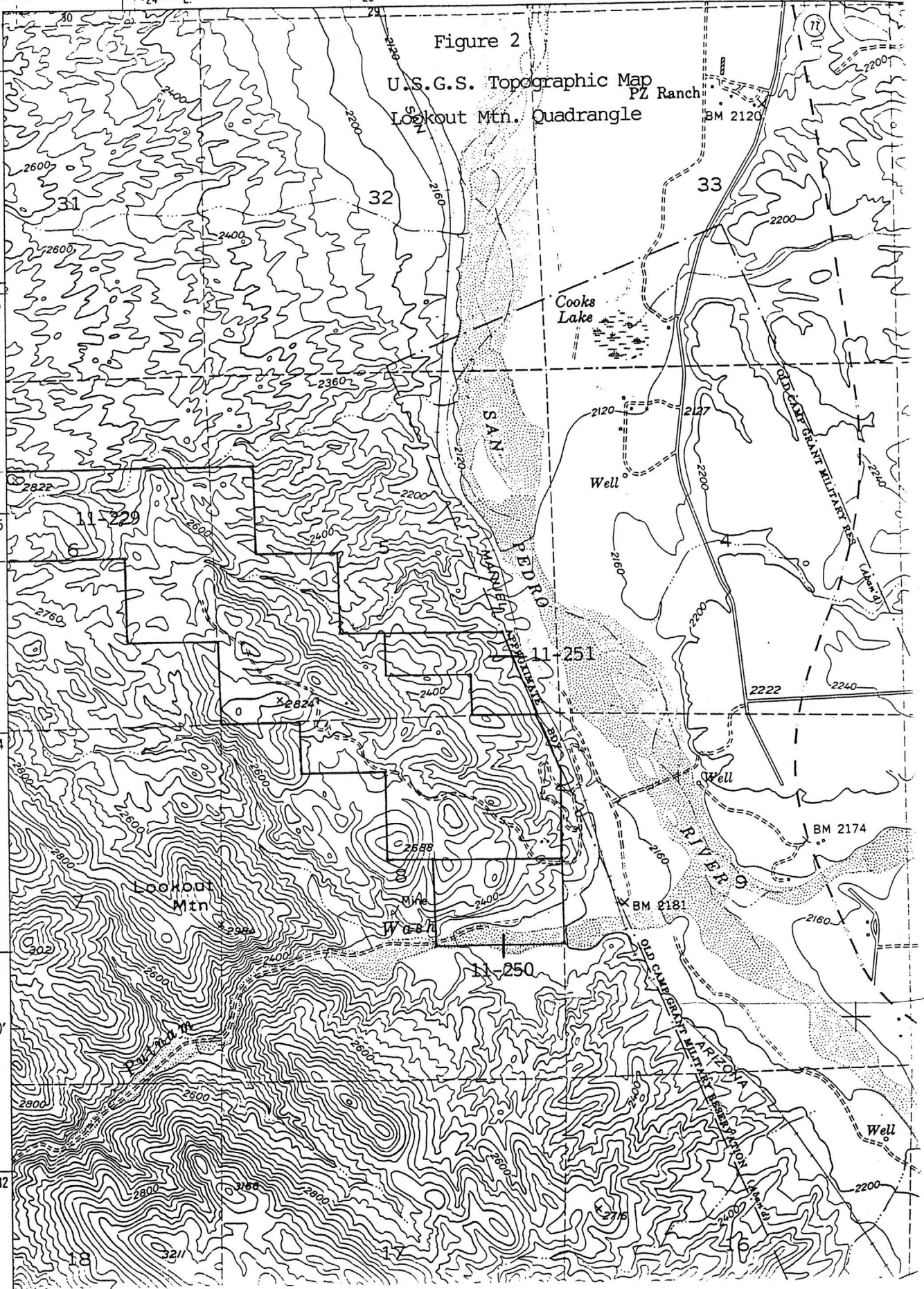
GLOBE 47 MI.
WINKELMAN 10 MI.

110°45' 32°52'30" 524000m E. 525 526 42'30"

Figure 2

U.S.G.S. Topographic Map
PZ Ranch
Lookout Mtn. Quadrangle

3637000m N.
3636
T. 6 S.
T. 7 S.
3635
3634
50
3632
5



Sund



SAN MANUEL LIMESTONE QUARRY
file

Office of State Mine Inspector

STATE MINE INSPECTOR

705 West Wing, Capitol Building
Phoenix, Arizona 85007
602-255-5971

MAR 07 1985

NOTICE TO ARIZONA STATE MINE INSPECTOR

In compliance with Arizona Revised Statute Section 27-303*, we are submitting this written notice to the Arizona State Mine Inspector (705 West Wing, Capitol Building, Phoenix, Arizona 85007) of our intent to start stop (please circle one) a mining operation.

COMPANY NAME A. J. Gilbert Construction

CHIEF OFFICER A. J. Gilbert, Jr.

COMPANY ADDRESS 6741 N. Thornydale, Suite 121, Tucson, AZ 85741

COMPANY TELEPHONE NUMBER 742-2976

MINE OR PLANT NAME Magma - Camp Grant

MINE OR PLANT LOCATION (including county and nearest town, as well as directions for locating by vehicle)

Located in Pinal County, ten miles north of Mammoth, AZ

on State Route 77

TYPE OF OPERATION Crushing PRINCIPAL PRODUCT Silica

STARTING DATE 8-28-84 CLOSING DATE 2-28-85

DURATION OF OPERATION 6 months

PERSON SENDING THIS NOTICE A. J. Gilbert Construction

TITLE OF PERSON SENDING THIS NOTICE Vice President

DATE NOTICE SENT TO STATE MINE INSPECTOR 3-6-85

*A.R.S. Section 27-303 NOTIFICATION TO INSPECTOR OF BEGINNING OR SUSPENDING OPERATIONS: When mining operations are commenced in any mine or when operations therein are permanently suspended, the operator shall give written notice to the inspector at his office prior to commencement or suspension of operations.

Tangby



AN MANUEL LIMESOME (A)

Office of State Mine Inspector

STATE MINE INSPECTOR

705 West Wing, Capitol Building
Phoenix, Arizona 85007
602-255-5971

SEP 06 1984

NOTICE TO ARIZONA STATE MINE INSPECTOR

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COMPANY NAME A. J. Gilbert Construction

CHIEF OFFICER A. J. Gilbert, Jr.

COMPANY ADDRESS 6741 N. Thornydale, Suite 121, Tucson AZ 85741

COMPANY TELEPHONE NUMBER 602-742-2976

MINE OR PLANT NAME Camp Grant Quarry

MINE OR PLANT LOCATION (including county and nearest town, as well as directions for locating by vehicle)

Located in Pinal County, ten miles north of Mammoth, AZ
on State Route 77.

TYPE OF OPERATION Crushing PRINCIPAL PRODUCT Silica

STARTING DATE 8-28-84 CLOSING DATE March of 1985

DURATION OF OPERATION 6 months

PERSON SENDING THIS NOTICE A. J. Gilbert, III

TITLE OF PERSON SENDING THIS NOTICE Vice-president

DATE NOTICE SENT TO STATE MINE INSPECTOR September 5, 1984

*A.R.S. Section 27-303 NOTIFICATION TO INSPECTOR OF BEGINNING OR SUSPENDING OPERATIONS: When mining operations are commenced at any mine or when operations therein are permanently suspended, the operator shall give written notice to the inspector at his office prior to commencement or suspension of operations.

RECEIVED
OCT 02 1984

DEPT. MINERAL RESOURCES
PHOENIX, ARIZONA
2/80

ARIZONA DEPARTMENT OF MINERAL RESOURCES
Mineral Building, Fairgrounds
Phoenix, Arizona

1. Information from: Mr. Roy Lindsey, Superintendent
Address: _____
2. Mine: CAMP GRANT 3. No. of Claims - Patented _____
(Pinal County) Unpatented yes
4. Location: At "T" intersection of Highway 77 & Aravaipa Rd., go west about one mile
NE 1/4 on dirt road.
5. Sec 8 Tp 7S Range 16E 6. Mining District San Pedro
7. Owner: Magma Copper Co.
8. Address: P.O. Box M, San Manuel, AZ 85631 (Phone: 385-2201)
9. Operating Co.: Gilbert Construction Co.
10. Address: P.O. Box 5288, Bisbee, AZ 85603 (Phone: 432-2078)
11. President: A.J. Gilbert, Jr. 12. Gen. Mgr.: _____
13. Principal Metals: Silica Flux 14. No. Employed: _____
15. Mill, Type & Capacity: Crushing and screening plant
16. Present Operations: (a) Down (b) Assessment work (c) Exploration
(d) Production (e) Rate _____ tpd.
17. New Work Planned: Weather permitting, mining and crushing requirements for 1983
will be completed by the end of February and periodic loading will be only
activity during balance of year.
18. Misc. Notes: Gilbert Construction is contracted by Magma Copper Co. to mine
and crush quartzite to provide silica flux to the copper smelter at San Manuel.
The 1983 contract calls for 50,000 tons. The quartzite is generally very high
quality; it may contain trace amounts of copper but is nil in gold or silver.
Quartzite is crushed to 2 inches and loaded into railroad cars at Putnam Siding.
The crushed quartzite is hauled by rail to the smelter on the Magma-owned rail-
road.

Date: January 24, 1983

(Signature)

M. W. Greeley

(Field Engineer)

DEPARTMENT OF MINERAL RESOURCES

STATE OF ARIZONA
FIELD ENGINEERS REPORT

Mine San Manuel Limestone Quarry
2 miles SW of Feldman 7516E
Date
District San Pedro Dist., Pinal Co. Engineer Lewis A. Smith
Subject: Visit 9-24-62

The new quarry $3/4$ miles north of the present quarry, and 200 or more feet higher, is being set up for operations. The road from the old quarry to the new one is partly completed. The new area has a large reserve of Carboniferous limestone which caps a narrow ridge that is bordered on three sides by alluvium and on the west side by the Apache Group. The limestone exposure is 2 or more miles long and approximately $1/4$ mile wide and trends NW-SE (40 to 45 degrees). The Naco and Escabrosa formations are not separated on Wilson's map. The ridge appears to be a faulted block.

The present quarry was idle.

DEPARTMENT OF MINERAL RESOURCES

STATE OF ARIZONA

FIELD ENGINEERS REPORT

Mine San Manuel Limestone-Silica Pit Date March 20, 1962
District San Pedro District, Pinal Co. Engineer Lewis A. Smith
Subject: Interview with C.L. Pillar, Mine Supt.

The smelter limestone and silica is being mined 12 miles south of Winkelman. 2 Northwest 1- yard deisel shovels, 1 RD 8 Cat, 5 - 10 yard trucks, and 1 new Joy Rotary Drill, plus jackhammers, are used in the pit. 12 people are employed on the average.

Movement now is to the north end of the old pit into a new area further north. This area will be able to supply limestone and Troy quartzite for a long time.