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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Arizona Department of Mines and Mineral Resources Mining Collection

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PRINTED: 01/31/2002

ARIZONA DEPARTMENT OF MINES AND MINERAL RESOURCES AZMILS DATA

PRIMARY NAME: MANGANESE KING GROUP

ALTERNATE NAMES:

PIMA COUNTY MILS NUMBER: 107

LOCATION: TOWNSHIP 11 S RANGE 2 E SECTION 36 QUARTER NW
LATITUDE: N 32DEG 26MIN 05SEC LONGITUDE: W 112DEG 07MIN 31SEC
TOPO MAP NAME: GU ACHI - 15 MIN

CURRENT STATUS: PAST PRODUCER

COMMODITY:
MANGANESE

BIBLIOGRAPHY:
S.B. KEITH, AZBM BULL. 189, 1974, P. 115
ADMMR MANGANESE KING FILE

11-8-41

Mr. Young says this property under litigation in Tucson courts —

Black Jack + Manganese King

Same property

A.L.J. says this not same as Black Jack Mine 2-1959

NAME OF MINE: MANGANESE KING

COUNTY: ~~Pinal~~ S
DISTRICT: Pima
METALS: Mn

OPERATOR AND ADDRESS: DATE:		MINE STATUS DATE:	
6/15/44	Joe Thurman, 529 W. Encanto Blvd., Phoenix	6/15/44	Shipping
		8/44	Idle

(manganese King)

Dorsey, Amory S. & Others
~~1605 E. Polk Street~~ ~~Apt. 182, 407 B, No. 19th St.~~
Phoenix, Arizona unclaimed 8-46 1-29-41

See MM-65 - Mine Owner's Report
See STEAMBOAT MANGANESE - Re gas application 1-8-45
" " " " " " 2-27-45

MM-63, MANGANESE KING GROUP, Pima Co.

Dunning

August 24, 1945

Mr. H. H. Van Narel
Manganese King Mine
Box 182
Casa Grande, Arizona

Dear Mr. Van Narel:

By now you will have executed your manganese contract, which was mailed to you on the 20th of this month.

I hope you are successful in hiling out your investment.

Sincerely yours,

W. C. Broadgate

cc: Charles H. Dunning
304 Home Builders Bldg
Phoenix, Ariz.

WCBROADGATE/AW

OPA

DEPARTMENT OF MINERAL RESOURCES

REPORT TO OPA ON ACTIVE MINING PROJECT

Date 11 Nov. 24 1944

Name of Mine Manganese King

Owner ~~or Operator~~ Willard P. Price

Address 2309 N 8th St

Mine Location South 45 miles from Casa Grande

Filing Information

File System.....

File No.....

This chart to be used for gallons of gasoline required per month.

PRESENT OPERATIONS: (check X)

Production.....; Development.....; Financing ✓; Sale of mine.....;

Experimental (sampling).....; Owner's occasional trip ✓;

Other (specify).....

PRODUCTION: Past and Future.

	Tons
Approx. tons last 3 months	300
Approx. present rate per 3 months	950
Anticipated rate next 3 months	1000
If in distant future check (X) here	

EQUIPMENT OPERATED:

Type	Quantity or Horse Power	Miles ~~or Hours~~ Per Month	Gallons Required Per Month
Personal Cars	✓ 85	1000	65
Light or Service Trucks			
Ore Hauling Trucks			
Compressors			
Other Mine or Mill Eqpt.			

*

PRODUCT PRODUCED OR CONTEMPLATED: Name metals or minerals.

REMARKS: Property and put of Mn to be increased

ARIZONA DEPARTMENT OF MINERAL RESOURCES

By A. MacFarlane

Field Engr.

November 24, 1943

War Price and Rationing Board
No. 81.7.1
137 North Second Avenue
Phoenix, Arizona

Gentlemen:

Mr. Willard P. Price, 2309 North 8th Street, Phoenix, is part owner in the Manganese King Mine located 43 miles southwest of Casa Grande and it is necessary for him to make a trip at least once a month to the property to check over mine operations.

The Manganese King is shipping manganese ore and it is one of the essential minerals.

I can certify to the need of supplemental gas for this work.

Yours very truly,

J. S. Coupal, Director

JSC:LP

SEE LETTERS TO

J. H. RATLIFF, c/o Humphreys Gold Corporation,
901 First National Bank Bldg., Denver, Colo.

J. R. FINKELSTEIN, Hotel El Rancho, Gallup, New Mexico

E. J. BeLLEAU, 1400 South Manhattan Pl., Los Angeles, Cal.

C. W. GARLAND, 412 W.6th St., Los Angeles, California

REPORTS REFERRED TO THE ABOVE on 12-26-1940

5 DECEMBER 1940

Mr. Harry Clark, 118 North 21st ~~Xxxxxx~~ Avenue,
Phoenix
Telephone 37926

HAS option to purchase the MANGANESE KING MINE

owned by Harry Valentine.

Mr. Clark telephoned this information today.

DEPARTMENT OF MINERAL RESOURCES
STATE OF ARIZONA
FIELD ENGINEERS REPORT

Mine Manganese King SEC 36, T11S R2E Date Oct. 21, 1955

District Cimarron Mts. District. ----Pima Co. Engineer Axel L. Johnson

Subject: Present Status. Information from Thad Watkins, mine foreman and part owner.

Reference See my report of Sept. 1, 1955.

Recent changes and present status are as follows:

Number of Men Working 3

Production None at present.

Present Mine Workings (1) Upper Workings. One inclined shaft (incl. 20 deg.), 50 ft. deep on the incline, followed by a drift about 70 ft. long, with stoping from the side of the drift. These workings have been discontinued on account of running out of ore.

(2) Lower Workings. One inclined shaft (incl. 45 deg.) 50 ft. deep on the incline, followed by a drift 30 ft. long. The shaft was sunk in the limestone, near the limestone-rhyolite contact. The drift at the bottom of the shaft cut across the contact and into the rhyolite. These workings have also been discontinued, because no ore was found in either the shaft or the drift.

(3) New Workings. Operators are now driving a tunnel at an elevation 40 ft. lower than the bottom of the shaft of the "lower workings". This tunnel is now in a distance of 110 ft.----all in the rhyolite formation. Operators plan to drive this tunnel ahead another 30 to 40 ft. in the expectation that a body of manganese ore will be found near the contact with the limestone formation.

Proposed Plans The Manganese King Mining Co. is also looking for copper deposits and prospect to explore and operate, and will seek to acquire same by lease or purchase.

WATKINS, THAD, et al
Manganese King Mining Co. (Owners)
511 N. Marshall
Casa Grande, Ariz.

MINE: MANGANESE KING, Cimarron Mts. Dist., Pima County - 50 Mi. N of Sells, Ariz.

OPERATORS: Same 9-1-55

MINE: CAMINO MINE (formerly "Monarch"), Santa Rosa Dist., Pinal Co. 10-19-56

MB-80 -BLACK DIAMOND NOS. 1,2,3 & 4, Pima Co. 12-21-56
Now known as BLACK CHIEF MINE.

DEPARTMENT OF MINERAL RESOURCES
STATE OF ARIZONA
FIELD ENGINEERS REPORT

Mine Manganese King Date Sept. 1, 1955

District Cimarron Mts. Dist., Pima County Engineer Axel L. Johnson

Subject: Field Engineers Report ----Personal Visit & Information from Thad Watkins, Foreman.

Location About 50 miles north of Sells. Drive 22 miles north of Sells to the Covered Wells - Casa Grande Road Y. Turn right and drive 221/2 miles on the Covered Wells- Casa Grande road to road signs " Black Jack Mining" &"Stella Maris No. 1". Turn left (west) and drive about 6 miles to the mine.

Owners Manganese King Mining Co., 511 N. Marshall, Casa Grande, Ariz. Owners in the company are reported to be C. C. Waterbury, Box 1, Apache Jct., Ariz., Hugh Nichols, Rte. #1, Higlee, Ariz., and Thad Watkins, 511 N. Marshall, Casa Grande, Ariz.

Operators Same as above.

Officers Thad Watkins, Mine Foreman.

Principal Minerals Manganese ore.

Number of Men Employed 6 (at times only 5). 2 sinking a shaft, & rem. on ore prod.

Production Rate Variable. Mr. Watkins reports average shipments of about 50 tons per week, and expects production to increase in the near future.

Geology The manganese ore is found in fractures in rhyolite rock near a rhyolite-limestone contact. Fractures are variable in width and run from 2 to 5 ft. wide, and generally contain good manganese ore. The drift, from which the ore is mined is being driven towards the limestone contact, and better ore is expected as the drift is driven ahead.

Ore Values Mr. Watkins reports that the shipments to date have run from 29 to 32 %. Some hand sorting is being done.

Ore in Sight and Probable No blocked out ore. No estimates of "probable ore". A shaft is being sunk to a depth of 70 ft. to explore the ore body.

Milling and Marketing Facilities Now shipping the ore to the Deming Manganese Depot. Company is planning the construction of a mill to mill the ore and to ship same on the Car Lot Program, after the Deming manganese depot closes down after exhaustion of the quota.

Present Mine Workings (1) Upper Workings. 1 Inclined shaft (incl. about 20 deg), about 50 ft. inclined depth, followed by a drift, now in about an additional 50 ft. The ore production is obtained from the drift.

(2) Lower Workings. 1 Inclined shaft (incl. about 45 deg). The shaft is inclined to the south, and is being driven in the limestone, near the limestone-rhyolite contact. It is now down to a depth of 50 ft. on the incline, and it is planned to drive it down to a depth of 70 ft. (incl. depth). 2 men work in the shaft (1 shift). No ore is taken out from this shaft.

* Present Operations Stoping ore from the drift being driven ahead in the "upper workings" described above. Ore is hoisted up the incline shaft in ore cars, which are dumped in ore bin. Some hand sorting is being done.

DEPARTMENT OF MINERAL RESOURCES
STATE OF ARIZONA

FIELD ENGINEERS REPORT

MANGANESE KING — Date 1/15/49

Sheridan or Cimmaron — Engineer George A. Ballam

ct: Examination

This property consisting of 6 unpatented claims, is situated 43 miles southwest of Casa Grande on the Santa Rosa highway. Access is had by 7 miles of good all-weather road, westward from the highway near the Indian village of Komelik. Property is within Papago Reservation and road was built and is maintained by the Indian Service. Road level, and maximum loads may be transported to S.P. railhead at Casa Grande.

Water is obtained for camp purposes from Drew well in nearby wash. Capacity not known for possible milling purposes.

Manganese, as psilomelane and pyrolusite, occurs in altered limestone contacts with quartz, quartzite and other acid rocks. Outcrops were followed over about 2,000 feet in two generally parallel showings.

Most of the ore shipped during World War II was extracted from a cut some 20 feet deep, over a length of 150 feet. A tunnel had been driven from a wash to these workings, which is claimed to make accessible 200 feet of ore on strike, but was not open for examination. It is reported some 600 tons of ore were shipped to Phoenix stockpile during war by Thurman and Van Marel.

Some attempt had been made during this period to bring the ore to stockpile grade by milling, crushing and screening. Beneficiation was effected by removing fines consisting largely of lime gangue.

About 50 to 75 tons of ore remain at millsite, presumably awaiting treatment when operations ceased. It was reported that this ore would assay 40% Mn. However subsequent sampling revealed it would not exceed 32% Mn. This ore appeared to be representative of what could be obtained, by sorting, from some half dozen locations on the property.

This appears to be another of the numerous manganese showings where successful operation depended so largely on careful sampling, close sorting and, in most cases, improvement of grade by some milling operation such as crushing and screening or tabling. In any event, the establishment of critical specifications are the important criteria, and if the government will accept 40% and reject 39% Mn, the margin of safety advisable in such an operation would indicate some more positive operation than mere sorting of ore. This ore is amenable to jig or table concentration. Water might be developed in the area, which is generally one of deep water table - 300 to 500 feet.

The property is owned by Amory S. Dorsey, 1605 E. Polk Street, Phoenix.

United States Senate

Washington, D.C., August 24, 1945

Respectfully referred to

Mr. Charles H. Dunning:

For your information.

Respectfully,

Bill Broadgate

W. C. Broadgate
Technical Consultant

U. S. GOVERNMENT PRINTING OFFICE 16—3813

August 23, 1949

Mr. G. L. Springer
811 North Dwight St.
Compton, California

Dear Mr. Springer:

In reply to your letter of August 16th regarding the sale or leasing of your manganese property, the Manganese King, near Casa Grande, Arizona:

Mr. C. D. Brock, Canary Auto Court, 2041 W. Van Buren, Phoenix, is erecting a small mill near Winkelman for treating manganese. Mr. Brock is a mining man of considerable experience and has outlets for his ore. It is entirely possible that he might be interested in your mine since it is not located too far from his mill.

You might also contact Kaiser Industries, Oakland, Calif. I believe they have a Los Angeles office also.

Yours very truly,

Roger I. C. Manning
Field Engineer

RICM:mh

Compton, Calif.
Aug. 16, 1949

Mr. Chas. H. Dunning
Dept. of Mineral Recources
Mineral Building, Fairgrounds
Phoenix, Arizona

Dear Mr. Dunning:

This is in regard to a manganese property south of Casa Grande known as the Manganese King. The owner of this property, Mr. A.S. Dorsey, had several talks with you earlier this year mainly in respect to the sale of manganese to the federal government. At that time you were kind enough to send a letter to me interpreting the specifications set forth by the Munitions Board.

Unfortunately much of the ore mined from this property during the war was near the present minimum requirement limits of the government and it has seemed too great a gamble to sell under contract to that that agency until extensive development work has been done on the mine. Actually N either Mr. Dorsey or myself have sufficient capital to go ahead with the desired improvements.

We should, however, like to lease the mine or perhaps sell to a responsible company which has the necessary finances to develope it properly. I believe you referred a Mr. A.M. Riedesel of Denver to Mr. Dorsey. Apparently he was acting as an agent for a Utah Steel company which desired a better source of manganese. You may have heard that the sample of ore sent to this company from our mine contained more zinc than was desireable for their purposes. We have heard nothing further from Mr. Riedesel.

At present Mr. Dorsey is quite seriously ill with a throat tumor and is unable to do anything in the matter of selling, leasing or further developing our property. During my last talk with him at the hospital he suggested that I write to you to see if you might be able to direct us to any other parties whom we might contact having interest in manganese.

I should be glad to talk or write to any reliable party, answer their inquiries and arrange to show them the mine at their convenience. We have had several assays made to date and can furnish copies of each with samples. If you can direct me to anyone in Los Angeles or vicinity that I might talk to personally I should particularly appreciate it.

I am not an agent for Mr. Dorsey but rather a partner. We sincerely thank you and your department for all that has been done in our behalf in the past.

Yours very truly,

Gilbert L. Springer
Gilbert L. Springer

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

10

February 17, 1949

Mr. G. L. Springer
1212 Bay View Avenue
Wilmington, California

Dear Mr. Springer:

COPY

We have had several talks with Mr. A. E. Dorsey in regard to a manganese property south of Casa Grande, and he has asked us to give you an analysis of how we interpret the specification set forth by the Munitions Board.

We have not seen a complete analysis of your possible ore but Mr. Dorsey assures us that there would be no deductions because of excess iron, phosphorus or other undesired elements.

The Munitions Board is not making you an offer but is asking you to make them an offer, and the only guide as to price that we have is the commercially quoted price for metallurgical grade Mn as published.

On 48% Mn this is 70¢ per long ton unit, which would mean 48 x 70 or $33.60 (2240 lbs.)

The Munitions Board assesses penalties for lower grades and these work out as follows: On 44.0% deduct 1¢ for each 1% under 48%, which would mean 44% x 66¢ = $29.04 per long ton. On 40% (the lowest acceptable limit) a further deduction of 4¢, plus 1½¢ for each 1% down, is made. Therefore on 40% the results would be: 62¢ - 6¢ = 56¢ times 40% = $22.40 per ton.

Of course there is no assurrance that the Board will accept any such bid. Our thought is only to suggest a basis comparable to the general market price. From there on you will have to make your own guess.

Their contracts are usually based on FOB rail point, but whether or not a western rail point would require a lower price we also do not know.

Please call on us for any further help that we can give.

Yours very truly,

Chas. H. Dunning
Director

CHD:mh
cc: Mr. A. E. Dorsey
1605 E. Polk St.
Phoenix, Arizona

DEPARTMENT OF MINERAL RESOURCES
STATE OF ARIZONA
MINE OWNER'S REPORT

Date June 10, 1940

Mine Manganese King

Location -- 41 miles SW of Casa Grande, Arizona. Sec. 36, T 11 S, R. 2 East.

Mining District & County - Papago Indian Reservation. Pima County

Former Name

Owners - [redacted] and Clarke E. Young.

Address - ~~207 First National Bank Bldg~~ 1109 N. 1st St. Phoenix, Arizona

Operator Jim Stuckmeyer

Address

President, Owning Co.

President, Operating Co.

Gen. Mgr.

Principal Minerals - Manganese

Mine Supt.

Production Rate

Mill Supt.

Mill: Type & Cap.

Men Employed

Power: Amt. & Type

Operations: Present - None

Operations: Planned - None at present

Number Claims, Title, etc. - 6 unpatented. Located 11/28/39 and 1/12/40. Official receipts showing payments of annual rentals for the first year have been issued by the Papago Indian Agency at Sells, Arizona.

Description: Topography & Geography - Low rolling country.

Mine Workings: Amt. & Condition - Location work done on each claim, exposing manganese ore also many test holes.

Geology & Mineralization - Weathered limestone and chert, with underlying granite. Manganese beds, inclined from 40 to 70 degrees. Outcrops in irregular areas, in limestone, some calcite and silica.

Ore: Positive & Probable, Ore Dumps, Tailings - Ore exposed from lowest working elevation 150 ft. above them.

Dimensions and Value of Ore body - Two average samples showed:

Manganese	21.95%
Iron	8.61
Silica	11.40
Phosphorous	0.12
Aluminium	4.87
Zinc	0.11

Representing an area of over 30,000 sq. ft.

Mine, Mill Equipment & Flow-Sheet - Manganese occurs as Psilomelane manganite and pyrolusite.

Road Conditions, Route - Good desert road to and covering claims--41 miles SW from Casa Grande; 12 miles SW from Komalik and 1½ miles SW from the Montezuma Copper Co. Mine.

Water Supply - 1/2 mile NE from claim is the Drew Well for water supply.

Brief History - Very little investment needed to begin immediate mining operations. A carload or two of 50 tons each could be mined with hand steel rapidly, and the lay of the land facilitates storing and loading at economic costs. The ore deposit can be developed for mining by crosscuts and in many places strip mining is available. The deposit shows great possibilities and indicates that it is probably one of the greatest manganese ore deposits known in the U. S.

Special Problems, Reports Filed

Remarks

If property for sale: Price, terms and address to negotiate - For sale or lease.
Write ~~Harry Clark, 118 N. 21st Ave.~~
Phoenix, Arizona

(SIGNED)_____

From report by Herman Lainck, engineer, on file.

MM-63

DEPARTMENT OF MINERAL RESOURCES
STATE OF ARIZONA

MINE OWNER'S REPORT

Date 1/29/41

1. Mine Manganese King Group
2. Location 43 miles SW of Casa Grande, Arizona
3. Mining District & County Sheridan Mining Dist. Pima County
4. Former name Unknown
5. Owner Amory S. Dorsey & others
6. Address (Owner) Amory S. Dorsey 1605 E. Polk St. Phoenix, Ari
7. Operator None
8. Address (Operator)
9. President, Owning Co. None
9A. President, Operating Co.
10. Gen. Mgr. None
14. Principal Minerals Manganese
11. Mine Supt. "
15. Production Rate
12. Mill Supt. "
16. Mill: Type & Cap.
13. Men Employed "
17. Power: Amt. & Type
18. Operations: Present None

19. Operations: Planned Can be mined with power shovel.

20. Number Claims, Title, etc. 6 claims-title in clear, original locations holes completed and location work recorded according to law, and also leasage paid of 5¢ an acre to the Indian Service as these claims are located on the Papago Indian reservation, and in the event they are patented, the lease money is returned to the owners.

21. Description: Topography & Geography Consisting of a large dyke of approximately 150 ft. in height, 3600 ft. in length, composed of altered limestone in the ore occuring in same and in calcite.

22. Mine Workings: Amt. & Condition On Manganese King No. 1, there is a drift into the ore body of approximately 40 ft. depth showing the ore in practically a dense mass.

3. Geology & Mineralization — Altered limestone with quartz contacts limestone lying over granite. I would judge it to be at least 500 ft. thick in most places.

4. Ore: Positive & Probable, Ore Dumps, Tailings — Ore on dump in principle working of Manganese King No. 1, approximately 50 tons, and I would judge around 100 tons, on other opening on the apex of the dyke on 4 of the other 5 claims.

4A. Dimensions and Value of Ore body — Around 50,000 sq. ft. of surface exposure of possible ore body.

5. Mine, Mill Equipment & Flow-Sheet

6. Road Conditions, Route — 43 miles SW of Casa Grande, Arizona, about 33 miles of improved gravel Highway and 8 miles of dirt orad in fair condition. $100 would put it in hauling shape.

7. Water Supply — There is a well, known as Drew Well, which would furnish water for any Domestic purpose, more water could be developed with shallow wells within 50 ft. of surface or less.

8. Brief History — There was some work done on main working, just before the World War (No. 1) that was the work mentioned in this report.

9. Special Problems, Reports Filed — No reports filed. Silica approximately 8 to 12%, however, there is a quantity that could be sorted that I believe would pass Government specification as far as insoubles are concerned.

0. Remarks — I had one assay run by the Phelps Dodge Corp., which gave 44% Manganese of assorted ore.

1. If property for sale: Price, terms and address to negotiate. — $50,000 purchase price, with some kind of down payment, or would consider Bond and Lease with an advance on the royalty, to pay us for some of our expenditures on the same.

32. Signature (Signed) Amory S. Dorsey

3. Use additional sheets if necessary.

DEPARTMENT OF MINERAL RESOURCES
STATE OF ARIZONA
FIELD ENGINEERS REPORT

Mine Manganese King ✓ Date 1/15/49

District Sheridan or Cimmaron Engineer Ballam

Subject: Examination

This property, consisting of 6 unpatented claims is situated 42 miles southwest of Casa Grande on the Santa Rosa highway. Access is had by 7 miles of good all-weather road Westward from the highway near Indian Village of Komelik. Property is within Papago Reservation and road was built and is maintained by Indian Service. Road level, and maximum loads may be transported to S.P. railhead at Casa Grande.

Water is obtained for camp purposes from Drew well in nearby wash. Capacity not known for possible milling purposes.

Manganese, as Psilomelane and pyrolusite occurs in altered limestone contacts with quartz, quartzite and other acid rocks. Outcrops were followed over about 2000 feet in two generally parallel showings.

Most of the ore shipped during W. War II was extracted from a cut some 20 feet deep, over a length of 150 feet. A tunnel had been driven from a wash to these workings which is claimed to make accesible 200 ft ore on strike, but was not open for examination. It is reported some 600 tons of ore were shipped to Phoenix stockpile during war, by Thurman and Van Marel.

Some attempt had been made during this period to bring the ore to stockpile

2.

DEPARTMENT OF MINERAL RESOURCES
STATE OF ARIZONA
FIELD ENGINEERS REPORT

Mine Manganese King Date

District Engineer

Subject:

grade by milling—crushing and screening. Beneficiation was effected by removing fines consisting largely of lime gangue.

About 50-75 tons of ore remain at millsite, presumably awaiting treatment when operations ceased. It was reported that this ore would assay 40% Mn. However subsequent sampling revealed it would not exceed 32% Mn. This ore appeared to be representative of what could be obtained, by sorting, from some half-dozen locations on property.

This appears to be another of the numerous manganese showings where successful operation depended so largely on careful sampling, close sorting and in most cases, improvement of grade by some milling operation such as crushing and screening or tabling. In any event the establishment of critical specifications are the important criteria, and if the govt. will accept 40% and reject 39% Mn. the margin of safety advisable in such an operation would indicate

3.

DEPARTMENT OF MINERAL RESOURCES
STATE OF ARIZONA
FIELD ENGINEERS REPORT

Mine Manganese King Date

District Engineer

Subject:

Some more positive operation than mere sorting of ore. This ore is amenable to jig or table concentration. Water might be developed in the area which is generally one of deep water table -200-500ft.

The property is owned by Amory S. Dorsey, 1605 E. Polk St. Phoenix

F. A. Bellam

MM-63

DEPARTMENT OF MINERAL RESOURCES
STATE OF ARIZONA
MINE OWNER'S REPORT

Date 1/29/41

1. Mine Manganese King Group ~~of one Claims~~ 2. Location 43 miles S.W. of Casa Grande, Ariz
3. Mining District & County Sheridan Minging Dist., Pima County
4. Former name Unknown
5. Owner Amory S. Dorsey + Others
6. Address (Owner) Amory S. Dorse, 1606 E. Polk St., Phoenix, Arizona.
7. Operator none
8. Address (Operator) ———
9. President, Owning Co. none
9A. President, Operating Co. ———
10. Gen. Mgr. none
14. Principal Minerals Manganese
11. Mine Supt. none
15. Production Rate ———
12. Mill Supt. none
16. Mill: Type & Cap. ———
13. Men Employed none
17. Power: Amt. & Type ———
18. Operations: Present none

19. Operations: Planned
Can be mined with Power Shovel

20. Number Claims, Title, etc.
6 Claims
Title in Clear, Orignal Locations Holes ~~Completed~~.
and Location work Recorded according to Law.
and also Leasage Paid of.05¢ on Acre to the Indian Service

21. Description: Topography & Geography
Consisting of a large Dyke of Approx. 150 ft. in Height 3600 ft. in length composed of altered limestone the Ore occuring in same and in Calcite
As these Claims are located on the Papago Indian Reservation and in the event the are Pate the Lease money is returned to the Owners

22. Mine Workings: Amt. & Condition
On Manganese King No. 1. There is a Drift into the Ore body a Approx. 40 ft. depth. showing the ore in ~~mass~~ practily a Dense Ma

(over)

23. Geology & Mineralization

~~Altered~~ Altered Lime Stone, with Quartz contacts Lime stone dying over Granite, I would judge it to be at leas 600 ft. Thick in most Places

24. Ore: Positive & Probable, Ore Dumps, Tailings

Ore on dump in principle working of Manganese King No. 1 approx. 500 tons, and I would judge around 100 tons on other opening on the apex of the Dyke. on 4 of the other 5 Claims

24A. Dimensions and Value of Ore body

Around 50,000 sq. ft. of surface exposourse of Possible Ore body

25. Mine, Mill Equipment & Flow-Sheet

/

26. Road Conditions, Route

43 miles S.W. of Casa Grande, Arizona, about 33 miles of improved gravel Hiway and 8 mile of Dirt road in fair condation, $100.00 would put it in hauling shape

27. Water Supply

There is a well know as Drew Well which would furnish water for any Domestic Porpose, more water could be developed with shallow wells within 50 ft. of surface or less

28. Brief History

There was some work done on main working, Just before the World War (No. 1), that was the work mentioned in this report.

29. Special Problems, Reports Filed

No reports filed. Silica, approx. 8 to 12 %, however there is a quanity that could be sorted that I believe would pass v. specification as far as insoubles are concerned.

30. Remarks

I had one assay run by the Phelps Dodge, with gave 44 Manganese of assorted Ore.

31. If property for sale: Price, terms and address to negotiate.

$50,000 purchase price, with some Kind of a down payment or would consider Bond and Lease with an advance on the royality, to pay us for some of our expenditurs. on the same

32. Signature Emory S. Evans

33. Use additional sheets if necessary.

DEPARTMENT OF MINERAL RESOURCES
STATE OF ARIZONA

OWNERS MINE REPORT

Date **April 1, 1940.**

1. Mine **Manganese King**
2. Mining District & County **Papago Reservation Pima Co.**
3. Former name
4. Location **41 miles S. westerly from Casa Grande. Sec. 36 T 11 S, R 2 E.**
5. Owner **Harry J. Valentine**
6. Address (Owner) **207 First National Bank Bldg. Phoenix. Ph. 42674**
7. Operator
8. Address (Operator)
9. President
10. Gen. Mgr.
11. Mine Supt.
12. Mill Supt.
13. Principal Metals
14. Men Employed
15. Production Rate **Manganese**
16. Mill: Type & Cap.
17. Power: Amt. & Type
18. Operations: Present
19. Operations Planned
20. Number Claims, Title, etc. **6 unpatented claims, maps showing location accompany report.**
21. Description: Topography & Geography **Desert**
22. Mine Workings: Amt. & Condition **Many test holes and open cuts.**

(over)

23. Geology & Mineralization — In weathered limestone and chert with underlying granite. Beds dip 40° to 70°.

24. Ore: Positive & Probable, Ore Dumps, Tailings — A carload or two could be moned with hand steel. In many places strip mining is feasible. probably one of the greatest manganese deposits in the United States.

24-A Vein Width, Length, Value, etc. — Sample #1 average ore over 30,000 sq. ft. Manganese occurs as psilomelane, manganite, pyrolusite.

Sample #1 - Mn. 31.95% P-0.12%
Fe 8.61% Al-4.87%
Silica 11.40% Zn.0.11%

25. Mine, Mill Equipment & Flow Sheet

26. Road Conditions, Route — 1½ miles southwesterly from Montezpna Copper Co. From Casa Grande 33 miles improved graded road, 8 miles secondary road. Rough desert roads cross claims.

27. Water Supply — "Draw" well 1/2 mile northeasterly from claims.

28. Brief History

29. Special Problems, Reports Filed

30. Remarks

31. If property for sale: Price, terms and address to negotiate.

For further information see Harry J. Valentine, Phoenix, clark, 118 N. 2ist ave

~~From report by Herman Lainck~~

32. Signed.....

33. Use additional sheets if necessary.

DEPARTMENT OF MINERAL RESOURCES
STATE OF ARIZONA

OWNERS MINE REPORT

Date 6/10

1. Mine Manganese King.
2. Mining District & County Papago Indian Reservation, Pima County.
3. Former name
4. Location 4½ miles SW of Casa Grande
   Sect 36-T 11 S-R 2 E
5. Owner Harry J Valentine & Clarke E. Young
6. Address (Owner) 207 1st National Bank Bldg. Phoenix
7. ~~Operator~~
8. Address (~~Operator~~) Phoenix Ariz
9. President —
10. Gen. Mgr. —
11. Mine Supt. —
12. Mill Supt. —
13. Principal Metals Manganese
14. Men Employed —
15. Production Rate —
16. Mill: Type & Cap. —
17. Power: Amt. & Type —
18. Operations: Present - none -
19. Operations Planned — none at present -
20. Number Claims, Title, etc. 6 unpatented - located 11/28/39 and 1/12/40
    Official receipts showing payments of annual rentals for the 1st year have been issued by the Papago Indian agency at Sells, Ariz.
21. Description: Topography & Geography
    Low rolling country -
22. Mine Workings: Amt. & Condition
    Location work done on each claim
    Exposing manganese ore. also many test holes.

(over)

23. Geology & Mineralization Metamorphosed limestone and chert ... underlying granite. Manganese beds, inclined from 40 to 70 degrees. Outcrops in irregular areas, in limestone, some calcite and silica.

24. Ore: Positive & Probable, Ore Dumps, Tailings

Ore exposed from tunnel working to elevation 150 feet above them.

24-A Vein Width, Length, Value, etc. Two average samples showed:—

~~Four~~ representing an area of 30,000 sq. feet

Manganese	31.95 %
Iron	8.61
Silica	11.40
Phosphorous	0.12
Alumenia	4.89
Zinc.	

25. Mine, Mill Equipment & Flow Sheet

Manganese occurs as Psilomelane Manganite & Pyrolusite

26. Road Conditions, Route

Good dirt road to and crossing claims. 4 miles S.W. from Cananea Grande: 1/2 miles S.W. from Komalik and 1 1/2 miles S.W. from Montezuma Copper Company mine.

27. Water Supply

1/2 mile N.E. from claim is the Drew well for water supply.

28. Brief History

Very little investment needed to begin immediate mining operations. A carload or two of 50 tons each could be mined with hand steel rapidly, and the lay of the land facilitates storing & loading at economic costs.

29. Special Problems, Reports Filed

The ore deposit can be developed for mining by cross cuts and in many places strip mining is available.

30. Remarks

The deposit shows great possibilities & indicates that it is very probably one of the greatest manganese ore deposits known in the U.S.

31. If property for sale: Price, terms and address to negotiate.

For sale or lease — See owners.

Form report by 32. ~~Signed~~ Herman Lainck - Engineer - on file -

33. Use additional sheets if necessary.

MM-42

DEPARTMENT OF MINERAL RESOURCES
STATE OF ARIZONA
OWNERS MINE REPORT

Date June 10, 1940

1. Mine Manganese King ✓

2. Mining District & County Papago Indian Reservation
Pima County

3. Former name

4. Location 41 miles SW of Casa Grande
Sect. 36, T11 S, Rz2 E.

5. Owner ~~Harry I. Valentine~~ ✓ and ~~Clarke E. Young~~ ✓ clarke e. young

6. Address (Owner) ~~207 First Nat. Bank Bldg. Phoenix, Ariz.~~ 1109 N. 1st, Phx. ~~Luhrs. Bldg.~~

7. Operator

8. Address (Operator) Phoenix, Arizona

9. President

10. Gen. Mgr.

11. Mine Supt.

12. Mill Supt.

13. Principal Metals Manganese ✓

14. Men Employed

15. Production Rate

16. Mill: Type & Cap.

17. Power: Amt. & Type

18. Operations: Present ~~None~~ 11-8-41

All mail to be sent to Jim Struckmeyer atty for owners

19. Operations Planned None at present

20. Number Claims, Title, etc. 6 unpatented. Located 11/28/39 and 1/12/40
Official receipts showing payments of annual rentals for the first year have been issued by the Papago Indian Agency at Sells, Arizona

21. Description: Topography & Geography Low rolling country

22. Mine Workings: Amt. & Condition Location work done on each claim, exposing manganese ore
Also many test holes

(over)

23. Geology & Mineralization — Weathered limestone and chert, with underlying granite. Manganese beds, inclined from 40 to 70 degrees. Outcrops in irregular areas, in limestone, some calcite and silica.

24. Ore: Positive & Probable, Ore Dumps, Tailings — Ore exposed from lowest working elevation 150 feet above them.

24-A Vein Width, Length, Value, etc. — Two average samples showed:
Representing an area of over 30,000 sq. ft.

Manganese	31.95%
Iron	8.61
Silica	11.40
Phosphorous	0.12
Aluminium	4.87
Zinc	.11

25. Mine, Mill Equipment & Flow Sheet

Manganese occurs as
psilomelane
manganite and
pyrolusite

26. Road Conditions, Route — Good desert road to and covering claims 41 miles SW from Casa Grande : 12 miles SW from Komalik and 1½ miles SW from the Montezuma Copper Co. Mine.

27. Water Supply — 1/2 mile NE from claim is the Drew well for water supply

28. Brief History — Very little investment needed to begin immediate mining operations. A car load or two of 50 tons each could be mined with hand steel rapidly, and the lay of the land facilitates storing and loading at economic costs. The ore deposit can be developed for mining by crosscuts and in many places strip mining is available. The deposit shows great possibilities and indicates that it is probably one of the greatest manganese ore deposits known in the U. S.

29. Special Problems, Reports Filed

30. Remarks

31. If property for sale: Price, terms and address to negotiate. For sale or lease - see owners

32. Signed — From report by Herman Lainck - engineer on file

33. Use additional sheets if necessary.

REPORT ON MANGANESE KING MINING CLAIMS LOCATED IN PIMA COUNTY, ARIZONA.

The Manganese King group of mining claims consists at this time, April 1st, 1940, in six unpatented claims situated in or very near to Section 36 Township 11 South Range 2 East, G.& S.R.B.& M., when the same shall be surveyed, and in Pima County, Arizona. The claims are contiguous, located in the Papago Indian Reservation, about 41 miles southwesterly from Casa Grande, Arizona, about 12 miles southwesterly from the Indian village named Komalik, and 1½ miles southwesterly from the Montezoma Copper Company's mine. The claims can be reached from Casa Grande over 33 miles of improved gravelled highway and 8 miles of secondary dirt road, ordinary sloping gently desert road. One half mile northeasterly from the claims is located the "Drew" well.

The claims are all full claims each being 600 x 1500 feet in dimensions, and valid completed location holes have been excavated on each claim to sufficient depth to fulfill the requirements of the laws governing locating of mining claims. The location holes are in the centers of the claims excepting that the hole on Manganese No. 9 King is about 300 feet south of the north boundary and 1200 feet northerly from the south boundary and widway between the sides of the claim. Each of the six claims extends about 1500 feet north 10 degrees East and 600 feet South 80 degrees West.

GEOLOGY.

The country is formed of weathered limestone and chert with underlying granite. The strike is about South 60 degrees West. Small folds and erosion show some disturbance. The beds are inclined from 40 degrees to 70 degrees and dipping to the north. Manganese ore is outcropping on large areas and lays on the surface, in irregular deposits, in the limestone and sometimes with calcite, sometimes with silica, and sometimes in pure oxides, in secondary and tertiary enrichments. Many test holes and open cuts expose the manganese deposits from the bottom of the workings to an elevation of about 150 feet higher. The bottom of the workings at lowest elevation is in a wash which crosses the claims from northwesterly to southeasterly directions. Ore in place and float

were found on an area of about 17 acres. It assays, i.e., two apparently average samples selected by undersigned, as follows:

	Sample No.1	Sample No.2
Manganese	31.95%	
Iron	8.61%	
Silica	11.40%	
Phosphorous	0.12%	
Alumina	4.87%	
Zinc	.11%	

Sample No.1, taken from extensive ore body on claim No.1, is an average of ore over an area of over 30000 square feet; and all the other ore deposits on the claims are cleaner, purer Manganese Oxides in the form of Psilomelane Manganite, and Pyrosulite. Sample No.2 was taken by another engineer and is a higher grade of the same extensive deposits in the same area.

A fair rough desert road crosses all the claims from northeast to southwest, and with short extensions of the road all ore deposits are easily accessible, there being no real mountain climbing to get to them. Very little investment is needed to begin immediate mining operations. A carload or two of 50 tons each could be mined with hand steel rapidly; and the lay of the land facilitates storage and loading at very economical cost. The ore deposits can be developed for mining by cross-cuts and in many places strip mining is feasible.

The manganese bed shows very great possibilities and indicates that it is very probably one of the greatest manganese ore deposits known in the United States.

Data furnished by the attorney for the owners, Harry J. Valentine, whose office is room 207 First National Bank Bldg., Phoenix, Arizona, phone 42674, is included herein for convenience as follows:- RECORDINGS- (Tucson)

Name of Claim.	Date recd.	Book of Mines	Page.	Date located
Manganese King No.1	1/23/40	74	246	11/28/39
Manganese No.2	1/23/40	74	247	11/28/39
Manganese No.3	1/23/40	74	248	11/28/39
Manganese King No.7	1/18/40	74	238	1/12/40
Manganese No.8 King	1/18/40	74	239	1/12/40
Manganese No.9 King	1/18/40	74	240	1/12/40

Owners of Legal Title now of record: Harry J. Valentine (above address) and Clarke E. Young also of Phoenix, Arizona. All monuments are of stone and have been constructed as required by law. Most of them have been painted or whitewashed. Official receipts showing payments of annual rentals for the first year have been issued by the Papago Indian Agency at Sells, Arizona, covering all above described claims.

Respectfully submitted April 1st, 1940.

Herman Lainck

Herman Lainck

Engineer.

LEE HAMMONS, GEOLOGIST
6243 West Missouri Avenue Glendale, Arizona YE 7-6008

October 10, 1966

Mr. Julius Mallin
Suite 302
74 Victoria Street
Toronto 1, Canada

Dear Mr. Mallin:

In accordance with your request, I have made a feasibility study of the copper leaching operation based on the Makalla lease on the Hope Mining and Milling Company's claims in Courtland, Cochise County, Arizona.

My findings, conclusions and recommendations are contained in the accompanying report. Thank you for the opportunity to do this work.

Yours very truly,

Lee Hammons

REGISTERED GEOLOGIST
LEE HAMMONS
DEC. 31, 1966
ARIZONA U.S.A.

LEE HAMMONS, GEOLOGIST
6243 West Missouri Avenue Glendale, Arizona YE 7-6008

FEASIBILITY REPORT ON THE HOPE CLAIMS, COURTLAND, ARIZONA

The Hope Mining and Milling Company owns several groups of patented mining claims in and adjacent to the townsite of Courtland, Arizona. This report will be concerned with portions of two of these groups totalling 25 claims and fractional claims.

Shalom Makalla holds a lease on these claims and is conducting a leaching in place operation.

The purpose of this report and the field work on which it is based is to determine if the copper leaching in place project presently operating on the premises is economically feasible and if production could be expanded so that a good profit on investment could be realized. A secondary purpose is to determine if heap leaching of copper ores on the property is economically feasible.

The detailed geological study on the Hope and adjacent claims, including some compass mapping of underground workings, was carried out on several trips to the property during recent years. It was this work which established the fact that leaching in place was basically possible. A follow-up was made on October 1, 1966 to examine the present facilities and method of operation. The remarks on the general geology was adapted from the literature on the region.

Geology

The Turquoise Mining District lies on the east flank of the Dragoon Mountains at their southeastern extremity. The rocks are chiefly Paleozoic cut by igneous intrusions.

The geology of the Courtland area is complex. After the sedimentary rocks were laid down, crustal movements caused thrust faulting followed by normal faulting. The sedimentaries were intruded by igneous rocks and were metamorphosed by hydrothermal activity. The hydrothermal fluids also mineralized to some extent both the sedimentary and igneous rock.

A later period of normal faulting further complicated the structural picture. Probably some of the early thrust fault planes were tilted at this time.

While all of this was going on, weathering, erosion, and ground water leaching were taking place. The resulting chemical and physical changes complicated the situation further.

The oldest sedimentary beds in the Courtland area are Cambrian, although some Pre-Cambrian schists may once have been shales. The Bolsa quartzite is hard and dense and highly fractured in the Courtland area. It strikes generally north and south with an easterly dip of 40° to 80°. The abrigo limestone is a thin-bedded dolomitic limestone with some alternating silicic shale beds. It is strongly metamorphosed. These Cambrian beds lie on a quartz monzonite porphyry which, in some places, is intrusive into the quartzite.

No Ordovician or Silurian sediments exist in the Courtland area. Devonian rocks are also absent in the immediate area, but do occur in the Dragoon Mountains.

Carboniferous limestones, probably Mississippian, are thick and massive. They form the tops of Monarch, Casey, and Reservoir hills. They have been faulted out of their original stratigraphic positions relative to the Cambrian beds and have been intruded by igneous bodies.

Major intrusive bodies in the area are quartz monzonite porphyries. One is considered to be older as it is highly altered and decomposed. It underlies and, in places, intrudes the Cambrian sediments. The younger porphyry intrudes the Carboniferous beds and possibly the Cambrian also. It is a less altered and less silicic quartz monzonite porphyry than the older body.

The country rock of the Mama and other nearby mines is the Cambrian dolomitic limestone and interbedded shales. This rock is thin-bedded and dips steeply to the east. It is well metamorphosed, the thicker beds being dense and crystalline so as to be almost a marble. It has been intruded by dikes and sheets of quartz monzonite porphyry.

The cause of the metamorphism is not entirely clear, some of the intrusives also show signs of having been metamorphosed. There is a possibility that an underlying igneous mass was the source of hydrothermal fluids which altered the rock. These fluids were also the source of mineralization for the area.

Mineralization

These hot solutions deposited their mineral content as they moved under pressure along bedding planes, penetrated the more porous formations and replaced molecules of the country rock.

Mineralization bears no apparent relation to fissuring. The chief mineral is pyrite together with a small percentage of chalcopyrite, which is the chief ore mineral.

The minerals are disseminated with local concentrations in lenticular bodies and have also replaced limestone. Ore bodies are largest and most abundant near porphyry intrusions. To some extent the porphyry has been replaced.

There is very little oxide ore in the Mame mine compared with the large tonnage of pyritic ore. However, the sulfides have been oxidizing and forming sulfuric acid. Meteoric ground water has seeped down thru the overlying rock and, made acid by the oxidizing sulfides, further altered the limestone. The carbonates thus have in many places been converted to sulfates and oxides. Much or all of the calcium oxide thus formed, being soluble in water, has been leached out by ground water and is no longer an obstacle to the production of copper by an acid leaching process.

Of course, copper oxides and sulfates have been formed also, and these are the target of a man-made leaching cycle.

Subsurface

Data on the subsurface conditions were derived from field observations in those workings that were accessible before the present leaching operation made them unsafe. These were all on the 50 and 100 levels; the 200 and 300 levels have been flooded for decades.

There are many thousands of feet of tunnel connected to the several shafts on the claims and they are all connected together.

The Sunshine Mining Company drilled 14 churn drill holes in late 1957 along the trend of the major ore body. Total footage was 3380 feet. Sunshine's work bore out old reports, both verbal and written, that at least 10 million tons of over 1% copper ore exists in the claims.

Hydrology

A large amount of evidence indicates that the ground water in the Courtland area is contained in an isolated reservoir. It is certainly separate from the nearby valley system. Old records and reports from local mining men give an average of approximately 130 feet below the collar of the Mame shaft, which is 4845 feet above sea level.

Of course, the level has fluctuated over fairly wide limits from year to year. This has contributed to the oxidation of the ore and the release of sulfuric acid which has not only altered the limestone but enlarged many of the natural water courses by solution of the lime.

Bedding planes of the sedimentary rocks in the Courtland area are tilted at steep angles as a result of crustal movements. These same movements, normal faulting and thrust faulting, have broken the rock units quite severely. In and near the fault planes the rock has been crushed and loosely cemented into breccias. Such broken-up formations make it easy for rain water to enter the underground reservoir, and also increases its capacity by solution. Equally important, it increases the channels of communication between parts of the reservoirs.

Perfect communication between several areas is provided by the extensive underground workings. It has been established that pumping in one mine in the area lowers the water level in another mine.

Just how extensive the workings are is not known, so no accurate estimate of their volume can be given. Old records show that several hundred thousands of tons or ore were shipped and the numerous waste dumps also represent a large volume of rock removed.

Economics

The ore body is big enough. Estimates of tonnage by various authorities range from 10 million to 100 million. Average grade in explored areas is in excess of 1%. On the basis of 10 million tons at 1%, and assuming a 50% ultimate recovery, the total available copper amounts to 200 million pounds.

At $ .40 per pound, a gross value of $80,000,000 is indicated, or $60,000,000 net before taxes.

That leaching in place is feasible has been amply demonstrated by the present operation. It is proven that the pyritic ore will constantly produce acid as well as copper as it is irrigated. The old stopes were lined with copper and iron sulfates before leaching was started.

Percentage of recovery of ore in place by acid leaching is very difficult to estimate because of so many variables. It is theoretically possible to get some 90% of copper values, but the economic cut-off is likely to be reached at a lower percentage; 50% is a more realistic figure.

The ground water in the area is contained in a closed system so that any copper going into solution anywhere on the property is expected to be eventually recovered.

The present production can be expanded from 50,000 pounds per month to a very profitable 300,000 pounds per month. The existing precipitation plant was designed for a capacity of 360,000 pounds per month, so no expansion is required there.

The irrigating field would have to be increased from the present 70 holes to approximately 300 holes (part of the area needs to be "resting" or aerating so that oxidation will release a new supply of copper and acid from the ore body). Additional pumps will have to be set in the shafts to recover the additional volume of leach solution.

Metal buyers are presently paying $ .43 to $ .45 per pound for cement copper F.O.B. mine, less commission. Present operating costs add up to approximately $ .10 per pound. The following tabulation assumes a production rate of 10,000 pounds per day, a price of $ .40, costs of $ .10, and a 30 day month.

300,000 pounds per month
$120,000 gross
$ 30,000 cost
$ 90,000 net per month before taxes.
$1,080,000 net per year before taxes.

Capital costs will be quite low compared to standard mining and milling operations. They are not accurately predictable because each expansion of the irrigating area is partially experimental.

If this project proves successful, further expansion is possible by building more precipitation cells and further

increasing the irrigating field.

Recommendations

Increase the yield of the present leaching in place operation by drilling 300 shallow 4-inch holes above the ore body on 15-foot centers. Place additional pumps in the existing mine shafts as needed to recover the leach solution.

Expansion of irrigating field should be accomplished in steps of about 100 holes each so that the ore body can be tested in sections rather than attempt it all at once.

While drilling, carry a number of holes thru the ore body to further test its grade and extent. If sufficient ore could be blocked out, a future open pit operation might be contemplated.

Test the old dumps for heap leaching, on a pilot basis first. There is a considerable amount of carbonate rock in the dumps which would consume some acid. Perhaps pyritic ore could be mixed with the acid-reactive material so as to generate enough extra acid to make the project work. If favorable results are obtained, there are more than a million tons of dumps that contain copper which could be processed.

In addition, exploration could be carried on to determine if some small areas would be amenable to mining by pit method and the ore leached in heaps.

No firm recommendations can be made on heap leaching without additional field work and assays.

Respectfully submitted,

Lee Hammons

REGISTERED GEOLOGIST
CERTIFICATE EXPIRES
LEE
HAMMONS
DEC. 31, 1966
ARIZONA U.S.A.

Lee Hammons

October 10, 1966

July 13, 1959

Paramount Mining Corporation
613 North Alvernon
Tucson, Arizona

Gentlemen:

At your request, we have studied the geology of the Mano mine vicinity in relation to a proposed leaching in place operation. Five days were spent in the field.

Because of several favorable geological factors, we believe that a leaching operation has an excellent chance of succeeding. The large amount of limestone in the area, though it might discourage anyone making a superficial examination, does not necessarily rule out the property as a leaching prospect.

Our findings, conclusions, and recommendations are detailed in the accompanying report. Thank you for the opportunity to do this work.

Very truly yours,

ENGINEERING SERVICE CORP. OF AMERICA

Lee Harmons,
Geologist

LH/jm
Encl.

July 15, 1959

GEOLOGICAL REPORT ON THE
MAME PROSPECT,
COURTLAND, ARIZONA

The Mame Prospect is a copper mine that at one time produced a large tonnage of ore. The Mame claim is one of 25 patented mining claims known as the Great Western group. It is located in the Turquoise Mining District near the old mining camp of Courtland, some 18 miles east of Tombstone, Cochise County, Arizona. The operator of this property is the Paramount Mining Corporation, 910 North Alvernon, Tucson, Arizona.

Purpose and Scope of Report

The main purpose of this study and report was to determine if any geological conditions exist that would make a leaching in place operation impossible. Assuming a favorable answer to that question, the next objective was to map the most favorable areas for leaching and also to map any areas where leaching might be out of the question.

Secondarily, the operators desired to map more accurately certain underground features and to establish a site for the leach tanks.

Since other competent work, especially that of the Sunshine Mining Company, had indicated a tonnage of low-grade ore far in excess of that needed to support a leaching operation, no evaluation of ore reserves was attempted. However, rough tonnage calculations were made for certain localized areas.

Much of the general material contained in the section on geology was adapted from the literature on the region. There were two reasons: a thore

study would have been expensive and most of the underground workings were inaccessible.

Information contained in the Sunshine Mining Company's maps and drill logs has been an invaluable aid in this work.

Geology

The Turquoise Mining District lies on the east flank of the Dragoon Mountains at their southeastern extremity. The rocks are chiefly Paleozoic cut by igneous intrusions.

The geology of the Courtland area is complex. After the sedimentary rocks were laid down, crustal movements caused thrust faulting followed by normal faulting. The sedimentaries were intruded by igneous rocks and were metamorphosed by hydrothermal activity. The hydrothermal fluids also mineralized to some extent both the sedimentary and igneous rock.

A later period of normal faulting further complicated the structural picture. Probably some of the early thrust fault planes were tilted at this time.

While all of this was going on, weathering, erosion, and ground water leaching were taking place. The resulting chemical and physical changes further complicated the situation.

The oldest sedimentary beds in the Courtland area are Cambrian, although some Pre-Cambrian schists may once have been shales. The Bolsa quartzite is hard and dense and highly fractured in the Courtland area. It strikes generally north and south with an easterly dip of 40° to 80°.

The Abrigo limestone is a thin - bedded dolomitic limestone with some alternating siliceous shale beds. It is strongly metamorphosed. These Cambrian beds lie on a quartz monzonite porphyry which, in some places, is intrusive into the quartzite.

No Ordovician or Silurian sediments exist in the Courtland area. Devonian rocks are also absent in the immediate area, but do occur in the Dragoon Mountains.

Carboniferous limestones, probably Mississippian, are thick and massive. They form the tops of Monarch, Causey, and Reservoir hills. They have been faulted out of their original stratigraphic position relative to the Cambrian beds and have been intruded by igneous bodies.

Major intrusive bodies in the area are quartz monzonite porphyries. One is considered to be older as it is highly altered and decomposed. It underlies and, in places, intrudes the Cambrian sediments. The younger porphyry intrudes the Carboniferous beds and possibly the Cambrian also. It is a less altered and less siliceous quartz monzonite porphyry than the older body.

The country rock of the Mine and other nearby Mines is the Cambrian dolomitic limestone and interbedded shales. This rock is thin - bedded and dips steeply to the east. It is well metamorphosed, the thicker beds being dense and crystalline so as to be almost a marble. It has been intruded by dikes and sheets of quartz monzonite porphyry.

The cause of the metamorphism is not entirely clear, some of the intrusives also show signs of having been metamorphosed. There is a possibility

that an underlying igneous mass was the source of hydrothermal fluids which altered the rock. These fluids were also the source of mineralization for the area.

Mineralization

These hot solutions deposited their mineral content as they moved under pressure along bedding planes, penetrated the more porous formations and replaced molecules of the country rock. Mineralization bears no apparent relation to fissuring. The chief mineral is pyrite together with a small percentage of chalcopyrite, which is the chief ore mineral.

The minerals are disseminated with local concentrations in lenticular bodies and have also replaced limestone. Ore bodies are largest and most abundant near porphyry intrusions. To some extent the porphyry has been replaced.

There is very little oxide ore in the Mame mine compared with the large tonnage of pyritic ore. However, the sulfides have been oxidizing and forming sulfuric acid. Meteoric ground water has seeped down thru the overlying rock and, made acid by the oxidizing sulfides, further altered the limestone. The carbonates thus have in many places been converted to sulfates and oxides. Much of the calcium oxide thus formed, being soluble in water, has been leached out by ground water and is no longer an obstacle to the production of copper by an acid leaching process.

Of course, copper oxides and sulfate have been formed also, and these are the target of a man-made leaching cycle. (There has been a slight

amount of chalcocitic enrichment also which would probably contribute some copper to a leaching operation.

Subsurface

Data on the subsurface conditions of the Mame prospect were derived from field observations in the accessible workings and from the drill logs, cross-sections, and maps made by the Sunshine Mining Company.

There are reported to be some 12,000 feet of underground workings in the Mame mine. Since the Paramount Mining Corporation began operations the Mame shaft has been opened to the 100 level and about 1000 feet of workings have been made accessible and safe on the 100 level. The 200 and 300 levels have been flooded for many years.

The Sunshine Mining Company drilled 14 churn drill holes in late 1957 along the trend of the major ore body. Total footage was 3280 feet. Hole No. SCD 9 was drilled into one of the old stopes and presently serves as an air vent.

In a search for drilling water, Sunshine personnel tested the water in several shafts. In the McClendon shaft, 1900 feet northwest of the Mame, the water contained a considerable amount of copper in solution. The pH was 3 which is definitely acid.

Hydrology

A large amount of evidence indicates that the ground water in the Courtland area is contained in an isolated reservoir. It is certainly

5.

separate from the nearby valley system. Old records and reports from local mining men give an average level of approximately 130 feet below the collar of the Mame shaft, which is 4845 feet above sea level.

Of course, the level has fluctuated over fairly wide limits from year to year. This has contributed to the oxidation of the ore and the release of sulfuric acid which has not only altered the limestone but enlarged many of the natural water courses by solution of the lime.

Bedding planes of the sedimentary rocks in the Courtland area are tilted at steep angles as a result of crustal movements. These same movements, normal faulting and thrust faulting, have broken the rock units quite severely. In and near the fault planes the rock has been crushed and loosely cemented into breccias. Such broken-up formations make it easy for rain water to enter the underground reservoir, and also increases its capacity by solution. Equally important, it increases the channels of communication between parts of the reservoir.

Perfect communication between several areas is provided by the extensive underground workings. It has been reported that pumping in one mine in the area lowers the water level in another mine.

Just how extensive the workings are is not known, so no accurate estimate of their volume can be given. Old records show that several hundred thousands of tons of ore were shipped and the numerous waste dumps also represent a large volume of rock removed.

A very rough approximation is the best that can be expected in making an estimate of the total volume of the reservoir. It seems reasonable to assume an area of 100 acres (5 claims) and a depth of 300 feet. This would give a total

volume of 30,000 acre feet. It is safe to assume that 10% of this volume is void space. These voids are mine workings, fractures, and rock porosity. The resulting figure is 3000 acre feet of water.

Much of the surface runoff during the rainy season is dumped into the reservoir because many of the shafts, drill holes, and caved areas are located in natural drainage channels. The proposed dam (dashed line) shown on the Irrigating Plan Map represents a possible way of increasing this effect and, more than incidentally, a possible way of creating a very favorable irrigating area.

Taking into consideration the angles of the bedding planes, the broken condition of the rock, the location of faults, and changes of lithology in their spatial relation to the ore bodies, certain surface areas are seen to be more favorable for irrigating than others. These have been designated on the Irrigating Plan Map.

Photographic Illustrations

Plate I shows the Mame shaft and the existing equipment, except the pump which is set in the shaft below the 100 level. The pump is a Red Jacket rated at 150 gallons per minute. Approximately 1000 feet of 3 inch diameter plastic pipe is on the property. A timber headframe is shown, and the shaft is timbered to the 100 level.

Also shown in Plate I is the electrical equipment, REA power line, transformers to handle a 25 horsepower load, switch and circuit breaker boxes (installed immediately after photo was taken).

Plate I is a typical view of the low mountainous terrain and semi-arid vegetation.

Plate II is a fine illustration of the iron minerals found in the Mamo workings. Melanterite, the hair-like ferric sulfate, is not abundant but occurs in several places. The oxides are very abundant, especially where natural leaching has occurred. This is a favorable aspect of the prospect.

Plates III and IV are typical views taken in the stopes and drifts on the 100 level. They show an abundance of copper sulfate and copper oxides. It is impossible to estimate the tonnage of this ore because most of the workings are caved in or under water.

Recommended Projects

There is without doubt a large volume of water beneath the Mamo prospect and it may easily contain a large tonnage of dissolved copper. This is indicated by observations and tests made at various times and places. For instance, mine rails have been "eaten up" after being under water for comparatively short periods of time.

Since leaching of ores in place is a new art, it seems advisable to approach such a project experimentally. It is recommended that a pilot size plant be built first to support limited irrigating projects.

The first such projects should be the areas designated as most favorable on the map. The one to the south would be more economical to test. It has already been the subject of an initial experiment which was quite successful. Water was pumped from the Mamo shaft into the caved area at the point indicated on the map and recovered in the Mamo drift. The operators reported a good copper and acid content.

The area around drill hole SCD 9 should be an excellent location for a limited test. A pump should be set thru the drill hole into the old stope. The area of irrigation could be that designated as most favorable on the map, or a smaller area around the hole could be chosen.

In order to contain the solutions close to the hole so that they can be pumped out, a dam will have to be built across the tunnel as indicated on the map. The tunnel south of the drill hole may also have to be dammed.

These limited projects should show how the irrigating solutions will behave while percolating thru the overburden. Two questions have to be answered. Will the solutions reach the ore and be recoverable? Will they encounter too much lime and loose their acid content? This study indicates that the answers will be affirmative.

If these limited projects prove that it is feasible to leach these ores in place, then a full-size leaching facility will be justified. It is recommended that the whole area indicated on the map as being favorable be irrigated. By recovering the solutions on the 100 level, a quicker recovery of copper may be had. Whatever solutions that are not recovered will contribute their copper content to the major reservoir.

A detailed subsurface study should be made on the enriched zone which is indicated in the Sunshine Mining Company's data. Some new drilling may be required to get additional information. The holes may be required anyway for injection and recovery of leaching solutions. If this study indicates a good possibility of a profitable operation, then leaching is recommended. The tonnage here might exceed anything else on the property.

Summary of Findings

Geologically, no factors were discovered that would completely rule out an acid leaching operation. In fact, where limestone has been mineralized, it is so altered as to be hardly recognizable. In view of the prominent role that meteoric ground waters have played in a natural leaching process, it is probable that most of the calcium oxides have been carried away. The fact that ground water in the area has been found to be acid indicates sufficient natural acid to overcome these alkalies.

Obviously it would not be advisable to irrigate directly thru a limestone formation. It is possible that acid solutions would channel thru fast enough so as not to be completely neutralized, but this should be attempted only as a last resort. The Mamo prospect has many favorable irrigating areas that are apparently non-reactive.

There are some manganese oxides present in most of the formations and these will consume some acid. The amount of manganese, however, is small and is not expected to be a serious problem.

Since oxidation and natural leaching has been going on for many years, it is reasonable to believe that there is a large amount of copper in the natural reservoir under the Mamo prospect. There are indications that the ore will produce a substantial amount of natural acid. The accessible stopes on the 100 level are quite warm from oxidation that is still going on. The initial irrigating experiment recovered acid as well as copper.

The accessible stopes and tunnels on the 100 level are heavily lined with copper sulfate and oxide minerals. There is an abundance of iron oxide and some iron sulfate, which is favorable for this kind of operation.

There are some 30,000 tons of low grade ore (high grade for leaching purposes) under the area around drill hole ECD 9 shown on the map as most favorable. Possibly half that much exists under the other such area. Percentage of recovery is impossible to estimate because of many variables, but if leaching is feasible at all, these small areas could be very productive.

A 150 gallons per minute pump such as that now installed in the Mamo shaft will move enough water to produce 1792 pounds of copper per day at the economic limit of one gram per litre. The price at the smelter for the kind of concentrate produced by leaching is about $.25 per pound. Thus, the value of production on a pilot plant basis is $448.00 per day gross. Operating expenses are not predictable at this time, but since only one unskilled worker need be employed, costs should be very low. On a pilot size operation, only 2 trips per week need be made to the smelter, so trucking costs would be extremely low. Therefore, a profit can be realized from the beginning.

The ground water in the area is thought to be contained in a closed system so that any copper going into solution anywhere on the prospect is expected to be eventually recovered. To accomplish this, a pumping capacity of 2000 gallons per minute would be needed to recycle all of the water once a year. This figure is based on the rough estimate of 3000 acre feet for total volume.

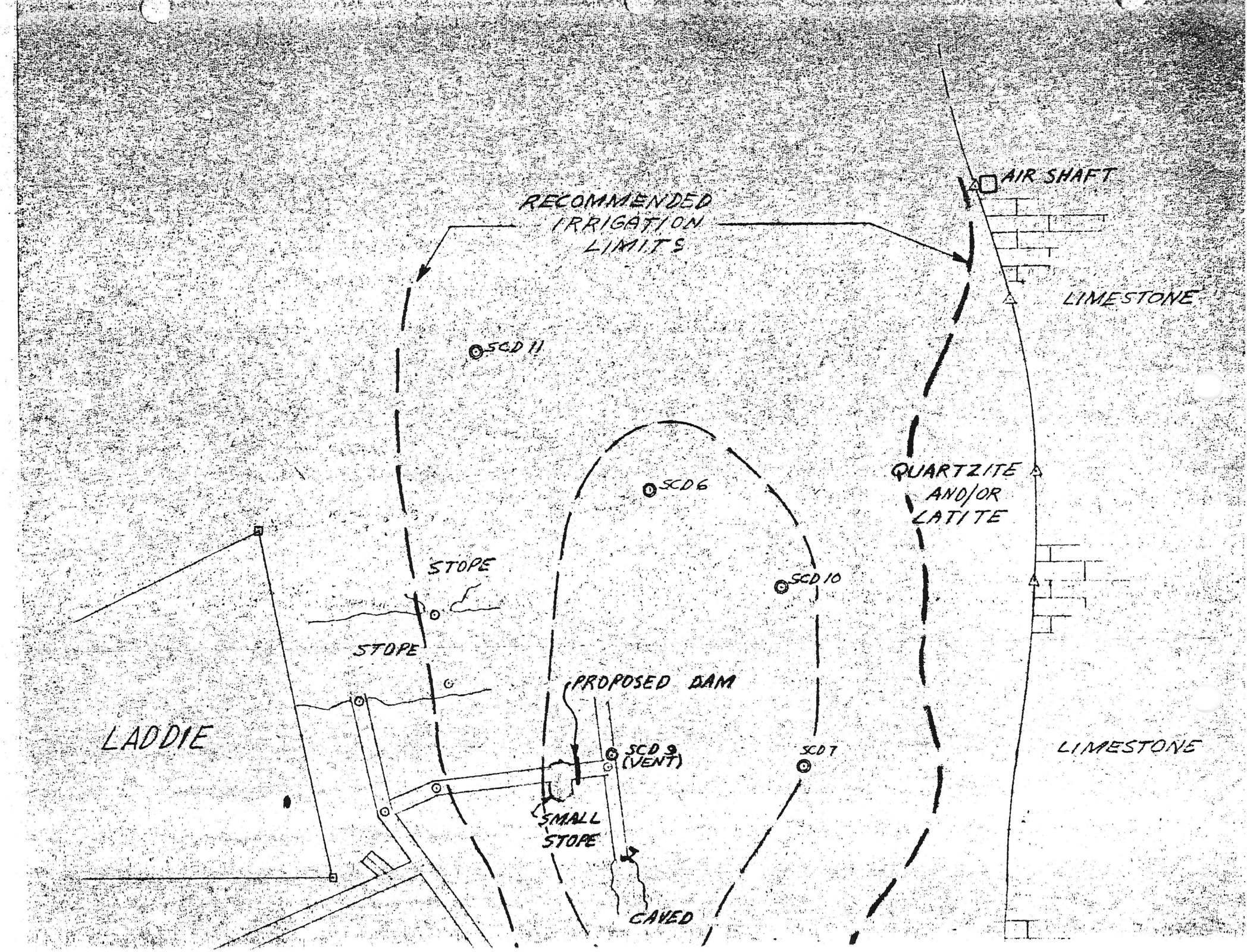
The favorable aspects of the Mamo prospect, as far as could be determined by this study, outweigh the unfavorable by a fairly wide margin.

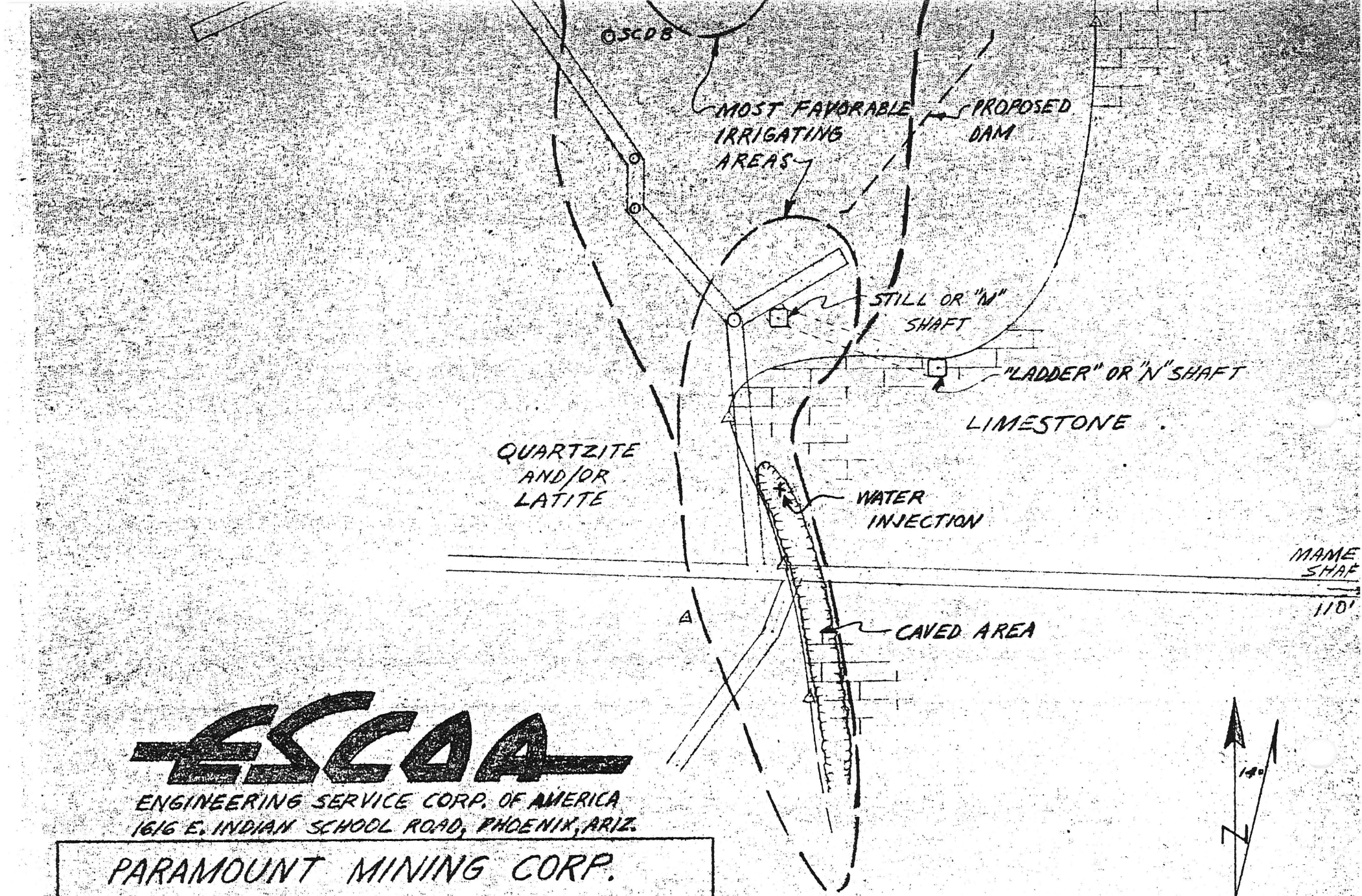
Respectfully submitted,

ENGINEERING SERVICE CORP. OF AMERICA

Lee Hammons,
Geologist

LH/jh


AIR SHAFT
RECOMMENDED IRRIGATION LIMITS
LIMESTONE
SCD 11
SCD 6
QUARTZITE AND/OR LATITE
SCD 10
STOPE
STOPE
PROPOSED DAM
LADDIE
SCD 9 (VENT)
SCD 7
LIMESTONE
SMALL STOPE
CAVED



ESCOA

ENGINEERING SERVICE CORP. OF AMERICA
1616 E. INDIAN SCHOOL ROAD, PHOENIX, ARIZ.

PARAMOUNT MINING CORP.

IRRIGATING PLAN MAP

DATE: 6-25-59	DRAWN BY: Lee Hammons	SCALE: 1" = 50'

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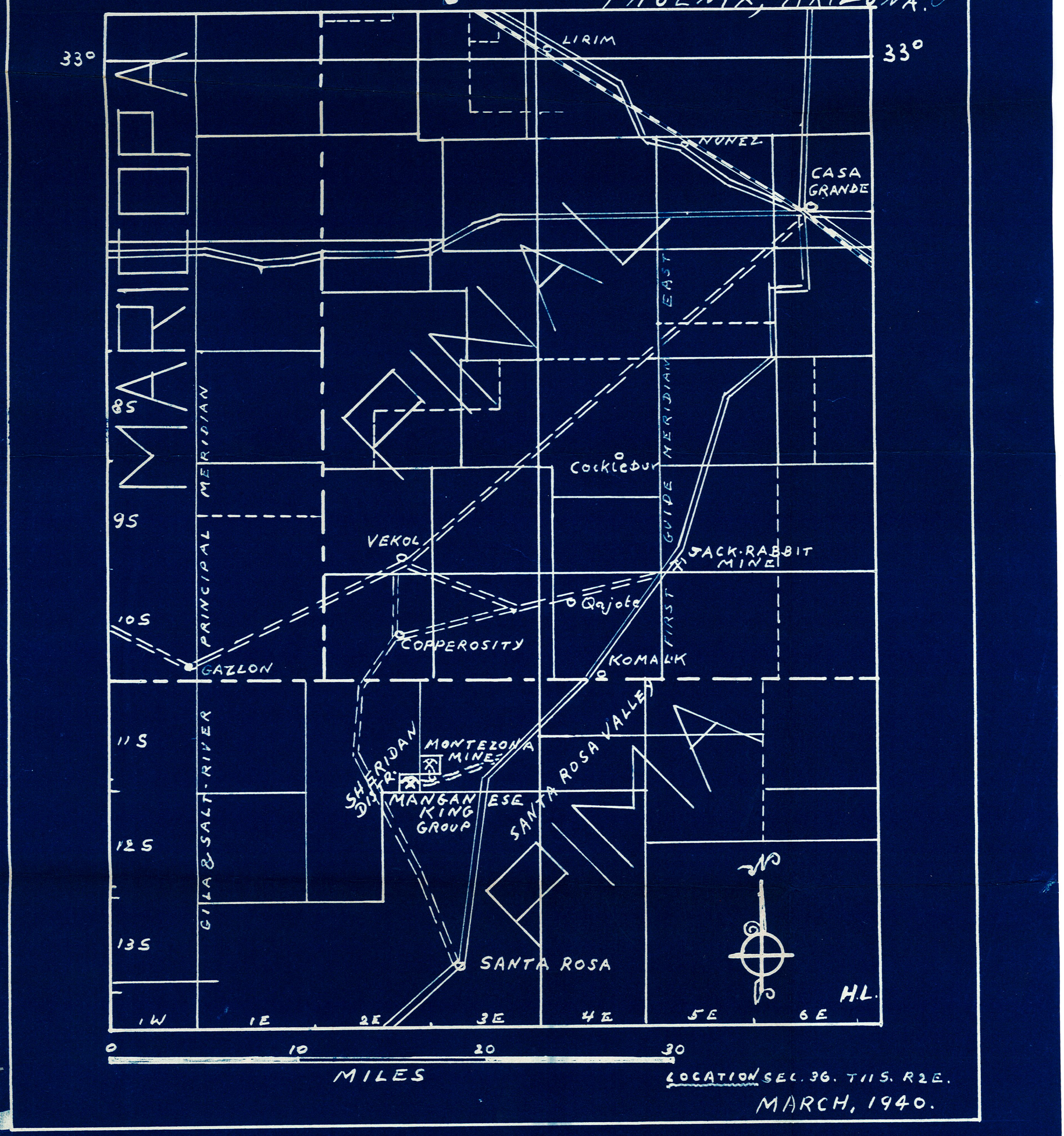
MANGANESE-KING-GROUP

FOR FURTHER INFORMATION SEE:-
Harry J. Valentine
207 First National Bank Bldg.
PHOENIX, ARIZONA.



LOCATION SEC. 36. T11S. R2E.

MARCH, 1940.

MANGANESE-KING-GROUP

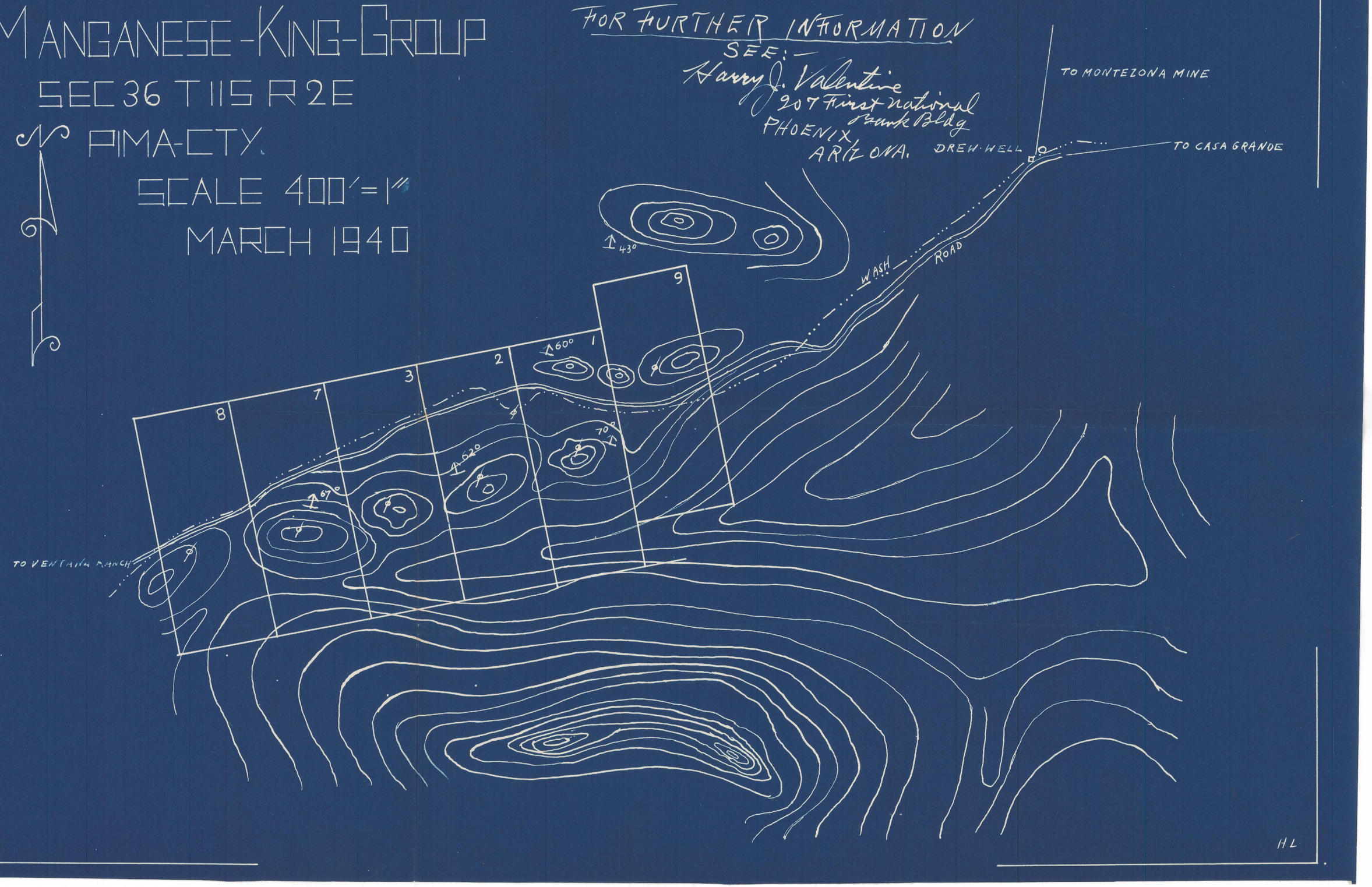
SEC 36 T11S R2E

PIMA-CTY.

SCALE 400'=1"

MARCH 1940

FOR FURTHER INFORMATION
SEE:-
Harry J. Valentine
907 First National Bank Bldg
PHOENIX
ARIZONA.



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