224 New Customhouse
Denver, Colorado

June 12, 1951

Memorandum

To: Landon Strobel, Executive Secretary, Defense Minerals Administration

From: DMA Field Team, Region IV

Subject: DMA Docket 434, Mohave Metal Mining and Reduction Co. Project, Mohave county, Arizona

We are attaching the original and two copies of the report on DMA Docket 434 listed above.

Also attached in a sealed envelope is a confidential letter regarding the competence of the management. From the statements made in this letter by M. J. Hiaing and L. F. Furnham, both of whom are reputable mining engineers in Arizona, the competence of the applicant can well be questioned. It is requested that the attached confidential letter not be allowed in general circulation.

We concur with the recommendations made in this report.

Attention is called to the second to last paragraph of the recommendations that "under present economic conditions no loan be granted for the opening of any mine in the district for the production of lead and zinc, that no loan be made for exploration of these metals and that no access roads be built." Since the application is for a loan to finish purchasing a 400-ton custom mill and to reduce zinc concentrates to metal, the recommendations obviously exceed the requirements of the application.

filed in Mr. East's desk

Paul T. Allsman
P. T. Allsman, Alternate

A. H. Koschmann
A. H. Koschmann

Attachments
One copy by air mail
Two copies by regular mail
Original brochure

PTA/cl Copy to DMA files, Koschmann, Allsman
Storms and Anderson

UNITED STATES
DEPARTMENT OF THE INTERIOR
OSCAR L. CHAPMAN, SECRETARY

DEFENSE MINERALS ADMINISTRATION

REPORT OF EXAMINATION BY FIELD TEAM
REGION IV

[illegible]. Roberts Metal Mining & Reduction Co. (Lead-Zinc)

Wallapai District

Mohave County, Arizona

FOR GOVERNMENT USE ONLY

M. J. Elsing, Consulting Mining Engineer
U. S. Bureau of Mines

L. L. Farnham, Mining Engineer
U. S. Bureau of Mines

John Faith, Geologist
U. S. Geological Survey

G. S. Dutcfield, Geologist
U. S. Geological Survey

May 1951

Mining Division
Region IV

June 8, 1951

Memorandum

To: DMA Field Team, Region IV

From: Chief, Mining Division

Subject: DMA 484, Mohave Metal Mining and Reduction Co., Vallapai District, Mohave County, Arizona

The Mohave Metal Mining and Reduction Company applied for a loan of $400,000 under the Defense Production Act of 1950 for the following purposes:

Purchase of prospectors mill	$40,000
Rehabilitation and equipment removals	28,947
Installation of flotation equipment	43,929
Power transmission line and sub-station	22,167
Completion of cyanide leach plant	150,000
Contingencies and working capital	114,957
Total	$400,000

This loan was to provide ore treatment facilities for milling 100 tons per day.

The company does not own any mines, but does have a lease on the Galena and other claims of Pershing Mining Company. Available reserves in the Galena Vein are estimated at 60,000 tons of ore carrying 17.3% Zn, 0.10 ounce gold and 2.4 ounces silver per ton. Other mines owned by Pershing Mines, Inc. are the Upper Bethel and Big Bethel which have produced some ore, but records of production are not available.

From the information available the average content of the ores in the Vallapai District is 3.5% lead and 6.5% zinc, with 0.05% ounce gold and 3.5 ounces silver per ton. The net value of concentrates from such an ore is equivalent to $17.5 per ton of ore as compared with estimated total costs of $26.44 per ton of ore.

The engineers conclude that ore in the Vallapai District is sub-marginal at present prices of metals and present costs and they recommend that the requested loan be denied, with which I agree.

Harry Miller

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
200 New Customhouse
Denver 2, Colo.

June 4, 1951

Memorandum

To : Field Team, Region IV

From : A. H. Koschmann

Subject: DMA Docket $494 - Mohave Metal Mining and Reduction Company, Mohave County, Arizona

I herewith transmit the geologic report on the above project by C. S. Bromfield.

A. H. Koschmann
A. H. Koschmann
Supervising Geologist
Colorado-Wyoming

Enclosures

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY
[illegible], University Station
[illegible], Arizona

[illegible] 17, 1951

[illegible] Registered mail
[illegible] return receipt requested

[illegible]orandum

To: Mr. A. B. Ackermann, Denver, Colorado

Report: Mr. [illegible], Tucson, Arizona

Subject: Inform [illegible] and education survey, [illegible] County, Arizona - [illegible]

Enclosed are original and 11 copies of the above report by J. W. Hickman and [illegible] Trumfield. Please return one copy to us and one to [illegible] Tucson.

This report and the recommendations in it [illegible] have been sent to C. [illegible] Anderson and have his approval.

A. [illegible] Bride
Acting District Supervisor
Arizona-New Mexico District

Enclosures 12

June 5, 1951

Memorandum

To: Paul T. Allsman, Denver, Colorado

From: Chief, Arizona-New Mexico Branch, Mining Division, Region IV

Subject: Report of Examination of the Mohave Metal Mining & Reduction Co., DMA Docket 494.

Enclosed are original and 11 copies of Summary, Conclusions and Recommendations by Kleing, Farnham, Faick and Brenfield; and the Engineering Section by Kleing and Brenfield.

J. Bruce Clemmer has read and approved the metallurgical phases of the report.

The report has my approval. The Summary, Conclusions and Recommendations section has been approved by A. F. Shride of the Geological Survey.

Walter R. Storms

CC P. T. Allsman
C. A. Anderson
DMA 494
RF

WRStorms:frj

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

By Maurice J. Elsing[1], L. L. Fuchser[2]
John N. Faick[3], and C. S. Brayfield[3]

The Sphere Metal Mining & Reduction Co., through J. S. Begg, one of three partners, has submitted an application for a loan of $[illegible] to purchase the Producers Mill, to rehabilitate it, install flotation equipment, build a power line and substation, and build a cyanide leach pilot plant for the treatment of zinc concentrates for the production of metallic zinc. The application is known as DPA Number 404. It was reviewed by the Lead-Zinc Branch of the Defense Minerals Administration and referred to the Field Team, Region IV, for investigation. The field investigation was made April 2 to 5, 1951.

In brief, the applicant proposes to change the Producers Mill, which was a cyanide mill, into a flotation mill for treating 400 tons of lead-zinc ore per day. He also proposes, at a cost of $[illegible], to install an experimental cyanide leach plant to treat the zinc concentrates and produce metallic zinc. The applicant has a lease on the Galena mine and other claims of the Pontiac Mines, Inc. The lease requested does not specifically provide for cost of reopening the Galena mine or any other mine from which the applicant expects to obtain ore.

1/ Consulting Mining Engineer and
2/ Mining Engineer, Bureau of Mines, Mining Division, Region IV Arizona-New Mexico Branch, Tucson, Ariz.
3/ Geologists, Geological Survey, Tucson, Ariz.

The Wallapai district occupies an area about 12 miles long by 6 miles wide in the Central part of the Cerbat Range in northwestern Arizona. The rocks underlying this area are summarized below.

Quaternary.....	Olivine basalt flows and detritus
Tertiary..... (Volcanic-intrusive)	Thick volcanics
Mesozoic (?)	Granite porphyry, diabase, and lamprophyre dikes.
Pre-Cambrian	Coarse-grained, porphyritic, gneissoid granites, granite altered to schist, diorite, amphibolite, graphite schist, pegmatite.

The ore deposits are mostly northeasterly trending fissure veins in pre-Cambrian host rocks, but are genetically related in space and time to the Mesozoic granitic intrusions. Commercial ores are confined to relatively small shoots scattered erratically along numerous mineralized quartz veins. The common ore minerals are galena, sphalerite, chalcopyrite, and nearly all of the ores contain values in gold and silver.

The problem resolves itself into a determination of whether or not the Wallapai district can be profitably operated under present conditions. This requires a determination of the probable daily production, the average grade of ore, the costs of production, and the net returns.

The question has been presented before. The answers have been definite but limited in scope in that only a few mines have been considered and not the district as a whole. The district has been examined at some time or other by a score of engineers and geologists from the U. S. Bureau of Mines, the Geological Survey, Reconstruction Finance Corporation, and the Arizona Bureau of Mines. The present conclusions are drawn from a field examination and particularly from reports by the engineers and geologists mentioned as well as other data that are available. One hundred former producing mines have been listed with some information about each that is indicative of possible future production. The amount and grade of past production from as many mines as possible has been recorded. The results of sampling in a number of mines has been considered. Wherever possible, vein widths have been tabulated. Costs of production have been made.

Briefly stated the average grade of the ore of the mines in the Wallapai district is definitely sub-marginal at present prices of metals and present costs of production. It is quite probable that no mine in the Wallapai district was ever profitable for any extended period. The Tennessee-Schuylkill mine has been operated for most of the past 30 years. The Needles Mining and Smelting Co., a subsidiary of the U. S. Smelting, Refining and Mining Co., operated the mine from 1911 to 1917. The company then gave up its

lease and one company after another has operated without success. The Golconda mine was operated from 1906 to September 1917 when the mill burned down. The mill has never been rebuilt. Approximately 150 mines in the district have had some production. It may be that a few small lease operations were successful mainly because development was unnecessary. During World War II, in spite of the Premium Price Plan and the granting of some $150,000 in loans by Reconstruction Finance Corporation there was a gradual decline of the production of lead and zinc from 1940 to 1947. The past history of the district indicates that there is practically no chance that a Government loan could ever be repaid.

The veins are strong and are continuous for long distances. The lead and zinc sulphides are primary and are deep seated. Ore occurs on the 1600 level of the Tennessee and the 1400 level of the Golconda. Ore has not been bottomed in any known mine. The ore shoots in the veins usually are comparatively short and narrow. Costs consequently are high.

The district now has two flotation mills which have in the past treated custom ore. These mills are idle because sufficient ore could not be mined at a profit to supply either of them.

Caustic leaching with the recovery of metallic zinc is still in the experimental stage. Should it prove successful the reduction in the costs of production would not be sufficiently great to materially change the situation.

Since there is no probability that profitable production could be made from the Colorado or any other combination of mines in the Hilliqui district, it is recommended that the applicant's request for a loan be denied.

It is further recommended that under present economic conditions no loan be granted for opening any mine in the district for the production of lead and zinc, that no loan for exploration for these metals be made, and that no access roads be built.

Should the need for lead and zinc really become critical a substantial premium price for the Hilliqui district would result in an annual production of at least 2 or 3 million pounds of lead and 3 to 4 million pounds of zinc. Production might eventually be double this amount and would continue for many years.

[illegible] MINERAL PLANTING AND PRODUCTION COMPANY
[illegible] COUNTY, ARIZONA

Geology

By John D. Haick and Calvin G. Mansfield
Geologists, U. S. Geological Survey

Geology

MOHAVE METAL MINING AND PRODUCTION COMPANY
MOHAVE COUNTY, ARIZONA

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GEOLOGY

The Hallapai district occupies an area about 12 miles long by 6 miles wide in the central part of the Cerbat Range in northwestern Arizona. The rocks underlying this area are summarized below.

Quaternary.....	Olivine basalt flows and detritus
Tertiary.....	Thick volcanics
(Mineralization) Cenozoic (?).....	Granite porphyry, diabase, and lamprophyre dikes
Pre-Cambrian.....	Coarse-grained, porphyritic, gneissoid granites, granite altered to schist, diorite, amphibolite, graphite schist, pegmatite.

The ore deposits are mostly northwesterly-trending fissure veins in pre-Cambrian host rocks, but are genetically related in space and time to the Cenozoic granitic intrusions. Commercial ores are confined to relatively small shoots scattered erratically along numerous extensive quartz veins. The common ore minerals are galena, sphalerite, chalcopyrite, and nearly all of the ores contain values in gold and silver.

According to Kings[1] "the total value of gold, silver, copper, lead, and zinc produced in the district from 1901 to 1916 was $23,904,960. Several million dollars may be added to this total for the value of ore produced prior to 1901 when no accurate records were kept. The largest past producers have been the Tennessee and Golconda mines, whose combined output has accounted for about 87 percent of the total value of of the lead and zinc produced."

1/ Kings, Mellland G., Hallapai Mining District, Mohave County, Arizona: Univ. of Arizona, Arizona Bur. of Mines Bull. 156, pp. 139, 1950.

The district may never reach its former importance, but many of its 225 mines are capable of making a small sustained production. It appears possible that a 100 ton per day mill could get sufficient ore to operate for several years under proper economic conditions and judicious management. Tentative reserves are suggested by the following table.

Mine	Measured	Indicated	Inferred
Tennessee-Johnny Hill	29,503	50,000	100,000
Goleonda		20,000	100,000
Summit		8,000	12,000
Champion	800	6,000	6,000
Copper Age		7,000	7,000
Banner		4,000	5,000
Fountain Head	350		10,000

The Mohave Metal Mining and Reduction Company (DMA Docket 494) supposedly holds leases on two mines, the Goleonda and Copper Age, to which this discussion will be confined.

GOLEONDA MINE

The Goleonda mine is inaccessible and the lower levels are flooded, consequently only the surface workings and remains of the surface plant can be seen. The vein occupies a northwesterly trending fissure dipping 76° NE. This has been opened by a 140 foot inclined shaft and extensively stoped above the 1100 level. The mine is reported to have the largest ore shoot known in the district, and there is supposed to be ore remaining at the lower levels. As an index to future potential production it is suggested that 20,000 tons of indicated ore

and 100,000 tons of inferred ore may reasonably be expected. A few tons of milling ore are scattered on the dump and about 40,000 tons of old jig tails are available. A grab sample of these yielded only 3.15 percent zinc.

COPPER AGE MINE

The Copper Age mine has developed a vertical northwesterly vein containing small shoots of lead-zinc ore with minor amounts of gold and silver. Three ore shoots have been mined; one about 250 feet long was mined to an unmeasured extent, another was mined for 150 feet on the strike and 175 feet high, and the third was mined for a length of 50 feet and a height of 140 feet. The average stope width was about 4 feet, and at least two of the stopes pitch steeply to the northwest. The mine is reported to have produced 15,000 tons of ore which yielded 7.3 percent zinc, 3.6 percent lead and $3.70 per ton in gold and silver.

There are two blocks of mineralized vein material that may constitute ore of a marginal grade. One block is exposed on the adit level from about 50 to 250 feet northwest of the shaft, the other is exposed in the southeast end of first level above one of the old stopes. These two blocks may contain 7,000 tons of ore which are regarded as indicated ore of low grade or marginal character. Another ore shoot may have been penetrated at the inaccessible face of the main adit in which case the potential is somewhat greater. There is a reasonable possibility of finding about 7,000 tons of inferred ore.

The possibilities of finding appreciable tonnages of mineable ore in the Copper Age mine by new exploration are quite doubtful.

The value of the expected ore may not pay the cost of exploration, development, and mining.

CONCLUSION

The examination made for the Mohave Metal Mining and Reduction Company, IMA Docket [illegible], reveals that the Golconda and Copper Age mines cannot, at the present stage of development supply sufficient ore to operate a custom ore reduction plant. Such a plant, in order to operate, would need a supply of ore from the Tecumseh-Schuylkill and other mines of the district. This contingency has apparently not been adequately considered or provided for by the Mohave Metal and Reduction Company, and the venture is unlikely to succeed because of an insufficient supply of ore.

EMA-494

MOHAVE METAL MINING & REDUCTION CO.
(LEAD-ZINC)
WALLAPAI DISTRICT
MOHAVE COUNTY, ARIZONA

Engineering

Engineering Report

By Marvin J. Kining,
Consulting Mining Engineer
and Lloyd L. Farnham,
Mining Engineer,
U. S. Bureau of Mines

RMA 404, Mohave Metal Mining & Reduction Co. (Lead-Zinc)
Wallapai District
Mohave County, Arizona

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INTRODUCTION

The Ambero Mining and Reduction Co., through E. S. Bagg, one of its three owners, has made application for a loan of $400,000 to complete purchase of the Producers Mill, add flotation equipment for the treatment of 400 tons per day, install a power line and substation, and construct a cyanide leaching plant for the production of metallic zinc. The applicant proposes to obtain ore from the Galena mine which he has under lease, and from other mines in the district. He proposes to start operations at 100 tons per day but will install equipment for 400 tons per day which he expects will be produced in the district.

The application was reviewed by the Lead-Zinc Branch of the Defense Minerals Administration and referred to the Field Team, Region IV, for investigation.

ACKNOWLEDGMENTS

Acknowledgments are herewith made to J. F. Ryan, consulting mining engineer for the company. He conducted the Government's examiners through the Producers Mill, down the Big and Upper Bethel tunnels of the Middle Galena, and to the Galena mine. Robert Paine, mill superintendent at the Ambero mine, was helpful in providing information relative to past operations in the district, particularly when he was superintendent and ore buyer for the Keystone custom mill which operated for several years prior to its closing in 1948. John W. Faick and C. S. Brenfield, geologists, U. S. Geological Survey, made a brief reconnaissance study of the entire district.

LOCATION AND ACCESSIBILITY

The Wallapai District is divided into four sub-districts, - Chloride, Oatman, Mineral Park and Stockton Hill. Most of the more than 200 mines in these districts are located on the sides of the Cerbat Mountain range. A paved highway skirts this range and bounds dirt roads lead from this highway to the various mines. The railroad, shipping point and supply center is Kingman which is 24-miles southeast of the town of Chloride. The area in which most of the mines occur is 10 miles long and 4 miles wide with Chloride at the northwestern end.

The topography is rugged in the most intensely mineralized area. This is advantageous as regards the possibility of development by tunnels rather than shafts, but disadvantageous from the standpoint of road construction. Most of the mines are within 12 to 20 miles of the Stockton Hill. The district is well provided with roads. Some grades are steep but in general are fairly easy to keep in condition.

HISTORY AND PRODUCTION

The Wallapai Mining District from 1900 to the end of 1949 has produced a total of 1,222,975 tons of ore with gross recoverable values of $34,820,100. The metals recovered include 134,344 ounces of gold, 4,788,984 ounces of silver, 1,[illegible] pounds of copper, 30,914,813 pounds of lead, and 113,[illegible],763 pounds of zinc. The

number of producers varied from 3 in 1921 to a high of 71 in 1941. An important part of the gold-silver production was made by mines that produced only gold and silver.

The most important part of the district's production was lead-zinc ore which contained appreciable amounts of gold and silver, with a little copper. Yearly production is shown in Table I. Some production was made prior to 1902 mainly from the Tennessee-Schuylkill mine and some gold and silver were produced in early-day operations by working the oxidized outcrops of veins which later produced sulphides of lead and zinc.

The Tennessee-Schuylkill and the Galena mines are the most important producers in the district. The former from 1901 through 1940 produced [illegible] tons of ore with a recovered content of 41,[illegible] ounces gold, 1,432,[illegible] ounces of silver, 612,[illegible] pounds of copper, [illegible],645 pounds of lead and 72,[illegible],244 pounds of zinc. The production of the Galena is reported to be approximately [illegible] pounds of zinc. The reports of the Galena that are available do not show the production of metals recovered but from 1908 to September 1917 they show that the net smelter returns were $[illegible]. The net smelter returns of the crude ore for 1917 were $14.73 per ton when zinc was worth [illegible] cents per pound and labor was $4 to $5 per day.

From such records as are available it has been calculated that the Galena mine from 1908 to 1917 produced approximately 410,000 tons of ore from 11 levels. This tonnage checks closely with an estimate of J. B. Wanvig, Jr., former mine superintendent, that from the 700 to the (1100 levels the average production per level was 30,000 tons. A stope map of the mine indicates that similar amounts of ore have been produced from each level above the 700 level.

Among the less important producers of lead and zinc are the Summit-Alpha group, the Copper Age or El Oro, the Big Bethel, Hilbert, Ore Plata, Silver Hill, Rumner and C.O.D. Most of the remainder of the lead-zinc production has come from several score of small operations which were worked for two or three years, then shut down. Many of these again were worked by other operators, then shut down. The periodic operation of so many mines by different operators also applies to the Tennessee-Schuylkill. This fact is indicative that operations were largely sub-marginal for most, if not the entire life of the district. The sub-marginal character of the ore also can be proven by direct calculations of operating costs and the net gulter returns. The conclusion drawn is that the great bulk of the ore produced has yielded no profit.

The following tabulation of production from the Wallapai district from 1940 through 1947 is informative:

COPPER, LEAD AND ZINC PRODUCTION
WALLAPAI DISTRICT 1940-47

Year	Producers	1/Ore Tons	Copper Pounds	Lead Pounds	Zinc Pounds	Total Value 1/
1940	61	92,317	[illegible]	7,097,[illegible]	5,[illegible]	$1,[illegible],839
1941	71	79,[illegible]	1,[illegible],[illegible]	4,814,[illegible]	4,[illegible]	1,[illegible],439
1942	36	79,[illegible]	1,[illegible]	3,[illegible]	4,[illegible]	[illegible],787
1943	12	43,734	[illegible]	2,754,[illegible]	3,[illegible]	783,[illegible]
1944	13	33,579	1,[illegible]	1,[illegible]	3,[illegible]	371,[illegible]
1945	11	36,[illegible]	414,[illegible]	1,[illegible]	1,367,[illegible]	420,414
1946	13	34,[illegible]	[illegible]	737,[illegible]	971,[illegible]	218,[illegible]
1947	14	44,[illegible]	414,100	1,[illegible]	1,715,[illegible]	549,[illegible]

1/ The value of gold and silver is included in these totals. The number of producers includes the producers of gold and silver.

A history of the production of the Wallapai district would not be complete without some reference to the premium price plan and Reconstruction Finance Corporation loans, both of which were established for the purpose of increasing the production of copper, lead and zinc.

Reconstruction Finance Corporation loans were granted to stimulate production at the following properties in the Wallapai district:

1.	Alpha	$4,000
2.	Columbus, $2,000 plus $16,000	18,000
3.	Patrick	24,000
4.	Hecla	14,000
5.	Golden Gem	5,000
6.	Keystone-Badger	5,000
7.	Golden Treasure	5,000
8.	Liberty (Silver Hill)	20,000
9.	Lone Jack and Blackfoot, $2,000 plus $10,000	12,000
10.	Bull Lake	5,000
11.	St. Louis	5,000
12.	Summit, (a second loan of $20,000 was returned)	20,000
13.	Thistle	4,000
	Total	$141,500

It will be noted that there is a gradual decline in the production of lead and zinc from 1940 through 1946. The premium price plan was in operation from 1942 to 1947. There is no doubt that Government loans and the premium prices brought out some production which otherwise would not have been made but premiums were not sufficiently high to offset the rising costs during the period in which they were in effect. Consequently production declined.

The reason for the decline is reported to be a shortage of labor. On the other hand the shortage of labor was essentially due to the inability of operators to pay a wage that was competitive with that paid in other mining camps.

Summarizing, the history of the district indicates that production is possible from a great many mines but that any substantial production will require high premium prices for copper, lead and zinc.

TABLE 1. - Production of Kellogg District,
Including Gambit, Gilmartin, Blossom Peak, Blackhawk
Mill Districts, Shoshone Co., Idaho.
(Figures in brackets are estimated production)
(Total Value is recoverable value of metals in ore.)

Year	Lode Shipments	Lead Tons	Gold Oz.	Silver Oz.	Copper Lbs.	Lead Lbs.	Zinc Lbs.	Total Value
1905	27	2,179	1,325	29,933	11,980	240,324	986,133	$76,313
1906	18	11,698	2,353	69,964	3,774	113,332	5,244,281	374,335
1907	15	(10,000)	(2,150)	(70,000)	20,241	235,368	5,476,816	(390,000)
1908	23	28,672	3,852	309,306	27,652	2,564,673	4,476,592	511,369
1909	24	36,508	4,386	331,232	209,180	1,934,780	6,386,462	870,209
1910	22	22,967	3,377	288,282	32,078	5,332,764	7,832,180	824,730
1911	17	48,527	2,776	323,369	28,307	3,782,328	9,523,898	779,[illegible]
1912	19	85,635	5,282	243,038	46,371	6,452,486	12,388,888	2,[illegible]
1913	21	104,458	6,307	289,237	196,807	5,885,798	17,884,686	3,[illegible]
1914	25	104,242	7,283	284,397	84,394	6,887,742	17,327,996	2,[illegible]
1915	16	2,888	964	38,338	17,730	523,885	82,399	114,346
1916	11	2,392	873	44,992	98,998	384,895	—	111,651
1917	13	2,379	648	37,988	11,140	386,423	—	81,133
1918	6	10,206	1,838	82,347	15,855	274,381	—	116,373
1919	14	3,483	—	—	—	—	—	81,334
1920	12	1,388	—	—	—	—	—	—
1921	17	388	—	—	—	—	—	—
1922	22	3,149	798	36,784	26,816	311,444	174,789	89,346
1923	28	18,556	2,688	75,478	88,728	687,885	2,649,264	261,149
1924	20	39,289	(3,870)	(60,000)	(95,000)	(600,000)	1,184,880	(720,000)
1925	14	996	188	10,778	18,189	43,791	150,339	15,417
1926	17	1,849	379	16,324	32,383	64,896	135,414	27,889
1927	5	362	183	4,188	2,413	37,648	35,384	7,620
1928	3	185	30	283	581	—	—	434
1929	5	236	184	3,588	2,335	27,988	—	5,675
1930	9	383	236	3,537	1,122	36,946	11,024	9,927

TABLE 1. - Production of Mullan District, Continued.

Year	Lode Producers	Lead Lbs.	Gold Oz.	Silver Oz.	Copper Lbs.	Lead Lbs.	Zinc Lbs.	Total Value
1934	20	1,057	244	4,728	2,737	11,514	10,698	11,973
1935	34	14,775	1,665	76,539	26,906	140,725	133,285	126,970
1936	21	34,185	5,782	182,743	207,859	1,681,478	1,047,960	491,334
1937	45	119,246	15,348	528,640	800,182	4,978,228	3,424,354	1,511,063
1938	99	109,810	15,087	560,528	331,163	4,087,239	3,389,832	1,262,478
1939	47	68,726	9,301	451,325	146,877	2,686,353	1,339,692	793,253
1940	65	76,317	8,135	284,780	124,221	4,687,480	8,589,000	1,384,039
1941	71	70,394	7,500	213,977	132,700	4,816,200	4,692,000	1,056,459
1942	36	78,533	5,406	157,181	136,800	3,382,680	4,487,700	936,787
1943	32	43,724	1,922	88,695	236,800	2,784,000	3,684,000	703,829
1944	23	33,579	895	57,836	1,080,200	1,567,000	2,091,000	571,983
1945	11	24,462	1,068	49,708	154,800	1,380,600	1,367,000	420,434
1946	13	34,899	720	38,329	390,900	737,000	971,000	318,695
1947	24	46,224	474	45,353	486,300	1,306,500	1,733,200	549,864
1948	16	52,736	694	32,859	621,400	891,300	1,344,700	[illegible]
1949	9	4,[illegible]	143	[illegible]	31,[illegible]	211,[illegible]	362,300	[illegible]
	935	1,322,976	124,544	4,785,904	5,638,300	69,954,933	133,648,765	24,831,300

1/ Years 1908-1933 from Arizona Bureau of Mines, Bull. 140; years 1934-1949 from Minerals Yearbooks, U.S.B.M.

OWNERSHIP AND EXTENT

The applicant owns some of the mines which he expects will produce the ore to supply the Producers Mill. He has a lease on the Golconda mine and adjoining claims from Pontiac Mines, Inc. The applicant has an option on the Producers Mill for $45,000 of which amount he has paid $5,000.

DESCRIPTION OF THE PROPERTIES

Golconda Mine

The Golconda Mine, one of the chief zinc producers of the Wallapai district, has been idle since 1917. A fire destroyed the entire mill in October of that year and it was never rebuilt.

The property is situated some 8 air-line miles southeast of Chloride and about 20 miles by road from the Producers Mill.

The mine was developed by a two-compartment incline (55°) shaft to a depth of 1,400 feet. Judging from the company's stope map of January 1918, the mine was well worked out from the surface down to the 1100 level. The ore shoot even had a maximum strike length of about 1,200 feet. No information is available as to the average width of the ore bodies. Only a comparatively small amount of ore was mined from above the 1200 level, nor was this level ever extended to the former limits of the ore bodies. No drifting whatever was done on the 1400 level, although, it is said, it was just getting under way when the fire terminated the operation.

Pontiac or Middle Golconda Mines

The Pontiac Mines, Inc. also owns what is known as the Middle Golconda. This group of claims adjoins the Golconda on the north. The property was developed through two crosscut adits known as the Upper Bethel and Big Bethel, which together have several thousand feet of drifting on the veins. A relatively small, but unknown, amount of ore was mined from above these adit levels. The stoped areas were short with long barren stretches in the drifts between the stopes. Judging from the pillars left in the mine the ore generally did not exceed 3 feet in width.

Copper Age Mine

Included with the lease application of the Mohave Metal Mining and Reduction Co. are two maps of the Copper Age Mine. The applicant does not own this property nor does he have a lease at this time. Consequently, the mine is discussed in this report under the generalizations of all the mines in the Wallapai district that might serve as a source of ore supply for a custom mill.

MINEABLE ORE RESERVES

Golconda Mine

In a photostatic copy of a letter, dated March 28, 1919, attached to the lease application, MMA-494, J. B. Wanvig, Jr., mine superintdent of the Golconda mine during 1913-1917 states: "there should be 60,000 tons of concentrating ore in the stoping zone along the Golconda vein above the 1400 level".

A map accompanying the application shows that the shaft extends slightly below the 1400 level; also that no development was done on the 1300 and 1400 levels and that four small stopes were started on the 1300 level. Wanvig estimated that the 1200, 1300, and 1400 levels should produce 20,000 tons per level. This estimate of tonnage was based on the fact that the average production per level from the 700 to the 1100 level was 20,000 tons. He does not give an estimate of the grade of this ore. Based on the results of 1917, the zinc content is 14.3 percent zinc and based on the gold and silver content for 1914-1917 the calculated average is 0.10 ounce gold and 2.4 ounces silver per ton. Concentrates for 1917 showed a low copper and lead content.

In addition to the Golconda mine, the Pontiac Mines, Inc. owns the Upper Bethel and the Big Bethel mines. Most of these workings, except the stopes, are open. Both of these tunnels have produced some ore but records of production are not available. There are no measurable ore reserves and little or no indicated ore. It is probable that deeper development will produce additional ore but judging from the present workings it will not be of importance and definitely not profitable under present economic conditions.

In response to an insistant request of the mine operators for a custom mill, engineers of the Bureau of Mines made an examination of the district prior to August 1947.

P. S. Henry[1] in the confidential report accompanying Report of Investigations 4188 estimated a possible daily production of 53 tons of ore with an average grade of 3.82 percent lead, 6.43 percent zinc, 0.82 percent copper, with 0.153 ounce gold and 3.41 ounces silver per ton. This tonnage is the combined production of six mines.

Henry states: "The estimate of available ore reserves indicates that if a custom mill were erected in the Chloride district, the total throughout would be insufficient to yield a profit on the milling operation".

Table II gives a summary relative to past operations of 100 mines in the district. From a study of these mines it is estimated that excluding the Galena a production of 150 tons of ore per day with a grade of 0.05 ounce of gold and 1.5 ounces silver per ton, with 0.05 percent copper, 3.5 percent lead, and 6.5 percent zinc might be made, provided the prices of metals were sufficiently high. Such a grade is not now profitable, nor was it ever profitable. The district has no mineable ore reserves

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[1] Henry, P. S., Examination of Zinc-Lead Mines in the Wallapai Mining District, Mohave County, Ariz. Bureau of Mines R.I. 4188

other than in two or three small leasing operations. The Tennessee-Schuylkill mine has measured, indicated, and inferred ore reserves but these are not minable under present economic conditions.

Most of the estimated production of 150 tons per day above mentioned would come from inferred ore, except the Tennessee-Schuylkill. This mine, and the Colorado, if it should be reopened, would be the only producers capable of producing as much as 50 tons per day. With the proper price incentive scores of lease operations would contribute small tonnages. The district has been an almost continuous producer for 50 years. It is practically idle today, not because of a lack of ore, but simply because the ore is sub-marginal.

TABLE II. - Gold, silver, copper, lead & zinc shipments and vein assays from 109 mines, in the Wallapai district, Mohave County, Ariz.

Mine	Year	Ore-Tons	Assay Values: Ounces/ton: Gold	Ounces/ton: Silver	Percent: Copper	Percent: Lead	Percent: Zinc	Remarks 1/
Alpha	1937	44	0.07	13.15	0.38			Smelter returns to company
"	1943	Samples	0.04	1.6	0.9	1.1	1.8	R.I. 4168, vein-3.1 ft. avg.
"	1945	44	0.07	7.1	0.5	1.9	5.1	R.I. 4168
Alpha-Keystone	1938	65	0.22	28.07	0.67			Smelter returns to company
" "	1938	80	0.14	17.40	0.27			" " " "
Alsuta	Early	Some		X	X			Ariz. Bureau of Mines Bul. 140
American Kettle	1938	Some		X				M.Y.B.
Ark-San Antonio	1938	Some	X	X				M.Y.B.
Atlas	1937	Some	X	X				M.Y.B.
Bent Bet	1942							R.F.C. loan denied, vein too small
Big Bethel	Early	Some	X	X				Ariz. Bureau of Mines Bul. 140
Blackfeet	1938-40	2 cars	0.12	21.3	1.9			Ariz. Dept. of Mineral Resources
"		Samples	0.12	21.5	3.2	1.8	4.8	" " " " " , vein 3 feet
Blue Bell	1937	450	0.07	11.98	0.61			Smelter returns to company
" "	1938	Some	X	X				M.Y.B.
" "	1940	Some	X	X				M.Y.B.
" "	1941	35	0.30	16.10	0.61			Smelter returns to company
Blumiest	1938	Some	X	X				M.Y.B.
Brighter Days	1936	4 cars	1.22	14.3		8.1		R.I. 4168
" "	1943	Samples	0.55	10.9	0.3	10.8	6.5	R.I. 4168, vein 0.87 feet
Cashier	1935	1 car	X	X				M.Y.B.
Corbet		Some	X	X			X	R.I. 4168
Champion	1938	Some	X	X	X	X	X	M.Y.B.
Chicago	1943	Samples	Tr	1.9	0.06	0.4	0.2	R.I. 4168, vein - 2.5 feet
C.O.D.	1938	Some	X	X				M.Y.B.
" " "	1941	Some	X	X				M.Y.B.
" "	1942	1,000		X				M.Y.B.
Columbus	1938-40	Some	X	X	X	X	X	M.Y.B.

TABLE II. - Gold, silver, copper, lead, & zinc shipments and vein assays from 102 mines, in the Hillside district, Yavapai County, Ariz. - Continued.

Mine	Year	Dry Tons	Assay values: Ounces/ton Gold	Ounces/ton Silver	Percent Copper	Percent Lead	Percent Zinc	Remarks 1/
Columbus	1943	98	X	X	X	X	X	N.Y.R.
"	1943	1 car	0.008	3.6	0.35	1.3	15.2	Ariz. Dept. Mineral Resources
"	1943	Samples	0.12	2.5	0.25	0.16	6.6	R.I. 4168, vein -3.25 Ft.avg.
"	1946	1,314	X	X	X	X	X	N.Y.R.
"	1946	109	0.05	2.13	0.09	0.4	6.5	R.I. 4168
Congress & Hess	1939	None	X	X				N.Y.R.
Copper Age		None	X	X	X	X	X	See El Oro Mine
Copperopolis					X			R.I. 4168, Copper reported
Cromwell	1948	3 cars	X	X				R.I. 4168
"	1946	77	X	X				R.I. 4168
De La Fountaine	1942	None				X	X	N.Y.R.
" " "	1946	5 cars	0.03	2.8		14.8	28.8	R.I. 4168
" " "	1946	Samples				3.6	14.2	R.I. 4168, vein - 1 to 4 Ft.
" " "	1947	263				X	X	N.Y.R.
Detroit	1943	Samples		7.2	2.5	0.8	6.3	R.I. 4168, vein - about 5 Ft.
"	1943	Samples		7.3	2.3		5.6	R.I. 4168, vein -4.4 Ft.
Dixie	1937	12,547	X	X				N.Y.R., tonnage treated
"	1938	32,000	X	X				N.Y.R. " "
"	1939	25,000	X	X				N.Y.R. " "
"	1940	2,000	X	X				N.Y.R.
Eisteff	1941	None		X				N.Y.R.
Elkhart	1938-42		862	10,385	7,848	365,199		U.S.G.S.Bings Report, total ounces
Elkhart	1939	5,000	X	X		X		0 total pounds produced N.Y.R.
El Oro	1944	400	0.08	2.37	0.1	2.15	4.78	N.Y.R.(tonnage) R.I.4168(grade)
" "	1947	500	X	X	X	X	X	N.Y.R.
" "	1948	1,000	X	X	X	X	X	N.Y.R.
" "	1949	4,500	X	X	X	X	X	N.Y.R.
Emerald Isle	1943	2,100			X			N.Y.R.

TABLE II. - Gold, silver, copper, lead, & zinc shipments and vein assays from 100 mines, in the Wickiup district, Maricopa County, Ariz. - Continued.

Mine	Year	Ore-Tons	Assay values: Ounces/ton Gold	Ounces/ton Silver	Percent Copper	Percent Lead	Percent Zinc	Remarks 1/
Emerald Isle	1944	8,635			X			M.Y.B.
" "	1945	8,312			X			M.Y.B.
" "	1946	28,698			X			M.Y.B.
" "	1947	23,683			X			M.Y.B.
" "	1948	14,000			X			M.Y.B.
Emerson	1942	Some	X					M.Y.B.
Eureka	1944-45	269	0.02	7.4	0.89	4.35	11.44	R.L.4161 & M.Y.B.
"	1946	Samples		4.37	0.85	3.36	9.28	R.L. 4161, vein - 2 ft. avg.
Flores	1942	Some	X					M.Y.B.
"	1943	343	X	X	X	X	X	M.Y.B. Including Minn.-Connor
Fortunatus	1945		X	X		X	X	R.F.C. grant denied, no ore exposed
Fountain Head	1937	215	0.44	4.14	0.66			Smelter returns to company
" "	1938	687	0.43	5.36	0.59			Smelter returns to company
" "	1938	Some	X	X	X	X		M.Y.B.
" "	1940	20	X	X	X	X		M.Y.B., includes New London
Golconda	1908-17	Some	X	X			X	Net Smelter returns -$2,636,488
"	1938	Some	X	X				M.Y.B. Probably dump ore
"	1939	Some	X	X				M.Y.B. Probably dump ore
"	1940	1,900	X	X			X	M.Y.B. Probably dump ore
Gold Bar	1935	1 car	X	X				M.Y.B.
Golden Eagle	1938	Some	X	X			X	M.Y.B.
" "	1940	1,142	X	X			X	M.Y.B.
" "	1941	Some	X	X			X	M.Y.B.
Golden Eagle-Subtail	1939	Some	X	X			X	M.Y.B.
Golden Gem	1939	Some	X	X				M.Y.B.
" "	1940	2,810	X	X				M.Y.B.
" "	1941	Some	X	X				M.Y.B.
" "	1942	2,800	X	X				M.Y.B.
" "	1948	161	X	X				M.Y.B.
" "	1949	43	X	X				M.Y.B.

TABLE II. - Gold, silver, copper, lead, & zinc shipments and vein assays from 100 mines, in the Bullard District, Yavapai County, Ariz. - Continued

Mine	Year	Ore-Tons	Assay values: Ounces/ton Gold	Ounces/ton Silver	Percent Copper	Percent Lead	Percent Zinc	Remarks 1/
Good Hope	1935	1 car	X	X				M.Y.B.
" "	1938	none	X	X				M.Y.B.
Hercules-Badger	1942	1 car	1.32	6.1	0.27	3.1	5.3	R.I. 4168
" "	1943	Samples	X	X		20.0	25.0	R.I. 4168, vein- 2 to 5 inches
Hidden Treasure	1937	9,300	0.02	0.76		0.7	1.4	R.I. 4181, recovered values
" "	1942	none	X	X				M.Y.B.
" "	1944	none	X	X				M.Y.B.
" "	1945	samples	0.15	1.4	0.12	2.4	4.8	R.I. 4168
" "	1949	62	X	X				M.Y.B.
Hillside	1935	1 car	X	X				M.Y.B.
Idaho	1938	none	X					M.Y.B.
Jackson	1935	1 car	X	X				M.Y.B.
"	1937	none	X	X				M.Y.B.
"	1938	None	X	X				M.Y.B.
Jim Kane		none		X	X	X	X	War Minerals Report, low grade
" "	1943	samples	Tr	0.02	0.23	2.9	8.45	R.I. 4168, vein-8.4 ft. avg.
Johnny Bull-Silver Knight		samples					X	War Minerals Report, low grade
" " " "	1944	samples					0.1-7.6	N.S.B.M. drilling
Juniper to	1943	600				X	X	R.F.C. B-468
"	1943	170	0.02	2.6		11.8	11.3	R.F.C. B-468
"	1943	samples				1.8	2.6	R.F.C. B-468
Juno	1937	none	X	X				M.Y.B.
"	1938	none	X	X				M.Y.B.
"	1939	none	X	X				M.Y.B.
"	1940	855		X		7.0	7.0	M.Y.B. (tonnage)R.I.4168(grade)
"	1941	none	X	X				M.Y.B.
"	1942	None	X	X				M.Y.B.
"	1944	none	X	X				M.Y.B.
"	1944-45	1,320	0.19	6.60	0.22	4.85	4.94	R.I. 4168

TABLE II. - Gold, silver, copper, lead & zinc shipments and vein assays from 300 mines, in the Vulcan District, Mohave County, Ariz. - continued.

Mine	Year	Ore-Tons	Assay Values: Ounces/ton Gold	Ounces/ton Silver	Percent Copper	Percent Lead	Percent Zinc	Remarks 1/
June	1946	samples	0.03	0.85		0.4	3.8	R.L. 4168, vein - 2.5 ft.
"	1946	samples	0.34	2.75	0.14	1.2	3.8	R.L. 4168, vein - 4.3 ft.
Jupiter	1946	15.8	0.01	1.60	0.88	5.75	6.4	R.L. 4168
Kane	1946	none						M.Y.B.
Keystone	1937	none	X	X				M.Y.B.
"	1939	none	X	X				M.Y.B.
"	1939	4,190		X				M.Y.B.
"	1940	1,416		X				M.Y.B.
Lateral Opt	1944	1,156	X	X				M.Y.B., includes Mins.-Commer
Liberty		samples	0.37	1.3	0.07	2.15	2.7	R.L. 4168, vein-4.7 ft. avg.
"	1939	none	X	X	X	X	X	R.L. 4168, (see Silver Hill)
Lillian	1940	none	X					M.Y.B.
Lone Jack	1940-45	949	0.19	2.75	0.23	4.35	5.39	R.L. 4168
" "	1946	1,740	X	X	X	X	X	M.Y.B.
Lone Jack & Blackfoot	1942	samples	0.01	3.47	0.19	5.15	4.66	War Minerals Memo, vein- 50 inches
Lucky Day	1942	none	X	X				M.Y.B.
Manganita	1943	samples	3.4	0.75	0.39	3.0	5.0	R.L.4168, vein- 1.9 ft.
"	1948	none	X	X	X	X	X	M.Y.B. (see Mins.-Commer)
Mary Bell	1939-40	none	X	X		X	X	M.Y.B.
" "	1940	137	X	X		X	X	M.Y.B., includes Banana Mine
Middle Golconda	1942	none	X	X	X	X	X	M.Y.B.
Middle Golconda-Ore Plata	1943	10,636	X	X	X	X	X	M.Y.B.
Midnight	1938	none		X				M.Y.B.
Miner's Hope	1938	none	X	X				M.Y.B.
Minnesota-Commer	1938	none	X	X				M.Y.B.
" "	1939	none	X	X				M.Y.B.
" "	1940	none	X	X		X	X	M.Y.B.
" "	1942	446	X	X		X	X	M.Y.B.
" "	1942-43	23 cars			0.6	5.0	4.0	R.L. 4168

TABLE II. - Gold, silver, copper, lead, & zinc shipments and vein samples from 100 mines, in the Bullard district, Yavapai County, Ariz. - Continued

Mines	Year	Ore-Type	Ounces/Ton Gold	Ounces/Ton Silver	Percent Copper	Percent Lead	Percent Zinc	Remarks 1/
Minnesota-Cannon	1942-43	1,200	0.27	12.0		4.	4.	R.I. 4181
" "	1944	none	X	X		X	X	M.Y.B.
Mint	1941	none	X	X				M.Y.B.
Mohawk	1935	1 car	X	X				M.Y.B..
"	1939	none	X	X				M.Y.B.
Neil-Louis								R.I. 4181, no record of production
New London	1945	none	X	X	X	X	X	M.Y.B.
" "	1947	176	X	X	X	X	X	M.Y.B.
" "	1949	38	X	X	X	X	X	M.Y.B., includes Fountain Head
New Moon	1947	1,694	X	X	X	X	X	M.Y.B.
" "	1949	315	X	X	X	X	X	M.Y.B.
Nighthawk	1939	none	X	X				M.Y.B.
"	1941	none	X	X				M.Y.B.
"	1942	none	X	X				M.Y.B.
98	1935	1 car	X	X				M.Y.B.
O'Brien	1939	none	X	X				M.Y.B.
"	1941	none	X	X				M.Y.B.
"	1942	none	X	X				M.Y.B.
Old 97		none	X	X				R.I. 4181
Ore Plata	1938	none	X	X				M.Y.B.
" "	1939	2,000	X	X				M.Y.B.
Paymaster		none	X	X				Ariz. Bureau of Mines Bull. 160
Payroll	1939	samples	0.10	3.0	0.40	0.84	7.6	R.I. 4181, vein - 5 ft.
"		samples	0.11	2.46	0.37	1.40	8.58	Ariz. Dept. Min. Resources, vein-4.1'
Prince George	1938	none		X				M.Y.B.
Rainbow	1938	none	X					M.Y.B.
"	1939	3,600	X					M.Y.B.
"	1940	none	X					M.Y.B.
"	1941	none	X					M.Y.B.

TABLE II. - Gold, silver, copper, lead, & zinc shipments and vein assays from 109 mines, in the Wallapai district, Mohave County, Ariz. - Continued.

Mine	Year	Ore-Tons	Assay values: Ounces/Ton: Gold	Silver	Percent: Copper	Lead	Zinc	Remarks 1/
Rambler	1942	None	X					M.Y.B.
Red Seal	1941	None	X					M.Y.B.
" "	1942	None	X					M.Y.B.
Rice	1937	None	X					M.Y.B.
"	1939	None	X					M.Y.B.
"	1940	None	X					M.Y.B.
"	1941	None	X					M.Y.B.
St. Louis	1935-40	213	Tr	5.54	0.2	46.17	3.	R.I. 4168
" "		600	0.02	8.6	0.22	80.0	2.7	Ariz.Dept.Mineral Resources, one car assay
" "	1943	Samples	0.003	2.05	0.15	12.13	1.8	R.I. 4168, vein - 2.05 ft.
" "	1940	None	X	X	X	X	X	M.Y.B.
Samson	1900-05	2,861	1.0	13		8		S.K. Garrett's report
"	1937	None	X	X		X	X	M.Y.B.
"	1938	None	X	X		X	X	M.Y.B.
"	1938	20 cars	0.8	6.0		11.0	4.5	Ariz.Dept.Mineral Resources
"	1943	376	X	X		X	X	M.Y.B.
"	1948	None						M.Y.B.
"	1949	137	X	X		X	X	M.Y.B., includes Mary Bell Mine
Sandy	1935	1 car	X	X				M.Y.B.
Shooting Star	1949	5	17.38	8.79				M.Y.B., Smelter returns to Co.
Silver Age	1941	None		X				M.Y.B.
Silver Hill	1949	None	X	X				M.Y.B.
" "	1932	37	0.358	2.3	0.19	3.78		Ariz. Dept. Mineral Resources
" "	1942	4 cars	0.56	3.40	0.36	6.40	5.30	Ariz.Dept.Mineral Resources, one car assay
" "	1948	311	0.61	3.9		6.4	5.0	R.I. 4168
" "	1943	None	0.53	4.4	0.55	8.9	6.2	Ariz. Dept. Mineral Resources
" "	1943-44	447	0.35	5.2	0.48	6.8	5.00	R.I. 4168
" "	1946	1,346	X	X	X	X	X	M.Y.B.
" "	1948	1,881	X	X	X	X	X	M.Y.B., includes Kane production

TABLE II. - Gold, silver, copper, lead & zinc shipments and vein assays from 109 mines, in the Wickiup district, Mohave County, Ariz. - Continued.

Mine	Year	Ore-Tons	Assay values: Ounces/ton Gold	Ounces/ton Silver	Percent Copper	Percent Lead	Percent Zinc	Remarks 1/
Silver Legion	1937	176	0.06	18.82	0.55			Smelter returns
Silver Member	1940	10	0.00	6.05				" "
" "	1943	none				X	X	M.Y.B.
Summit	1936	12,000	X	X				R.I. 4161
"	1938	none	X	X				M.Y.B.
"	1939	2,679	X	X				M.Y.B.
"	1940	None	X	X				M.Y.B.
"	1941	None	X	X		X		M.Y.B.
"	1942	44	0.33	5.0	0.66	6.9	7.5	Smelter returns
"	1943	23 cars	0.13	5.0	0.5	6.3	6.5	Ariz. Dept. Mineral Resources
"	1943-46	6,049	0.07	5.8	0.76	4.42	7.18	R.I. 4161
"	1944	3,131	0.06	5.2	0.68	4.21	7.33	M.Y.B., assay on smelter returns 2,944 tons
"	1945	3,473	0.07	4.0	0.52	3.98	6.07	M.Y.B., assay on smelter returns 3,587 tons
"	1946	4,563	0.08	4.19	0.57	3.78	5.48	Smelter returns
"	1947	8,905	0.05	4.1	0.5	3.8	5.5	M.Y.B. (tonnage & grade)
"	1948	620	0.05	5.24	0.64	5.8	6.92	M.Y.B., assay on smelter returns 321 tons
Tennessee-Schuylkill	1941-49	601,806	0.07	2.5	0.05	5.1	5.9	U.S.B.M. (Recovered metal)
" "	1951	28,053	0.07	2.0		3.1	7.7	U.S.B.M., measurable ore
" "	1951	52,209	0.06	1.9		2.9	7.6	U.S.B.M., indicated ore
" "	1951	94,406	0.06	1.6		3.4	6.4	U.S.B.M., inferred ore
Tin Cup	1941	none	X					M.Y.B.
Tintic	1937	none	X	X				M.Y.B.
"	1938	none				X	X	M.Y.B.
"	1939	none	X	X				M.Y.B.
"	1941	none	X	X				M.Y.B.
"	1943	samples	0.01	5.0	0.70	2.21	0.60	R.I. 4161, vein - 1.2 ft.
Tuckahoe	1940	none						M.Y.B.
Twins	Early	none	X					Ariz. Bureau of Mines Bull.100
Victory		none				X		R.I. 4161 (see Wrigley)

TABLE II. - Gold, silver, copper, lead, & zinc shipments and vein assays from 150 mines, in the Kaiser District, Mohave County, Ariz. - Continued.

Mine	Year	Ore-Tons	Assay values: Ounces/ton: Gold	Silver	Percent: Copper	Lead	Zinc	1/ Remarks
White Eagle	1938	None	X	X		X		M.I.R.
" "	1939	2,[illegible]	X	X				M.Y.B.
" "	1940	2,[illegible]	X	X				M.Y.B.
" "	1945	[illegible]	X	X				M.Y.B.
" "	1946	[illegible]	X	X				M.Y.B.
White Heron		none	X	X	X	X	X	War Minerals Mann, low grade
Wrigley		none	X	X		X	X	War Minerals Report

1/ References as follows: M.I. - Bureau of Mines, Report of Investigations;
M.Y.B. - Bureau of Mines, Minerals Yearbook;
X - indicates metals contained with grade unknown.

PRESENT STATUS

Exploration and Development

The Golconda mine is opened by a 1,400-foot inclined shaft. Water stands in the shaft somewhere near the 700 level. The condition of the shaft and the underground workings is unknown. The other mines of the Pontiac Mines, Inc., include the Upper Bethel and the Big Bethel tunnels. These properties are known as the Middle Golconda. The greater part of the tunnel workings are open but show little or no ore. The tunnel workings of the Copper Age (El Dre) are nearly all open. The above mines are those which the applicant states he intends to operate.

Mining and Milling Equipment and Other Facilities

None of the properties that the applicant intends to operate has any equipment. The only mine in the entire district that has substantial amounts of mining equipment is the Tennessee-Schuylkill. The Summit has compressors. Other mines not visited in the district may have minor amounts of mining equipment.

There are two flotation mills in the district, the Keystone of 70 tons capacity, and the Tennessee-Schuylkill of 150 tons capacity. Both of these mills could be put into production without excessive repairs and no costly additions.

The applicant claims to have an option on the Producers Mill which is a cyanide mill. He proposes to convert it into a 400-ton flotation mill.

PROJECT PROPOSALS

The Mohave Metal Mining and Reduction Co. has applied for a loan of $400,000 to be used for the following purposes:

Purchase of Producers Mill	$40,000
Rehabilitation and equipment removals	28,947
Installation of flotation equipment	41,920
Power transmission line and substation	52,167
Construction of cyanide leach plant	150,000
Contingencies and working capital	114,987
Total	$400,000

Included with the application is a copy of an option to lease the properties of the Pontiac Mines Co. who apparently own the Colorado and Middle Colorado Mines; also attached to the application are copies of two maps of the Copper Age Mine.

No request is made in the above expenditures for mining purposes. How the applicant intends to reopen and develop the mines is unknown.

The probable cost of new equipment, together with the rehabilitation and development of the mines mentioned, would involve a capital expenditure of at least $500,000, in addition to the $400,000 requested.

The Producers Mill was a well designed and constructed all-slime cyanide plant. It was built in 1939 to treat the gold ores from the Pilgrim and other gold mines of the River Range. It is well adapted to the sampling and treatment of custom ore and could be readily converted into a selective flotation plant for the treatment of the zinc-lead ores of the Wallapai district.

Transportation

The transportation of the ore from the various mines of the district to the Producers Mill would be by truck. The mines that might serve as a source of ore lie within a radius of from 8 to 20 miles from the mill. Most of the mines are served by good branch roads leading off of U. S. Highway 93. Trucking charges are about 12 cents per ton mile.

Manpower

Manpower is a very serious problem. Chloride is an almost abandoned mining camp. There are housing facilities available for a considerable number of men. There are several properties operating outside the Wallapai district, but near Kingman. Of these the Antler is the most important. These outside properties do not have living facilities comparable to Chloride. It is most likely that should operations be started at Chloride it would attract miners from properties already in operation. There is already a shortage of miners and it is believed that it will become increasingly difficult to meet the present labor requirements to say nothing regarding new operations that are now under way in areas outside of the Wallapai district. Mr. Langley of the Tennessee Manganese Corp. stated that he proposed to pay a wage that was $1.00 higher than that paid in the copper camps, so that he could obtain sufficient miners. The situation is less serious as regards common labor.

Power

The Producers Mill formerly had its own Diesel power plant. This was sold several years ago so now it is proposed to build 5.4 miles of electric transmission line to the mill. The power would be furnished by the Citizens Utilities Co. of Kingman.

Water

Water for milling purposes at the Producers Mill was pumped from the nearby Pilgrim Mine. J. P. Ryan says there is ample water from this source for a 400-ton mill. During the past operation of the mill sufficient water was apparently available.

PRODUCTION PLAN (AFTER COMPLETION OF PROJECT)

Time Schedule

The applicant proposes to start production in 90 days from the date funds are made available. He makes no mention of the initial tonnage or when he expects that production can be increased to 400 tons per day. No production plan or time schedule is given for the proposed cassetic leach pilot plant.

Rate of Production. Tons of Ore and Recoverable Metal

The applicant expects that 400 tons of ore per day will produce 20 tons per day of lead concentrates containing 11 tons of metal, and 20 tons of zinc concentrates containing 3.5 tons of metal.

At the rate of 400 tons of ore per day for 330 days per year the annual production would be 140,000 tons. The greatest production in the Wallapai district for any single year was 1937 when 119,246 tons were produced from 45 mines. In 1938 a total of 180,810 tons were produced from 39 mines. A large part of the 1938 tonnage came from gold-silver producers.

Robert Paine, now mill superintendent of the Antler mill near Kingman and formerly mill superintendent and ore buyer for the Keystone mill, probably is more familiar with the possible production of the

district than anyone else. He advised that it was his opinion 150 tons of ore per day is all that the district could produce and to obtain such a production would require considerable time.

Mining Methods and Costs

Judging from the ore seen and from the description of the ore occurrence in numerous mines it is believed that square-set and cut-and-fill methods of mining are the most suitable. Square setting was the most important method at the Tennessee-Belmykill mine, but some production was made by the cut-and-fill method. This latter method is best adapted to mining many veins in the district where the wall rock stands fairly well and where widths are from 1 to 3 feet. Some few sections where walls are good and widths are 4 to 5 feet, ore can be mined from open stopes with sculls and pillars. Shrinkage stoping in most cases should not be used because of the very considerable amount of waste that would be broken with the ore, and the probable additional dilution due the caving of the hanging wall when drawing is done.

The cut-and-fill method, where applicable, particularly in the 1- to 3-foot veins, gives the best opportunity to obtain a high-grade product. The waste is easily distinguishable from the ore and could be picked out and left as filling.

The following mining costs, including development work consisting of drifting and raising but not shaft sinking, have been calculated for various widths of veins.

Width of vein, feet	Cost per ton
4 - 5	$13.00
3 - 4	18.00
2 - 3	25.00
1 - 2	40.00

These costs do not include depreciation and amortization.

Milling Methods and Costs

The Wallapai district is served by two selective flotation mills, the Tennessee-Schuylkill with a capacity of 150 tons per day and the Keystone mill with a capacity of 70 tons per day. Two classes of concentrates are produced; (1) a lead concentrate which contains most of the gold, silver and copper; and (2) a zinc concentrate with a small content of gold and silver. The lead concentrate contains approximately 60 percent lead, and the zinc concentrate contains approximately 54 percent zinc.

It is estimated that milling costs in the district, based on a daily production of from 100 to 150 tons, will be not less than $3.50 per ton. This cost is based on milling costs formerly obtained in the district adjusted to present day labor and supply costs. Company overhead, depreciation, amortization and income taxes have not been included.

Based on past milling operations in the district the approximate recoveries by selective flotation are as follows:

	Percent mill recovery in Lead Concentrates	Zinc Concentrates
Gold	75	10
Silver	72	8
Copper	60	1/
Lead	90	1/ 5
Zinc	1/ 8	75

1/ Not paid for

Available information for the Colorado mine is difficult to obtain. The mine recovery is estimated at 87.5 percent, and gold and silver at 90 percent.

Smelting Methods and Costs

The concentrates from milling include a lead concentrate containing gold, silver and some copper, and a zinc concentrate containing gold and silver. No payment is made for the zinc in the lead concentrate, and no payment is made for the lead and copper in the zinc concentrate.

Lead concentrates have been shipped to the American Smelting & Refining Co. at El Paso, Texas and to the United States Smelting, Refining & Mining Co. at Midvale, Utah. Zinc concentrates are shipped to the Amarillo Plant of the American Smelting & Refining Co. at Amarillo, Texas.

All smelter settlement sheets show that the basis for payment and smelting charges are substantially the same.

Payments for lead concentrates are approximately as follows:

Gold, 100 percent at $32.82 per ounce; silver, 95 percent at $0.90 per ounce; copper, less 6.5 percent at market price less 6.4 cents per pound; lead, less 1.5 percent and 90 percent of the remainder at the market price, less 2 cents.

Smelting charges for lead concentrates are as follows:

Base charge, $9.50 per ton; credit of 10 cents per unit for lead over 32.5 percent; freight, Kingman to El Paso, $12.36 per wet ton or $13.73 per dry ton; trucking, mill to Kingman, $2.06 per wet ton or $2.29 per dry ton.

Payments for zinc concentrates are approximately as follows:

Gold, 80 percent at $32.21; silver, 80 percent at $0.80 per ounce; copper, 66 percent at 6.5 cents less than market; zinc, 85 percent at market (17.5 cents) less 0.45 cents.

Smelting charges for zinc concentrates are as follows:

Base charge, $38.00 per ton; zinc adjustment charge, $1.00 for each cent over a zinc price of 6 cents per pound which amounts to $11.50 per ton; labor adjustment amounts to $7.50 per ton; iron penalty, 50 cents for each per cent over 12, amounting to $1.00 per ton; freight tax on spelter, $0.12 per ton. These costs total $58.12 per ton of concentrates.

It is difficult to present a simple formula for the exact payments and deductions for lead-zinc concentrates without knowing the analysis of the ore. The data shown above are sufficient for all practical purposes in obtaining the value of the net smelter returns.

Based on a study of the production of a large number of mines in the Wallapai district there seems to be considerable uniformity in the grade of the primary ore. It has been found that the combined lead-zinc content averages approximately 10 percent, of which lead is 3.5 percent and zinc is 6.5 percent. This grade and the relative amounts of lead and zinc are shown by an arithmetical average of the grade of ore in some 30 mines. It includes the production of the last 10 years at the Tennessee-Schuylkill, most of the production from the sulphide zone of the Summit and Copper Age, and weighted averages of samples taken in numerous other mines. It does not apply to the Golconda mine. The average grade of the Golconda is available for 9 months of 1917. The content of the ore does not follow the general average of most of the rest of the district. The Golconda concentrates in 1917 did not contain sufficient lead for payment. The calculated grade does not apply to small lessee operations where ore was mined and carefully sorted. The calculated average grade is for mill ore such as normally would be mined.

The net smelter returns on the basis of an ore averaging 0.05 ounce gold and 2.5 ounces silver per ton, with 0.03 percent copper, 3.5 percent lead, and 6.5 percent zinc, have been calculated. On the basis of 100 tons of lead-zinc ore milled there will be 3.35 tons of lead concentrates and 7.00 tons of zinc concentrates with a grade as shown below:

Concentrates Produced from 100 Tons Ore

Kind	Tons	Ounces/ton Gold	Ounces/ton Silver	Percent Copper	Percent Lead	Percent Zinc	Ratio of Concentration
Lead	5.26	0.71	14.2	1/	66.0	5.0 1/	19.0
Zinc	9.00	0.06	2.2	1/	3.0	54.0	11.1

1/ Not paid for

Value of Concentrates per Ton

Kind	Gold	Silver	Copper	Lead	Zinc	Total
Lead	$11.36	$28.34	1/	$137.95	1/	$218.40
Zinc	1.65	1.56	1/	1/	$136.52	139.65

1/ Not paid for.

Total Value Concentrates from 100 Tons Ore at Mill Before Transportation and Smelting

Lead	5.26 tons at $218.40 per ton	$1,147.18
Zinc	9.00 tons at 139.65 per ton	1,256.85
	Total value	$2,544.03

Total Cost Trucking, Freight and Smelting of Lead and Zinc Concentrates

Kind	Tons	Per Ton Concentrates Trucking	Freight	Smelting	Total	Grand Total
Lead	5.26	$2.38	$11.73	$6.85	$22.67	$110.34
Zinc	9.00	2.38	18.55	$50.12	70.96	$638.64
				Total costs		$757.98

The net value of 100 tons of ore in concentrates at the mine is $2,544.03 less $757.98 or $1,786.15, which is $17.86 per ton of crude ore.

The average grade of the ore from the Galesville mine is unknown. From the best available information the grade of the ore in the three last years of operation is estimated to average 14.3 percent zinc, with 0.10 ounce gold and 2.4 ounces silver per ton.

On the basis of 100 tons of ore milled there will be 25 tons of zinc concentrates with a grade as shown below:

Concentrates Produced from 100 Tons Ore

Kind	Tons	Ounces per Ton Gold	Ounces per Ton Silver	Percent Zinc	Ratio of Concentration
Zinc	25	0.35	8.6	30	4.0

Value of Concentrates per Ton

Tons	Gold	Silver	Zinc	Total	Grand Total
25	$9.80	$6.15	$144.93	$160.40	$4,010.00

Total Cost Trucking, Freight and Smelting Zinc Concentrate per Dry Ton Concentrates

Tons	Trucking	Freight	Smelting	Total	Grand Total
25	$2.20	$15.24	$52.12	$70.96	$1,774.00

The net value of 100 tons of ore in concentrates at the mine is $4,010.00 less $1,774.00, or $2,236.00. This is $22.36 per ton of crude ore.

SUMMARY: COST OF PROJECT

Capital Requirements Including Development

The applicant proposes to remodel and equip the Producers Mill for a production of 400 tons of ore per day which he expects to produce from the Galeenda mine and other properties belonging to the Pegasus Mines, Inc., and from the Copper Age mine. He also proposes to obtain ore from other mines in the district. His request for a loan does not provide for the cost of reopening and equipping any mine. It is believed that it would cost at least $300,000 to open up the Galeenda mine. This is an approximate figure. The mine has been closed since 1917. It might cost $100 per foot to retimber the shaft. To open up the 1200, 1300, and 1400 levels would cost $125,000. The cost of equipment, power lines, ore bins and other necessary items would be great.

To prepare other mines of the Fentian Mines, Inc. for production would require $50,000. To bring into production other mines from which the applicant expects to obtain ore perhaps would add another $100,000. To assure a production of 150 tons of ore per day would require as much as $300,000 for mine development and equipment. This is in addition to the loan requested by the applicant, which amounts to $400,000 (including $150,000 for the caustic leaching plant). Should the erection of the caustic leaching plant be delayed until sufficient ore was developed in the Galesnda, Middle Galesnda and other mines to warrant such a plant the cost of the project would be $750,000. The applicant's proposal starts at the wrong end. He requests a mill and a caustic leaching plant and requests no funds to develop the ore to supply his proposed treatment facilities.

Operating Costs

It is estimated that the direct costs of mining, transporting ore to a mill, and milling will average from $20.00 to $30.00 per ton of ore, depending upon the width of the vein. In addition to these direct costs overhead will amount to $1.00 and amortization will be approximately $2.50 per ton. These costs, for mining under the most favorable circumstances, are as follows:

	Per Ton
Mining	$15.00
Transporting ore	1.50
Milling	[illegible]
Direct costs	$[illegible]
Overhead	1.50
Amortization	[illegible]
	$[illegible]
Estimated royalty	[illegible]
Total	$[illegible]

Royalty amounts to 10 percent of the net smelter returns. In order to break even the net smelter returns should be $26.66 per ton of ore mined.

The mining cost of $15.00 per ton is based on mining a 4- to 5-foot vein. Many veins have a width considerably less. The mining cost for veins of lesser widths will increase in direct proportion to the width of the narrower veins.

The $15.00 cost of mining is not an estimate. It is calculated from 4 years operation at the Tennessee-Dobyhill. The costs obtained during this period have been modified to fit present wages and costs of supplies. Mechanization cannot materially reduce the cost of mining narrow veins.

Indicated Profit or Loss

Net smelter returns on the basis of the average grade of ore produced in the Hallapai district are $17.06 per ton. The Colorado ore might produce net smelter returns of $[illegible].36 per ton. Mining, milling and transportation costs will be not less than $26.66 per ton for production from the lowest cost producer.

Under present economic conditions no profit is possible from the operation of any mine or group of mines capable of producing 100 tons per day. A few lessees might operate successfully, shipping small amounts of high-grade mill ore to Utah and New Mexico custom mills.

CONCLUSIONS

With the present prices of metals and the present costs, ore in the Wallapai district is submarginal. The past history of the district with possibly two or three minor exceptions indicates that the ores of the district always have been submarginal. It is possible that the Golconda might have been profitable in a small way but it was not sufficiently so for the company to rebuild its mill after it was destroyed by fire in 1917. It is certain that under present economic conditions the Golconda could not be profitably operated with the grade of ore mined during the last years of its operations.

The district does not need an additional custom mill to treat its ore. It now has two mills. The Keystone flotation mill of 70 tons capacity operated from 1945 to 1948 at only half capacity. The Tennessee-Schuylkill mill also treated custom ore.

The veins are strong and are continuous for long distances. The lead and zinc sulphides are primary and are deep seated. Ore has not been bottomed in any known mine. The ore shoots are narrow and

irregular and consequently the cost of mining is high. The district is 10 miles long and 4 miles wide and contains some 200 mines, at least 150 of which have made some production. The district is important and some day will be operated.

Not so many years ago operators in the district were certain that if the district had a custom mill their difficulties would be solved. A custom mill was built and the operators were forced to close down because of a lack of ore. Now they want a caustic leaching plant which they think will make their ore profitable.

Caustic leaching with the recovery of metallic zinc is still in the experimental stage. Should this method of treating zinc concentrates be successful the reduction in the costs of production would not be sufficiently great to materially change the situation. The gap between the costs of production and the returns is much too great to be bridged by any saving that might result in producing metallic zinc by the caustic leaching process.

It is understood that leaching tests have gone sufficiently far to warrant the erection of an experimental pilot plant. If Government money is to be used to construct such a plant it should be built and operated under the supervision of engineers of the Bureau of Mines, possibly, at Boulder City, Nevada, where so much experimental work has already been done.

RECOMMENDATIONS

Since there is no probability that profitable production can be made from the Colonado or any of the other mines or combination of mines in the Wallagai district, it is recommended that the applicant's request for a loan be denied.

It is further recommended that under present economic conditions no loan be granted for opening any mine in the district for the production of lead and zinc, that no loan for exploration for these metals be made and no access roads be built.

Should the need for lead and zinc really become critical a substantial premium price for the Wallagai district would result in an annual production of at least 2 to 3 million pounds of lead, and 3 to 4 million pounds of zinc. Production might eventually be double this amount and might continue for many years.

It is also believed that given the incentive of a premium price private capital would adequately finance the smaller as well as the larger operations.