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"WAM 175 Item 4

ECONOMICS PROPOSED OXIDIZED ORE PLANT PIOCHE, NEVADA

BY

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The purpose of this report is to present the financial aspects of a proposed hydro-metallurgical plant to be built at Pioche, Nevada. It is supplemental to report dated August 1942, copy of which is attached.

Over seventy years of mining in the Rocky Mountain area has resulted in the development of numerous deposits of complex oxidized ores containing values too low in gold, silver and lead to be profitable, if sold to a lead smelter, and too low in zinc or manganese to be marketed in the Middle West or East for either their zinc or manganese content, and of physical characters that defy successful concentration or separation by gravity or flotation methods.

With the exception of the period of World War I, ores of the character and grade of those given below, have had no suitable market, except the limited outlet furnished by the Columbia Steel Company for manganese ores with no zinc content.

The development of several million tons of the complex oxidized ores by the Combined Metals Reduction Company and its neighbor, the Prince Consolidated Mining Company in the Pioche, Nevada mining district has led the former company to intensively study and test the metallurgy of these ores for more than ten years. The hydro-metallurgical process described in Mr. Klepetko's report, was developed as a result of such work. Its outstanding advantages are its flexibility and broad application for the recovery of gold, silver, zinc, lead, cadmium, copper, and manganese from these oxidized ores. It involves no new chemistry nor steps requiring difficult or tedious control, but only more "know how" in the practical handling of well known, concentrated chloride solutions.

The process is not recommended to any metallurgist who expectx to recover five metals in finished products from a complex ore in two or three simple steps. It is designed to treat complex ores containing a comparatively high gross metal value at a reasonable cost for the results obtained.

ORES & RAW MATERIALS

Mr. Klepetko's report covers a description of the metallurgy, estimated operating and installation costs for a plant designed to treat 760 tons of crude ore per day of the analyses shown below:

Tons Per Day	Au. Oz.	Ag. Oz.	Pb. %	Zn. %	Cd. %	Mn. %	Fe. %	Insol. %
500 Pioche oxidized complex	.048	4.67	3.05	3.01	0.03	13.4	21.4	25.6
160 Custom lead zinc	.01	4.50	5.00	25.0	0.15	Tr.	2.0	20.1
100 Custom Manganese	-	-	-	-	-	29.3	2.0	50.6
135 Pyrite Concentrate	.0165	2.46	1.6	2.4	-	-	39.8	5.1

Raw supplies required for the above ore tonnage are estimated at:

	Per Day
Salt	10 Tons
Burned Lime	60 "
Coal	96 "
Water	320,000 gal.

Bound under separate cover and submitted herewith are detailed estimates of ore reserves. From these it will be noted the positive tonnage in the Pioche area of complex oxidized ores is in excess of 2,000,000 tons, equivalent to a ten year ore supply for the proposed plant, and that the probable and possible tonnages total more than 4,000,000 tons additional.

These estimates also show a positive tonnage in excess of 600,000 tons of oxidized lead zinc ores can be had from neighboring districts, and that there are over 125 potential producers of these ores within economic transportation distance from the proposed plant.

It should be noted that the sulphide flotation concentrate from the Pioche mill, after roasting may be used in place of oxidized zinc ore in the process. Roasting the sulphide concentrate would also furnish SO_2 for the leaching step. This would be very desirable in connection with the use of low grade sulphide zinc concentrates containing substantial values in cadmium, copper or lead.

The 100 tons per day of custom manganese ores listed above can be obtained from the following properties:

Black Bird Mine	(concentrates)	Marysvale, Utah
Black Metals Mine	(Pioche)	Jack Rabbit, Nevada
Black Prince Mine	(Pioche)	Highland, Nevada
Comet Coalition Mine	(Pioche)	Comet, Nevada
Black Spot Mine		Near Eureka, Nevada

Referring to pages 8 and 26 of the ore estimate of Combined Metals Reduction Company, the manganese (pyrolusite) ores from the 840 and 300 levels of the Caselton Mine and the zero tunnel area can be substituted as economics warrant for the custom manganese ores in the chlorine generation step of the process. These ores contain less manganese but more gold, silver, lead and zinc than the custom manganese ores, and under normal conditions their use will be more economical than the custom ores.

The pyrite concentrate required by the proposed plant can be recovered by flotation from the zinc circuit tailings of the Pioche sulphide mill. The capacity of this mill is now being enlarged to 24,000 tons per month. The iron concentrate from the treatment of 12,000 tons per month of Pioche sulphide ore would adequately supply the 135 tons per day of pyrite concentrate needed by the proposed oxidized ore plant when treating the tonnages listed above.

ESTIMATED PRODUCTION

	Per Day
Zinc Oxide (79.0% zinc)	67.0 short tons
" (equivalent)	49.6 " "
Manganese Oxide (Mn_3O_4)	123.0 " "
Lead	21.0 " "
Magnesium Oxide	7.6 " "
Cadmium	528 pounds
Silver	2,648 ounces
Gold	23 ounces

The values of these products based on present prices of 8.25¢ per lb., St. Louis for Prime Western Zinc, $1.00 per long ton unit for manganese, 6.5¢ per lb. for lead at New York, 90¢ per lb. for cadmium, 71.11¢ per oz. for silver and $35.00 per ounce for gold are estimated as follows:

Zinc Oxide - 79% Zinc - Sold as ore to Texas Retort Plant

		Total Value Per Day
67 tons - 79% x 85% = 44.99 tons @ $ 165.00 =	$ 7,423.00	
Treatment $ 32.50 per ton oxide		
Freight 12.00 " " "		
costs 67 tons @ $44.50	2,982.00	
Value per day of zinc oxide production if sold as concentrates.	$ 4,441.00	$ 4,441.00

Zinc Oxide - 79% - Retorted at Pioche

67 tons oxide equivalent 49.2 tons of recoverable zinc - 49.2 tons		
High Grade zinc @ $185.00	$ 9,102.00	
Freight & selling @ 12.50	615.00	
Value f.o.b. Pioche	$ 8,487.00	
Cost of Retorting (See Coulter's Report)	1,703.00	
	$ 6,784.00	$ (6,784.00)

Lead Bullion		
21 tons @ $130.00	$ 2,730.00	
Fgt. & Refining to N. Y. @ $30 per ton	630.00	
Value of lead in lead bullion f.o.b. plant	$ 2,100.00	$ 2,100.00
Manganese Oxide Sinter - 70% Mn.		
123 short tons = 109.82 long tons @ $70	7,687.00	$ 7,687.00
Magnesium Oxide		
7.6 short tons @ $ 64.00	$ 486.00	
7.6 " " fgt. & Marketing @ $23	175.00	
Value f. o. b. Pioche	$ 311.00	$ 311.00
Gold 23.1 ozs. @ $32.00 per oz.		$ 739.00
Silver 2648 ozs. 99% @ 70.625¢ per oz.		$ 1,851.00
Cadmium 528 pounds @ 73¢ per pound (Pioche)		$ 385.00
Total value f. o. b. Pioche		$ 17,514.00

The above total does not include any value for the metals in the pyrite sinter.

ORE COSTS

With the metal prices given above, ore costs are estimated on the basis of arbitrary schedules outlined below to give the mines a liberal operating profit to warrant production under present adverse conditions. In the case of the oxidized lead-zinc ores, the proposed schedule is approximately $8.00 per ton more favorable for the mines than the basis of settlement now being offered in the Goodsprings District for these ores for stockpiling.

Short Tons Per Day		Value Per Ton	Cost Per Day
500	Pioche Complex Ore		
	Gold .048 ozs. - 80% @ $32	$ 1.23	
	Silver 4.67 ozs. - 80% @ 70.625¢	2.64	
	Lead 3.05% - 80% @ 6.5 - 1.625¢	2.38	
	Zinc 3.01% - 80% @ 8.25 - 2.75¢	2.65	
	Manganese 13.4% @ 28¢		
	Short Ton Unit	3.75	
	Total Value	$ 12.65	
	Treatment	5.00	
	Cost per day 500 tons @	$ 7.65	$ 3,825.00
160	Oxidized Lead-Zinc Ore		
	Lead 5.0% - 100 lbs. @ 3¢	$ 3.00	
	Zinc 25% - 500 lbs. @ 3¢	15.00	
	Cost per day - 160 tons @	$ 18.00	$ 2,880.00
105	Manganese Custom Ores		
	Manganese 29.3% Base 40% f.o.b. Pioche	$ 26.00	
	Under 40% 10.7 units @ $1.30	13.91	
	Cost per long ton	12.09	
	Cost per day 93.765 tons @	$ 12.09	$ 1,134.00
135	Pyrite Concentrate		
	135 tons @ $5.75		$ 776.00
900 Tons	Total Cost of Ore per day		$ 8,615.00

OPERATING EXPENSE

Operating Expenses as estimated in Mr. Klepetko's report total $5,364.00 per day, equivalent to $7.01 per ton of crude ore treated, of which $1,442.00 is labor based on a common labor rate of $6.00 per 8 hour shift. A further increase of 15% will probably be had in wages unless present labor policies are changed. Therefore $400. per day is being added to operating expense to offset this probable increase and other costs incidental thereto making total plant operating expense per day $5,764.00.

ESTIMATED PLANT PROFIT		Per Day	Per Year 360 Days
Production		$ 17,514.00	
Ore Cost	$ 8,615.00		
Plant operating cost	5,764.00	14,379.00	
Estimated profit before taxes and Capital charges		$ 3,135.00	$ 1,128,600.00

If a zinc retort plant were installed in the Pioche or Salt Lake districts, an additional plant profit estimated at $2,343.00 per day, equivalent to $845,000.00 per year, would be had.

ESTIMATED MINE PROFIT PIOCHE COMPLEX ORE

On the basis of the schedule used above for calculating plant ore costs, Pioche mine profit before depreciation, depletion and taxes is estimated as follows:

	Per Day	Per Year
Gross value f.o.b. mine - 500 tons @ $7.65	$ 3,825.00	
Mining cost - $4.00 Trucking 25¢ = $4.25	2,125.00	
Estimated mine profit 500 tons @ 3.40	$ 1,700.00	$ 612,000.00

The above mine profit includes no allowance for premium metal payments.

PLANT INSTALLATION COSTS

An analysis of the construction costs detailed in Mr. Klepetko's report is shown below:

	Manufacturer's Labor	Freight & Plant Labor	Material	Engineering & Administrative expense	Total
Pioche Plant	$ 805,415	$ 500,532	$1,174,223	$ 372,024	$ 2,852,194
Retort Plant		145,880	287,964	86,956	521,800
Total	$ 805,415	$ 646,412	$1,462,187	$ 458,980	$ 3,373,994

The above estimates were completed in June 1942 by Mr. F. C. Torkelson, an experienced engineer on plant construction, who was familiar with government practices and labor policies. No accurate method is available for estimating present efficiency in plant construction as compared to 1942 for a job of this size. In view of the conservative basis used for estimating, it is reasonable to assume the Pioche Plant, exclusive of the Retort Plant can be built in 18 months at a cost of $3,000,000.00.

MATERIALS OF CONSTRUCTION

Referring to Mr. Klepetko's report, the estimated materials required for construction are summarized below:

			TONS
Cement			3,134.75
Timber			3,686.10
Steel	(Structural)	201.55	
	(Equipment)	1,895.46	2,097.01
Bolts Nails Pipe Wire			
	Buildings	199.60	
	Equipment	96.02	295.62
Brick		Pounds	3,180.00
Copper	- Motors	10,793	
	Starters	2,467	
	Wiring	3,317	
	Transformers	3,560	
		20,137	10.07
TOTAL MATERIALS			12,403.55

MANPOWER REQUIREMENTS

The labor summary in the report shows the estimated number of men required for the plant operation at 188.

The number of men required to mine 500 tons per day of Pioche Complex ore is estimated at 100. Ore would be taken from the Caselton and Prince mines which are now producing sulphide ores.

An additional 50 men would probably be required to mine the custom manganese ore and 160 men to mine the lead zinc oxide ore.

Total additional labor is therefore estimated as follows:

	No. Men	Tons per Man Shift
Pioche Plant Operation	188	
Mining - Pioche Complex	100	5.0
" - Custom Manganese	50	2.0
" - Lead - zinc oxidized	160	1.0
Estimated total labor required	498	

As this plant can be operated profitably with lead and zinc prices at New York and St. Louis respectively of 5¢ per pound and on a Ferro manganese price of $80 per long ton, it should be noted it will normally support a population of 1,500 to 2,000 people.

CONCLUSIONS

The advantages of this proposal are summarized below:

(1) The construction of the plant at an estimated cost of $3,500,000 will result in an estimated annual production of the metals listed below from ores not now being utilized:

High Grade slab zinc	17,700 tons
Manganese Oxide (70% Mn.)	39,500 long tons
Lead	7,500 tons
Cadmium	190,000 pounds
Silver	953,000 ounces
Gold	8,300 ounces

(2) It will make possible the utilization of stockpiles of low grade manganese ores and lead zinc oxidized ores in the Rocky Mountain area for which no suitable treatment has been provided.

(3) It has been carefully developed over a long period of time, and would be a sound investment for private capital with a reasonable tax structure in spite of the present excessive construction costs.

(4) One month's operation of the plant represents a production of metals equal in weight to approximately twice the weight of the steel and copper required for its construction.

The proposal is submitted on its merits in the interest of the war effort. If those in authority wish it to go forward, Combined Metals Reduction Company will be pleased to cooperate.

Respectfully submitted,

Gen'l Manager