006963

TO: Herbert H. Cox

FROM: H. Lyall Ames

SUBJECT: Visit to the Anvil Mining Corporation Mill at Faro
September 21 - 23, 1970

This report covers my recent visit to the Anvil mill. It is directed mainly to questions by yourself and Mr. Thurmond. I was particularly interested in seeing what improvements, if any, had been made since my previous visit June 29 - July 2.

In general the mill looked in better condition but operating times and zinc metallurgy particularly were still far from satisfactory (average lead recoveries for July and August were 80.2% and 81.7% respectively, while the corresponding zinc recoveries were only 69.4% and 62.4%).

I think it was a definite step in the right direction that the mill staff had been augmented by Mr. Likins, Mill Manager, and an Assistant Superintendent to help Peter Taggart. Walter Hamilton had also returned to the property shortly before I arrived. I am confident that these men can gradually work out most of the problems that have plagued the operation since start-up. Certainly our discussions indicated a better understanding of the difficulties than on my first visit. I hope that definite responsibilities will be taken with regard to specific problem areas such as thickening, filtering, and grinding.

One afternoon we had a long meeting with Mr. Thurmond, Mr. Cornish and other staff members regarding metallurgical forecasts and how best to optimize the operation.

The metallurgical laboratory was beginning to take shape but Joe German's work is still curtailed by shortage of proper equipment, most of which is fortunately on order. Also, although theoretically there were more men on the laboratory staff they did not appear to be oriented toward actual flotation test work. Working space could be improved by removing all non-laboratory supplies. I will mention later two tests run while I was there.

Further comments are given below.

1. Zinc Recovery The following table of zinc recoveries is based on various laboratory and operating data and has been compiled to assist in estimating the optimum zinc recovery possible and also in forecasting probable recoveries in the near and long term future. Some of the recovery figures have been adjusted slightly from original in order to correspond with a 50% zinc concentrate assay. The "calculation figure" is based on a metallurgical balance rather hastily compiled by Walter Hamilton, Corwin Likins and myself.

Zinc Recovery Table

Ralph Parsons Metallurgical Balance	89%
Galigher locked laboratory tests	86%
Galigher single laboratory tests	74%
Anvil Mill January - August (ex April and August)	71%
Anvil Mill January - August	68%
Calculation including 15.8% zinc in bulk concentrate	80%
Anvil Mill September 28-29 including bulk	81%

My experience has been that actual mill recoveries on a refractory ore of this type will be about 5% lower than that obtained in a carefully controlled laboratory locked series. Theoretically this discrepancy should be reduced when making a bulk concentrate containing middling particles and assaying 30% zinc. However, on the basis of all the existing metallurgical data from recent laboratory tests at Anvil and Mattagami Lake and actual mill results I think that 80% is a realistic figure to use in forecasting future results. Even this figure will necessitate a smooth mill operation. In any case now that the bulk circuit is presumably in regular operation a more accurate overall zinc recovery should soon be available.

The following table is the hypothetical metallurgical balance referred to above for overall mill operation. The figures are indicative of what is expected with the bulk circuit in operation as the mill circuits are at present.

Metallurgical Balance

	TPD	Assay % Pb	Assay % Zn	Recovery % Pb	Recovery % Zn
Feed	6600	5	7	100	100
Bulk Concentrate	242	18	30	13.4	15.8
Pb Concentrate	365	65 ~~61~~	7.8	71.0	5.8
Zn Concentrate	594	~~1.50~~ 2.87	50	~~4.8~~	64.2
Tailing	5399	.60	1.12	~~10.8~~	~~15.0~~
		Total		~~100.0~~ 84.4	~~100.0~~ 80.0

2. Lead Recovery Lead Recovery in the mill is also lower than predicted on the basis of laboratory tests. The following table shows the extent of the discrepancies.

Lead Recovery Table

Ralph Parsons metallurgical balance	90%
Galigher locked laboratory tests	89%
Galigher single laboratory tests	87%
Anvil mill January - August, 1970	79%
Calculation including 13.4% Pb in bulk concentrate	84%
Anvil mill September 28-29 including bulk	87%

On the basis of these figures I think that with a smooth mill operation lead recoveries will average in the order of 85%.

3. Thickening Thickening still remains a serious bottleneck to the smooth operation of the entire mill. I think that the zinc thickener is the proper size so there must be something seriously wrong with its operation. I have recommended that all extraneous water should be eliminated from the feed to this thickener. An attempt has been made in this direction with some success. I think that the launder water is still excessive and that the spray water on top of the tank should be reduced some way.

They are using more and better combinations of flocculants and this is certainly helping to produce a clear overflow. A diaphragm pump has been ordered to give better control of the discharge. This should help operation by maintaining a more consistent high density pulp to the filter and

this in turn will reduce the percentage of circulating load going back into the thickener from the filter feed box. I suggested that in the meantime better control might be obtained by installing a valve in the end of the discharge line from the pump handling the thickener underflow. They are testing in the laboratory theidea of filtering the concentrate direct from the final cleaner cell, with only the excess going to the thickener.

Walter Hamilton thinks that all the streams feeding the thickener should be combined in one pump box so that the flocculants will be thoroughly mixed before entering the thickener. This may help but I still think that less water and better discharge control is more important. If all else fails then cycloning of the concentrate ahead of filtering should be tried. I suggested sending a sample of concentrate to Krebs and asking them for their comments.

4. Mill Availability Although operating times were better during the first part of September, for some reason, they fell off drastically in the middle of the month. When I was there tonnage was reduced considerably on one occasion when lower grade (and harder) ore was being milled. Apparently a hole in one of the crushing plant screens also contributed to the problem. In any case the rod mills began discharging more tramp oversize than could be handled and the mill tonnage had to be reduced. Shortly after I left a surge of lead concentrate was caused by having to shut down the bulk circuit temporarily for grade reasons and this overloaded the lead thickener necessitating a reduction in milling rate. Certainly this condition will not

exist when operation of the bulk circuit is balanced as to tonnage and grade.

I am forwarding with this report a drawing of a rod mill liner which might be considered for a future replacement. It is highly recommended by Zinc Corporation of Australia. I personally favour a wedge type liner but with the shell holes as badly worn as they are at Anvil the other liner might be the answer.

5. Milling Rate I did not give much consideration to the question of increasing the average milling rate under normal operating conditions. I suspect that the main bottleneck to actually getting the feed through the mill would be the grinding circuit - especially on harder ore. If the tonnage is increased past a certain point several things will happen. First, the rod mills will become overloaded and rather suddenly "stop grinding" causing excessive oversize in the product. If the mills are fully loaded with large enough rods and running at as high a speed as motors will permit there is not much that can be done to alleviate the situation except to reduce the size of the feed by installing finer screens in the crushing plant and this, of course, could be done only if the crushing plant capacity is sufficient or its operating rate could be reduced by running more hours per day. Secondly, the overall fineness of the feed to flotation would be adversely affected and the metallurgy would suffer accordingly. There would likely be severe settling of sand in the flotation cells, launders and pipe lines which would cause serious

disruption to the operation and before long shut down the entire plant. Thirdly, most of the flotation circuits are already overloaded to some extent from a metallurgical standpoint and unless the increased tonnage were accompanied by lower heads the metallurgy would be adversely affected as well as making operations very difficult.

I really don't know whether the milling rate could be increased to 7000 TPD as I didn't study the operation with this in mind.

6. Bulk Concentrate I have always thought that production of a bulk middling type concentrate would solve a great many metallurgical problems on a refractory ore such as Anvil. In fact my thought when I left the mine a few weeks ago was one of wait and see what happens before initiating any serious reagent or circuit change, or even purchasing more flotation cells. I had a brief telephone conversation with Mr. Thurmond the day I left Vancouver and the results from a couple of days operation sounded quite encouraging. These were noted in a previous table.

7. Laboratory Tests Two laboratory tests were run while I was there. One used aeration in the cell with soda ash for the lead float and lime for the zinc float. The other was standard Anvil procedure with lime to both floats. Rougher concentrates were not cleaned and no credit was taken for metal in the scavenger concentrates. The results were indicative in one respect. The lead grade was 10% higher with soda ash with the same recovery.

The zinc recovery was slightly better with the all lime circuits. The complete assays are given in the following table for reference.

Soda Ash

	% Wt.	Assay % Pb	Assay % Zn	Recovery % Pb	Recovery % Zn
Pb concentrate	6.2	57.1	3.1	69.8	6.9
scavenger	3.6	16.5	11.4	11.6	5.6
Zn concentrate	11.3	2.0	44.4	4.5	69.4
scavenger	5.3	3.5	12.3	3.7	9.0
Tailing	73.6	.8	1.0	10.4	9.1

Lime

Pb concentrate	7.4	47.2	9.2	69.9	9.0
scavenger	2.8	17.6	11.4	9.8	4.2
Zn concentrate	11.2	2.4	47.6	5.4	70.5
scavenger	5.2	1.6	4.4	1.6	3.0
Tailing	73.4	.9	1.4	13.2	13.3

Preliminary aeration tests carried out at Mattagami Lake were not encouraging. I have not actually studied the results but I understand that the differential was poor. Anyway we now know that the Mattagami Lake flowsheet and reagents, as they are, are not suitable for Anvil ore. We will investigate the soda ash and aeration ideas later. I am enclosing a drawing of a Noranda type laboratory aerator which I think should be made and installed in or near the Anvil laboratory.

I understand that lime was originally added directly to the rod mill and for some reason was discontinued. I recommend that it be put back for a week anyway as a test.

H. L. Ames

October 23, 1970 H. Lyall Ames