

March 17, 1970.

To: W. R. Bandeen, President,
Antoine Silver Mines Ltd.
From: John Lamb, P. Eng.

The Feasibility of Mining High Grade Ore at the Slocan Property
of Antoine Silver Mines Ltd.

FOREWARD

Acting upon your request, I submit the following report.

During the two months prior to the shutdown of the Antoine in November 1968, I made only two short visits to the underground workings and for this reason I am not completely familiar with the mining outline between 6700 and 6821 sublevels, as it now stands. At that time surface mapping in the basin above, was requiring all my time to complete, before the Winter snows. I recall, however, that a raise had been completed between the levels and that stoping was proceeding upward on either side of this raise for possibly 25 feet above the lower level. About a week prior to the shutdown I saw a lens of high grade galena in this stope.

Structure of the Ore Zone

On the basis of past mining experience we know that the mineralized ore shoot is about 300 feet long, following a northeast striking lode zone, which dips from 45 to 65 degrees southward. In this section a barren lamprophyre dike closely follows the lode, varying from two to five feet wide. Short lenses of high grade ore are scattered erratically along the lode in the 300 foot interval and may be found on either side of the dike and close to it.

The plane of intersection of the dike with the lode has a marked rake to the southwest, from which it follows that the ore lenses have a similar rake. In other words, they do not extend directly down dip but are found farther to the southwest at successively lower elevations.

Mining Problems

The main problem is to avoid excessive dilution of ore by the lamprophyre dike, which tends to spall off in big blocks when exposed to air. It was dilution in this manner that accounted in part for the low grade of production in 1968.

Mining Problems cont.

The erratic distribution of high grade ore shoots makes the mining operation one of "feast and famine.!" By this I mean that periods of good production are invariably followed by periods of no production, when development must carry on to locate new ore.

The mine set-up partly mitigates against clean ore production because only one transfer chute is available in the Selnes Raise for handling both broken ore and waste. A normal situation is to have separate transfer facilities for each. The set-up, also contributed to dilution of the ore in 1968.

Other Considerations

1. Efficient mining will be done only by good men who will require some motivation over and above their wages. As the success of the operation depends on these men, this is a very important consideration. I believe a bonus or profit sharing arrangement based on the net smelter returns would supply this motivation.
2. In such an operation one can only afford minimum overhead cost. I visualize not over five men being employed, with one in control but with all as producers of ore. No bunkhouse, cookhouse or extra vehicles could be afforded. The men would have to provide their own accommodation, preferably at home. Accounting and administration costs would be minimal.
3. Because of the type of mining, one could expect a low rate of production, possibly only a few tons per day. Even if an average of 5 tons per working day, was achieved it would yield only a little over 100 tons per month.
4. Capital will be required to re-mobilize the operation and rehabilitate the workings before any smelter returns come back. It is not unreasonable to anticipate a sum of \$20,000 for this purpose.
5. Upon completion of the extraction of the high grade ore, there would be nothing more worth mining between the 6700 and 6821 sublevels.

Ore Reserve:

In my report entitled "The Present Situation at Antoine Silver Mines - May 1969," I estimated the ore reserve in the block under consideration to be:

5000 tons grading 20 oz. per ton silver, 7% lead, 7% zinc

This reserve is that of milling grade ore only and not ore for direct shipment to a smelter. It would probably require a grade at least five times greater, to produce a worthwhile shipping product.

By inference it follows that in the above reserve block of milling grade ore one might expect about 1000 tons grading 100 oz. per ton silver, 35% lead and 35% zinc. Undoubtedly some of this ore would be unminable due to its small dimensions while some would probably be missed due to the amount of development one could afford to carry out. For these reasons I estimate that only 75% of the above tonnage would actually be mined (750 tons).

At present metal prices the gross value of the total metal content would be:

Silver	100 x 1.90	= \$190 per ton
Lead	35 x 20 x .15	= 105
Zinc	35 x 20 x .14	= 98
	TOTAL	<u>\$393 per ton</u>

Past smelter shipments by Antoine of high grade ore, indicate a net return to the shipper of 65 % to 70% of the gross value as calculated above. Therefore ore of this grade would return about $393 \times .67 = \underline{\$263/\text{ton}}$.

The total net return on the whole operation should then be
 $750 \times 263 = \underline{\$197,250}$

All productions costs would have to be paid out of this sum.

Production Costs

With such a small tonnage involved and a difficult mining problem it is not easy to forecast accurately, productions costs. For this reason my figures below are tentative and could well vary 10% either way.

or more!

Rehabilitation and Mobilization	\$20000
Wages plus incentive payment	55000
Truck haulage to smelter @ \$11/ton	8250
Materials and supplies	30000
Contingencies	15000
	<hr/>
	\$128250
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Net smelter return	\$197250
Therefore - operating profit	\$ 69000
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The above figures are based on a company-run operation. It will require an injection of capital to finance operations before any smelter settlements are received for ore shipped.

Alternative Operating Plan

The mine could be leased to a partnership of several good miners. The advantages of this method are:

1. A minimum of capital outlay by the company.
2. The miners will be self motivated because they know their income depends entirely on their own efforts.
3. Equipment and supplies would be to their account. In other words, they might use company-owned equipment under a rental arrangement, payable out of smelter returns.

In a leasing type of operation, standard royalty rates run from 15 to 20% of net smelter returns. At a rate of 20% the company, using tonnage and grade figures proposed, could expect to net

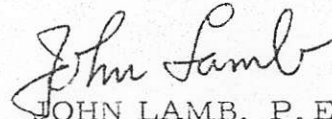
$$197,250 \times .20 = \$39,450$$

Conclusion

I believe it is feasible to mine high grade ore only, at the Antoine, between 6700 and 6821 sublevels. Based on the figures given it should produce a net return to the Company. You have two alternatives, either:

1. operate as a company, hiring miners for the job
2. lease the property on a royalty basis to a partnership of men experienced at this work.

The first requires financing by the company, a higher risk and a higher rate of return. The second requires much less financing by the company, a lower risk and consequently a lower rate of return.



JOHN LAMB, P. Eng.
Mining Geologist.

JL:pb

THE PRESENT SITUATION AT ANTOINE SILVER MINES LIMITED
MAY 1969

Foreword

The writer has been associated with the Antoine company since October, 1967 and, prior to its closure last November, he was in charge of geological mapping and exploration, both on surface and underground. During this period, he reported monthly to the President.

Numerous other reports have been made on the property: Cairnes (1928), Fawley (1965), Weymark (1965), Price (1964), Jory (1967, 1968), and Selnes (1964 - 1967).

At the present time the mine is inoperative due to a lack of working capital, while the company is in debt to various creditors. *incl. J.C.*

The production record is as follows:-

Direct Shipping Ore

Prior to 1910

1300 tons @ 190 oz/ton silver and 48% lead

The difficulties of transportation in these early days forced the operators to hand sort the ore carefully and eliminate all possible waste. This practice accounts for the comparatively high grade and small tonnage of ore. The writer estimates that possibly five times the tonnage was extracted from the mine before sorting.

1965

8.3 tons @ 310 oz. silver/ton, 56% lead and 3.6% zinc.

1967

25 tons @ 150+ oz. silver/ton, 60% lead and 13% zinc.

A certain amount of hand sorting was done prior to making both the above shipments.

Milling Grade Ore

1967 - 1968

6671 tons @ 11.0 oz./ton silver, 2.9% lead and 2.6% zinc.

(from figures supplied by W. C. Wingert)

*2/3 * 6671 = 4450 tons @ Ag. 16.5% / 15%
Pb. 4.35%
Zn. 4.9%*

This ore was treated in the concentrator of the Red Deer Valley Coal Company at Silverton, about 20 miles by road from the mine. Due to a lack of proper ore and waste separating facilities underground, the grade was lower than anticipated and certainly lower than was necessary.

Mine Location and Property Holdings

The main mine portal and the camp, consisting of cookhouse, office, bunkhouse, dry house, power house and assorted sheds, is situated at elevation 6500 feet, about 13 miles by gravel road from New Denver in the Slocan Mining Division.

Located at the head of the West fork of McGuigan Creek on the northwest shoulder of Reco Mountain, the property consists of 15 claims, extending 8,000 feet in a northwesterly direction, with an average width of 2,000 feet. The lower claims have a dense growth of brush and fair timber while the upper ones are largely bare. Snow covers the ground from November to June.

Below is a list of the claims.

Crown Grants

Laughing Waters	L. 11127
Red Cross	L. 3176
Soho	L. 3175
Northern Pacific	L. 3174
Abey Dones Fr.	L. 11126
Liberator No. 2	L. 11124
Boxer No. 2	L. 11128
Old Tom Moore	L. 11125
Antoine	L. 516
Surprise No. 2	L. 514

Taxes for the current year (at 25¢ per acre) will soon be due. I would estimate the tax to be between \$65. and \$100.

Mineral Leases (reverted Crown grants)

Ogema	L. 3163 (M. L. 31)
Alice Fr.)	L. 1928)
Spokane	L. 3515 (M. L. 33)
Galena Fr.	L. 4895 (M. L. 142)

These leases are in good standing until 1973.

Located Claims

Maria No. 2 Fr.

Rec. No. 10893

Saddie Fr.

Rec. No. 10894

The above two claims are registered in the name of W. C. Wingert (Mine Manager) to be returned to the Company by bill-of-sale at any time after August 23, 1968. They are in good standing to 1973.

It is the writer's understanding that Benjamin H. Swig of San Francisco has an undivided one half interest in all claims on the property.

Geological Setting

As with most Slocan vein-lodes, those on the Antoine property are tear faults, trending northeasterly, dipping steeply southward and crossing the regional trend of the rocks almost at right angles. These rocks consist of black argillite, with minor limestone and quartzite beds, all part of the Slocan series which trends northwesterly across the shoulder of Reco Mountain. Known as the Reco productive belt, these rocks contain the majority of the formerly productive mines, namely the Surprise, Last Chance, Reco, American Boy, Washington and Payne. The Rambler, although not in this belt, is nearby in a similar geological setting.

The outstanding feature of the productive belt and probably its greatest asset from the standpoint of ore, is the host of sill-like masses of quartz-feldspar porphyry which have been intruded into and consequently stiffened the sedimentary rocks, rendering them more favorable for deposition of ore minerals. In detail, the geologic structure is considerably more complex and given the combination of a lode, competent rocks and a favorable fold structure, the chances are good that ore will be found.

Following is a list of the known lodes crossing the Antoine group of claims:-

Surprise Lode

Produced (prior to 1923) about 50,000 tons at 38 oz./ton silver and 13% lead.

Antoine - Red Fox

Although the 3 Red Fox claims are not in the group, they contain the easterly extension of the Antoine lode. Production has already been given.

Ogema

Close to the Antoine vein, this lode has produced a few hundred tons of low grade mill feed.

Spokane

This lode has been observed by the writer in one location only. Its production is not known but was probably very small.

Tom Moore

Extensively developed, this lode seems to be low grade, having produced approximately 3,000 tons of ore.

Ryan

Only slightly developed, with an unknown but almost certainly small production.

Rambler

On the adjoining Rambler property this lode produced 208,000 tons of milling grade ore. Its westerly projection on Antoine ground has never been developed, consequently its potential is unknown.

Soho

From very limited workings this lode produced (prior to 1910) about 65 tons at 90 oz./ton silver, 40% lead and 12% zinc. An exploration proposal has been made, for this lode.

From the above it is clear that at least two lodes produced good mines (Surprise and Rambler), two have yielded significant production (Antoine and Tom Moore) and the remainder have barely gone beyond the prospect stage.

Between the Antoine and Surprise lodes, and almost completely surrounded by the Surprise No. 2 claim lies a claim known as the Ruby Silver, Lot 515. Two well-defined lodes outcrop on this claim and prior to 1905 were developed by several adits, to comparatively shallow depths. They yielded a small tonnage of very rich ore. The writer believes these lodes to have good potential for ore at depth, especially their westerly extensions through the porphyry belt. Unfortunately these extensions would run across two claims, the Maud 'E' and Blue Jay which, like the Ruby Silver claim are not owned by Antoine Silver Mines Ltd.

Mine Workings and Exploration

The main workings on the claim group are those on the Antoine and Tom Moore lodes. They consist of crosscuts and drifts, connected by raises

and shafts, aggregating some thousands of feet in length, and ranging from 6500 to 7050 feet in elevation. The present company's work has been confined to these mines and the most important piece of work done has been the extension of the Tom Moore 5 level crosscut, 1500 feet into the Antoine lode, with a connecting raise to the old upper Antoine levels. Most of the current production has come from two sub-levels driven off the raise and lying 80 and 190 feet respectively below old Antoine 5 level.

Much of the above development, although yielding ore production, has been in the nature of exploration to determine the location of the lode and possible ore trends. It has been augmented by limited diamond drilling on both lodes. That on the Antoine has been too limited in objective to yield meaningful results, while that on the Tom Moore outlined possibly 6500 tons of marginal grade ore beneath the bottom (No. 5) level. Considered separately, this body is not attractive but in conjunction with the Antoine lode, it has some value.

In the Surprise mine at the extreme south end and highest part of the claim group, there are several thousand feet of workings in eight levels, ranging from 6700 to 7500 feet elevation. These are not connected with the present Antoine-Tom Moore mine, having been driven by another company, from the southern slopes of Reco mountain.

With the purpose of ultimately investigating the potential of the whole property, the writer initiated in the summer of 1968, a surface mapping program which covered the southern half of the claim group from the camp up to the summit of Reco ridge. Much pertinent information was recorded and maps commenced but because of the Company's financial troubles, the work remains uncompleted. From one to two months office work will be required to produce results in usable form.

Roads

The present access and haul road to the camp leads 6.5 miles up the M McGuigan Creek draw from the main New Denver-Kaslo highway in the valley below. In this distance it is narrow and steep, containing about 20 hairpin bends and rising 3200 vertical feet. It is far from adequate as an ore-haulage road.

In anticipation of easier haulage and possibly using the Carnegie mill in Sandon for ore concentration, the Company built a new well-graded road around the northeast shoulder of Payne Mountain, connecting the Antoine road with the old Payne road, leading down to Sandon. This link, about two miles long, puts Sandon within nine miles of the Antoine Mine.

From the above information, it is obvious that the nine mile ore haul

route to the Carnegie mill would represent a tremendous saving in cost over the twenty mile route to the Red Deer Valley mill in Silverton.

Present Ore Situation

Broken Ore

This figure, estimated by W. C. Wingert (October 1968), is approximately 2400 tons. The writer estimates its grade to be similar to that of the ore recently milled (11 oz./ton silver, 2.9% lead and 2.6% zinc). Some 1600 tons of this ore is stockpiled near the bottom of the Antoine haul road while the remainder is either at the portal or underground.

Ore in Place

<u>Tom Moore Lode</u>			
<u>Tons</u>	<u>Silver (oz./T)</u>	<u>Lead (%)</u>	<u>Zinc (%)</u>
6500	8.0	2.5	12.0

Situated in the 100 foot interval beneath the present bottom level, this block requires additional development to be mineable. As part of a proposal involving underground ore storage and a simple up-grading plant (the so-called Ryan project), it is probable that the ore could be mined. It would, however, require concurrent production of a larger tonnage of higher grade ore from the Antoine lode.

Antoine Lode

(a) Above 6700 sublevel

<u>Tons</u>	<u>Silver (oz./T)</u>	<u>Lead (%)</u>	<u>Zinc (%)</u>
5000	20	7	7

(b) Below 6700 sublevel for 50 feet

<u>Tons</u>	<u>Silver (oz./T)</u>	<u>Lead (%)</u>	<u>Zinc (%)</u>
2500	20	7	7

These figures are based on recent experience of mining the ore shoot above the 6821 sublevel. There, with a stope width of 5 feet, ore shoot length of 300 feet and a volume factor of 11 cu. ft. per ton, some 6500 tons of ore was mined, heavily diluted with waste. Even within the length of the ore shoot, the mineralization is very lousy and may be found either above or below a 3.5 foot barren lamprophyre dike which accompanies the lode in this area. The importance of an efficient ore-waste separation at this point cannot be over-emphasized and the lack of it contributed to the low grade of production last year.

No doubt further ore will be found down to the main haulage level, 150 feet below but at present, there is no positive evidence on which to base any tonnage calculations.

In the past, ore reserve figures have been quoted for other lodes on the property but in the opinion of the writer they are unproved. He would classify some of these as prospects for exploration.

Exploration Possibilities

To the writer the most attractive feature of the Antoine property is its possibility for long range exploration, with a reasonable expectation of success. It is situated in a favourable belt of rocks, in which several productive lodes have already been mined, especially on the southern slope of Reco Mountain. The presence of good values in silver, lead and zinc is well demonstrated by production records, notwithstanding the comparatively poor grade of ore milled in 1968, the reasons for which have been explained earlier.

Given success in exploration, one could not logically expect an orebody larger than the largest found to date (the Surprise), i.e. 50,000 tons. The story of the discovery of this orebody illustrates that it too was a long range bet, prosecuted with courage and persistence. It ultimately paid off, although at times the picture must have looked bleak.

Slocan orebodies tend to be of relatively good grade but are small by ordinary standards. For this reason a daily production rate of 50 to 75 tons is usually adequate. The ruling consideration is not "cost per ton" but "cost per ounce of silver and per pound of lead and zinc". One simply cannot afford the expense and luxury of making a large tonnage producer out of a small orebody. The end result of this course is sloppy mining practice and unnecessary dilution of ore by waste rock.

Following is a list of the exploration possibilities:

Surprise

Already a large producer, this lode may well have mineable extensions near the old orebody. The authority for this statement is C. E. Cairnes in his Memoir No. 184 of the Geological Survey of Canada. Unfortunately, the lode is near the south boundary of Antoine holdings and at depth dips out of the property into ground held by Reco Silver Mines Ltd. Some of these extensions, consequently, may lie on the Summit Fractional claim, owned by that company.

Ruby Silver

Development has been so shallow in the favorable belt on the two attractive lodes on this claim that they still present good possibilities for exploration. Strictly speaking, the claim should not be mentioned here because of its separate ownership, but it could hardly be explored adequately, except through the surrounding Antoine property. The bottom level of the Antoine mine is already within several hundred feet of the claim boundary and might, if advanced, be expected to encounter the first of the two lodes within 800 feet, at a depth of 700 feet below the surface outcrop. Knowing that this level is now over 2000 feet from its portal, it is obvious that it forms the logical line of approach to the Ruby Silver lodes. The western extensions of these lodes run across the favourable belt on the adjoining Maude 'E' claim, which again is under different ownership. The Antoine company would be well advised to obtain control over both claims.

Antoine

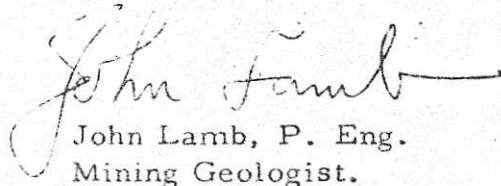
This lode is at present the most important in the group, partly because it is better known and partly because it has a fair production record. The ore shoot rakes sharply westward and presents an attractive target for exploration both above and below the main haulage level (elevation 6500).

Tom Moore

This lode is of secondary importance to the Antoine but does have limited possibilities at depth.

Spokane, Ryan, Rambler, Soho

The exploration possibilities of these lodes are at present almost unknown, but they all merit an examination to assess these possibilities. A separate report was issued by the writer in July, 1968, recommending a modest diamond drill program for the Soho lode; it has not yet been carried out.


John Lamb, P. Eng.
Mining Geologist.

1200
 near 2000 Re "Economic Feasibility of reactivating the mine."

Advise Kapp if I would be available to carry out geol. Note also that a study of all drill maps, drilling records, smelter returns etc. & perusal of report of geol. rubys. Advise Kapp on schedule for proceeding with a geological evaluation (not a feasibility study) and preparation of a report.

Acknowledge state of no charge for time spent on prelim aspects of the project, but that time spent required to be spent on studies of data maps that reports or other data that requires a significant amount of time in dissection and for interpretation would be chargeable.

Lamb & I refer to essentially the same mill, in that the same plant was referred to as the Carnegie mill prior to being rehabilitated and reconditioned & changed by Ham-Kalen under the

Notes on J. Lamb report:

May 1969

Feed 6671 tons @ Ag, 11.0 g/ton; Pb, 2.9%, Zn, 2.6%

yields 4450 tons @ Ag, 16.5 g/ton @ 70% — $16.5 \times 5.50 \times .70 = 63.52$
 Pb, 4.35% @ 67% — $87 \times .20 \times .67 = 11.66$
 Zn, 4.9% (incl) @ 40% — $98 \times .30 \times .45 = 13.23$

88.41

Estim mining cost @ \$40/ton — 1967-68 contract

net op. profit = 48.41

less 40% taxes = \$29.00/ton

after O.H. chgs — say \$25.00/ton

1967-68 net earnings — 4450 x 25 = \$111,250

Estim tonnage at this grade to break even or say \$300,000 pre-product expenditure on capex & develop.

$$= \frac{111,250}{4450} = \frac{300,000}{x} \quad ; \quad x = \frac{300,000 \times 4450}{111,250} = 11,900 \text{ say } 12,000 \text{ tons}$$

x = Estim. Tonnage = $\frac{300,000 \times 4450}{111,250} = 11,900 \text{ say } 12,000 \text{ tons}$

Allowing for extra haul, custom milling & royalties say 20,000 tons + taxes

Antoine Ore Reserves - J.L., 1967-68

Tom Moore Code

6500 Tons @ Ag. 8.0%

Pb, 2.5%

Zn, 12.0%

Antoine Code

7500 Tons @ Ag. 20.0%

Pb, 7%

Zn, 7%