

CONFIDENTIAL

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TYEE-LENORA
Victoria Mining Division

Some twenty-four Crown-granted mineral claims including three former producing mines - Tyee, Lenora and Richard III - were acquired in 1935 by Tyee Consolidated Mining Company.

The property is near Duncan, on the eastern side of Vancouver Island, readily accessible by road. Principally between 1903 and 1907, the three properties have produced ore as follows: Tyee, 166,000 tons containing about 26,000 oz. gold, 415,446 oz. silver, and 14,715,336 pounds copper, equivalent to average content of Gold 0.15 oz. per ton, silver 2.5 oz. per ton, copper 4.43%; Lenora, 80,000 tons, and Richard III about 4000 tons (Reference, Geological Survey, Canada, Memoir 13, page 187). The ore was shipped by aerial tramway and by wagon to the railway and thence to smelters at Ladysmith and Crofton Bay where it was smelted. After 1907, although attention was directed to the property from time to time, there was little activity until the last few years. Since 1935 underground workings have been made accessible, and some new exploration workings have been driven underground.

The ore mined came from bodies in a rather complex structure. Chalcopyrite and sphalerite are the principal ore minerals, galena, pyrite and pyrrhotite also occur; barite is an important constituent of the gangue. For direct smelting zinc was detrimental and high grade copper ore was desired. The north vein in the Tyee-Lenora workings, higher in zinc and lower in copper than the south vein, received less attention and zincy mineralization carrying some copper was left unmined.

Two reputable engineers in private practice, thoroughly familiar with the work done in recent years, have estimated available tonnage. The one, in 1937, placed the reserves at 34,000 tons averaging

Gold	0.10	oz. per ton
Silver	3	oz. per ton
Copper	1.7	per cent
Zinc	6.7	per cent.

Late in 1940, the other considered that the above figure for positive tonnage still stood, but thought that careful mapping of the workings then open and analysis of the information might indicate 50% more ore, and considered it likely that counting all parts of the mines from which ore would probably be won, a total of 100,000 tons or more might be reached. He accepted the earlier estimate of grade.

A special report by John S. Stevenson of the British Columbia Department of Mines (not published), based on a detailed study in the summer of 1941, gave his estimate of ore available in the north vein as 31,500 tons. The estimate of grade given above was used.

Other statements have been made about the property. A recent one gives ore reserves as 100,000 tons averaging,

Gold	0.15	oz. per ton
Silver	3	oz. per ton
Copper	2.0	per cent
Lead	1.0	per cent
Zinc	11.0	per cent.

Based on these figures for quantity and grade and an estimated recovery of 90 per cent of each metal, profits are shown. No evidence is presented in support of the estimate of quantity, grade or recovery.

There is galena in the ore but it is unlikely that the first three engineers mentioned would have disregarded a lead content amounting to 1 per cent.

Milling

Samples for mill tests have been sent to the Ore Testing Laboratory, Canada, Department of Mines, Ottawa, and to the Denver Equipment Company.

Calculated average feed analyses for the tests considered are as follows:

	<u>Ottawa</u>	<u>Denver</u>
Gold, oz. per ton	0.07	0.27
Silver, oz. per ton	2.16	7.74
Copper, %	1.48	2.39
Lead, %	1.21	1.39
Zinc, %	11.32	10.84.

Unfortunately neither lot is a close approximation of the figures given for the average grade, it is to be noted that both lots contain lead in excess of 1%. It is not possible to predict with assurance from tests made on these lots what recoveries would be made in concentrates and what the grade of concentrates would be when milling ore of the grade taken as mine average.

Both laboratories made a copper-lead concentrate, a zinc concentrate and a barite concentrate. The copper concentrates were lower in copper than would be expected if less lead were present. Zinc in the copper concentrates was high enough to be penalized so that the cost of smelting copper concentrates would be increased by the penalty. If lead is present in some quantity, it would be much more profitable if recovered in a lead concentrate and might yield no return if recovered in a copper concentrate. Recovery of zinc was generally good in concentrates of good grade, but some difference would be expected in milling ores much lower in zinc than was the material used in the test; a considerable part of the total gold, silver and copper were recovered in the zinc concentrates.

Based on the tests, results from milling mine average ore might be about as follows:

	<u>Feed</u>	<u>Copper Conc't</u>	<u>Assay</u>		<u>Recovery</u> <u>% of Metal in Feed</u>	
			<u>Zinc Conc't</u>		<u>Copper Conc't</u>	<u>Zinc Conc't</u>
Gold	0.10 oz/ton	0.84 oz/ton	0.3 oz/ton		60%	30%
Silver	3.0 oz/ton	32.0 oz/ton	4.5 oz/ton		75%	15%
Copper	1.7%	20%	2%		83%	12%
Zinc	6.7%	15%	55%		15%	82%

On these assumptions, and reasonably close approximations of smelter settlements and freight charges, at United States prices Gold \$35.00 per oz., Silver 35¢ per oz., Copper (export) 11.7¢ per lb., Zinc 8.25¢ per lb., United States duty on zinc 1.2¢ on 100% of zinc content of zinc concentrates, the yield per ton of ore milled would be

From $\frac{1}{14.2}$	ton copper concentrate	\$4.60
From $\frac{1}{10}$	ton zinc concentrate	<u>2.40</u>
	Total	\$7.00.

There might be a small additional return from lead but the quantity of lead per ton and the form in which it would be recovered are uncertain. Barite is an important constituent of the ore and could probably be recovered in a concentrate of grade which meets common specifications, but marketing it is uncertain. Lead and barite combined might yield up to \$1.00 per ton of ore milled.

Production and Operating Costs

Reasonably assured ore amounts to about 35,000 tons, and there are fair chances of developing a further 35,000 to 70,000 tons. A mill should be located near the mine, electric power could be obtained from Nanaimo-Duncan Utilities, involving construction of 5 miles or so of transmission line, or from diesel engines installed at the mine. Production could probably be started within 6 months. That period should be used to the full in exploration at the mine, and mill tests, as well as building a mill and preparing the mine for production.

If we assume that the mine yields 75,000 tons of ore and is provided with a mill of 75 tons daily capacity, capital costs would probably be from \$1.75 to \$2.00 per ton. Operating costs would probably be \$4.50 to \$5.00 per ton milled, including current development and the cost of trucking concentrates to the railway or tidewater.

On the foregoing estimates and assumptions, operating profit is small, and the possibility that ore would not amount to 75,000 tons, or that metal prices would decline during the life of the operation, are serious risks to the capital invested. If the ore position were made more certain by preliminary exploration, particularly if tonnage in excess of 75,000 were assured, and if settlement prices for copper and zinc were assumed at levels somewhat above those now prevailing, the venture would have a good chance of showing a final profit.

H. Sargent,
Mining Engineer.

Vancouver, B.C.,
June 26, 1942.