

600373

LEAD-ZINC DEPOSITS, BIG BEND MAP-AREA

An essay submitted in partial fulfillment
of the requirements of the course in
Third Year Geological Engineering at the
University of British Columbia.

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November 15, 1947

presentation $\frac{28}{35}$
Matter $\frac{18}{25}$

Eng.

$\frac{29}{40}$

75%

W.H.

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November 15, 1947

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Gentlemen:

In compliance with course requirements, I am submitting herewith my summer essay, entitled "Lead-Zinc Deposits, Big Bend Map-Area".

This report is of a descriptive nature and is based upon personal observations made during my summer employment with Raindor Gold Mines.

I am deeply indebted to Mr. J.E. Ridell, mining engineer, and Manager, Raindor Gold Mines, for his discussions and explanations of the geological features of the properties.

Yours truly,

W. Holyk

W. Holyk

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INTRODUCTION

Numerous mineral deposits containing values in lead and zinc are found in the Big Bend map area. This area is *On which sides 7* bounded by the Columbia River and the Canadian Pacific Railway between Revelstoke and **Beavermouth**. This report, of a general descriptive nature, is limited to the properties with which the writer became familiar while in the employ of the Rainor Gold Mines. These properties include the J & L and A & E group of mineral claims.

Deposits of low grade copper, gold, and silver also occur in this district. The topography of the area together with the former difficult transportation facilities have doubtlessly discouraged careful prospecting and the attraction of mining interests in the past. Consequently, there are no producing mines in this area today and only several properties have been actively developed. The recent completion of the Big Bend Highway and the increased demand for base metals have stimulated some interest in the mineral deposits. Several companies have undertaken development work and others have their prospectors in the field.

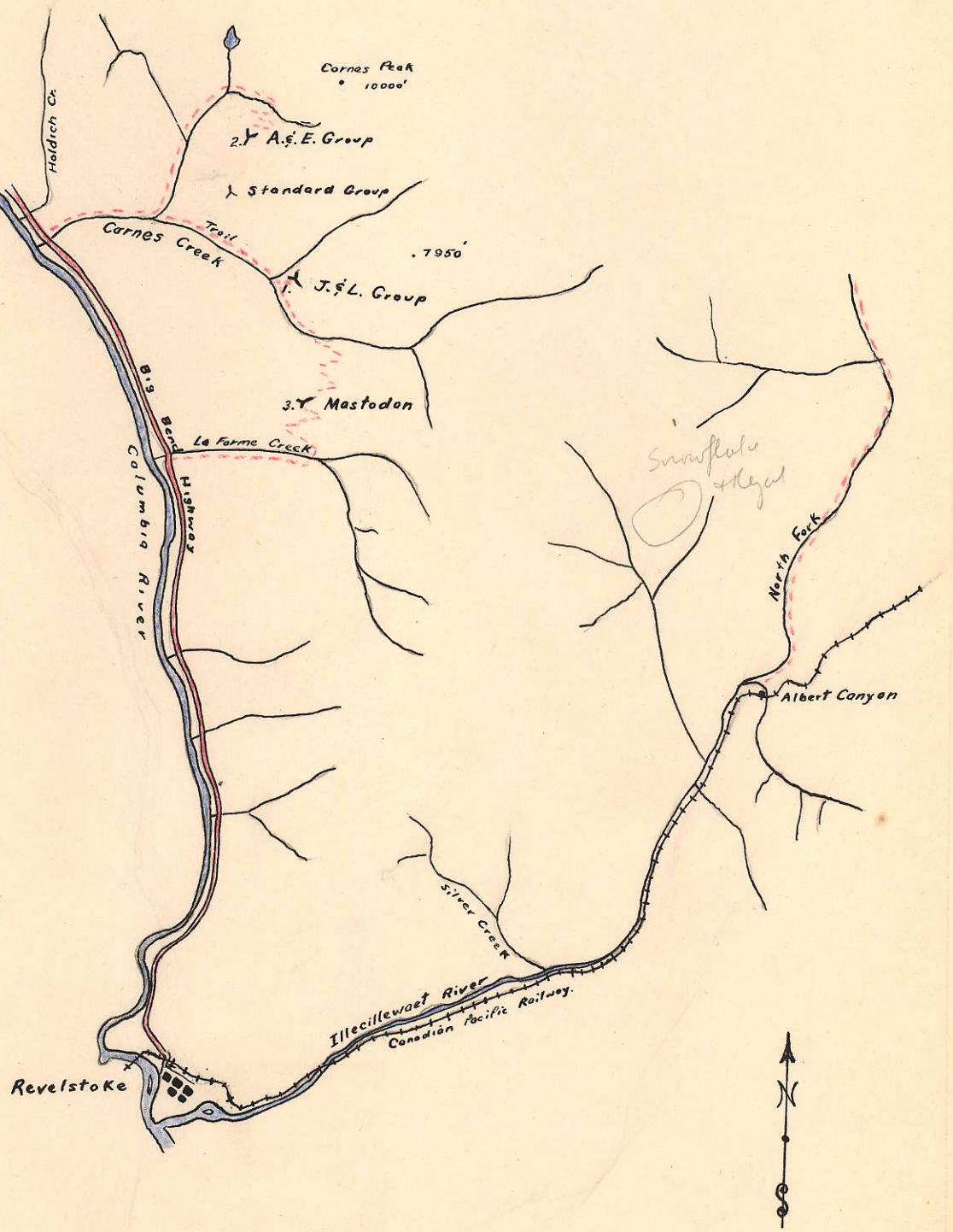
CHARACTER of the BIG BEND DISTRICT

The Big Bend district lies in the Selkirk Mountains. The entire area is exceptionally mountainous with many precipitous peaks and ridges which rise from 7000 to 10000 feet. The valley of the Columbia river is the largest in this district and possesses a very low gradient. Its elevation at Revelstoke is 1450 feet above sea level. The other principal valleys are those of the Carnes, Downie, and Goldstream creeks. They have been modified by valley glaciers and possess low gradients. Numerous hanging tributary valleys occur at the headwaters of these creeks. The mountains are covered locally with permanent ice glaciers and snow fields. Although numerous forest fires have destroyed vast tracts of forests, the mountainslopes are nevertheless heavily timbered. Balsam occurs in the upper reaches while hemlock and cedar predominate in the lower regions. The thick underbrush, ferns, devil's clubs, and alder slides make travelling very difficult away from trails. Most of the trails are now overgrown and are impossible to find in many cases. *weak count*

The Big Bend Highway, completed in 1940, follows the eastern side of the Columbia river and is in comparatively good condition for automobile traffic. This road, however, is open to traffic in the summer months only. During the winter of 1946-47 it was maintained open as far as Downie creek to permit logging operations. *kept*

The climate is mild with considerable rainfall in

Map Showing Portion of Big Bend Area



0 4 8
Scale 1 inch = 4 miles

the summer and extensive snowfalls in the winter. In the vicinity of the J & L property, the snow does not melt until late in May and usually begins to fall in October.

J & L GROUP

The J & L group of mineral claims lie between the east and south forks of Carnes creek and can be reached only by trail. The trail is eight miles long and starts at the highway alongside the mouth of Carnes creek. This group consists of seven crown granted claims extending along the outcrop. Two claims are on the northern side of the east fork and the remaining five extend across the shoulder in a southeastern direction.

This property had been originally staked in 1898. In 1924 the Porcupine Goldfields Development and Finance Company, Limited, held an option on this property and did a considerable amount of development work. All work had been abandoned in 1929 and improvements have fallen into disrepair since then.

In 1946 Raindor Gold Mines, Limited, obtained an option on the J & L group. This company, head office 184 Bay Street, Toronto, is controlled by the Quebec Gold Mining Corporation. This company staked additional claims in this vicinity and now holds a total of 61 claims and 17 fractional claims. The claims extend for approximately 12000 feet along

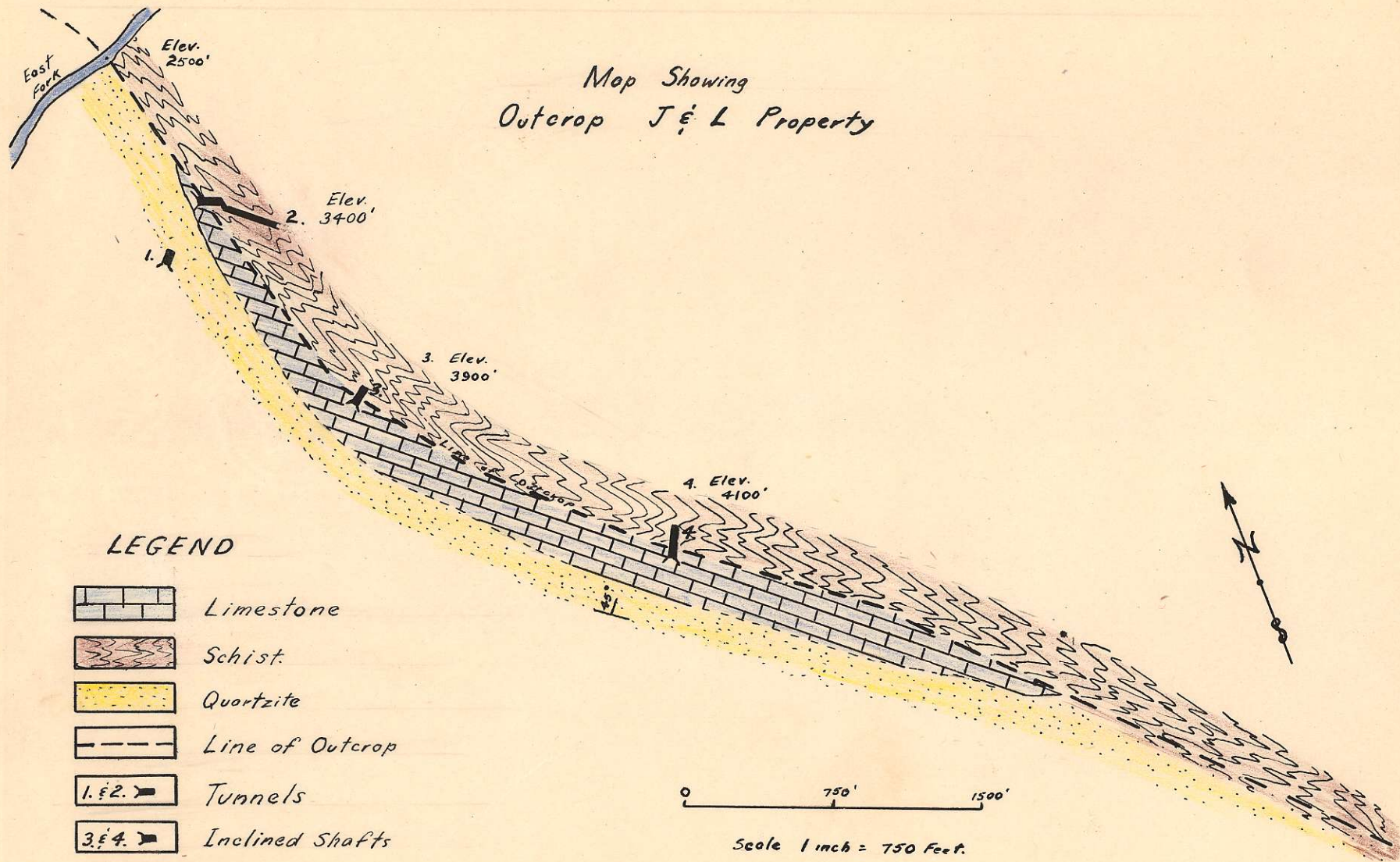
Carnes creek and nearly 10000 feet along the east fork. The crown granted claims form the nucleus of the present holdings.

Raindor Gold Mines started an extensive explorations program in the summer of 1946. The work was designed to investigate the continuity of the mineralized zone, to obtain accurate observations on the width of the vein, to observe the state of oxidation underground, and to obtain samples for assay values and mill tests.




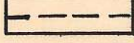
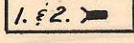
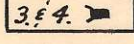
The relative positions of the various workings are indicated on the adjoining map(4a). Previous improvements consisted of two adits, two inclined shafts, and several surface cuts. The entrance to the lower adit, position No. 1 on map, was found to be caved in and could not be investigated. It is reported that this adit was driven for 200 feet at right angles to the sedimentation with the purpose of intersecting the vein underground but was abandoned before the vein was reached. A second adit, position No. 2, lies at an elevation of 3400 feet. This adit was driven along the schist-limestone contact and followed the vein for 200 feet. At an elevation of 3900 feet a shaft ~~was~~ sunk at an angle of 45^o and followed the vein for 125 feet. A similar shaft was sunk at an elevation of 4100 feet at the point where a 90 foot adit intersected the vein.

poor count.
The improvements accomplished during the summer were various. Twenty five men were employed throughout the summer. The trails leading from the highway were repaired and two bridges were built to span the east and south forks of Carnes creek. Presently the trail is in very good condition.

Map Showing
Outcrop J & L Property



LEGEND

-  Limestone
-  Schist
-  Quartzite
-  Line of Outcrop
-  Tunnels
-  Inclined Shafts

Scale 1 inch = 750 feet.

Note: The vein has been exposed by trenches at 100-foot intervals.

A suction fan, operated by a gasoline motor, provided the ventilation in the lower adit. A blacksmith shop and other facilities were installed to permit hand mining. The lower adit was driven ahead along the schist limestone contact for over 200 feet making the total length ~~th~~ more than 400 feet. Surface trenches were dug at 200-foot intervals along the supposed outcrop of the vein throughout a total distance of more than 10000 feet. Samples were obtained from every exposure of the footwall, vein, and hanging wall. All samples were assayed for their values in gold, silver, lead, and zinc.

GEOLOGY and MINERALIZATION

The J & L property lies in the northern part of the sedimentary series which crosses the Canadian Pacific Railway at Albert Canyon. This series contains most of the important mineral deposits of the Big Bend area. The rock in this area consists of Precambrian¹ sediments which strike northwest and dip about 45° to the east. The sediments are metamorphosed and are chiefly crystalline limestones, ^{what kind?} schists, and quartzites. There are no outcrops of intrusive rock in the immediate vicinity of the J & L. The nearest outcrop is the granite that is exposed at the north side of the north fork of Carnes creek in the vicinity of a small lake.

The mineralized zone consists of a bedded vein of

¹Gunning, H.C. "Geology and Mineral Deposits of Big Bend Map-Area, British Columbia; Geol. Surv., Canada, Sum. Rept. 1928, pp. 140a.

massive sulphides ~~occurring~~ at the upper schist-limestone contact. The schistosity of the hanging wall is parallel to the bedding. The limestone footwall, typical of most limestone beds in this area, is lenticular. It extends for approximately 5000 feet and at times is several hundred feet wide. The vein continues in quartzite schists upon leaving the limestone footwall. There are no visible faults or folds on this property although displacement may have occurred in the shear zone where the vein is found. Gouge is present here in many cases. The vein is a fissure type, high temperature deposit, and occurs in lenses and at times the sulphides have replaced the limestone footwall. The lenses of the sulphides vary from several inches to as much as 7 feet in thickness. Several crosscuts in the lower adit showed that there was little mineralization in the schist hanging wall. Considerable oxidation of the ore was encountered 400 feet inside the lower adit which is about 500 feet below the surface.

why?

How much?

Should this be under Geology & Mineralogy?

The two inclined shafts are driven to a depth of 125 feet and follow the lead. Both shafts follow the badly decomposed vein matter to a depth of about 40 feet whereupon stringers of the sulphides are recognized. These stringers vary in thickness up to 3 feet.

The vein had been traced by surface trenching and found to be continuous for more than 10000 feet. The lowest exposure occurs on the bed of the east fork of Carnes creek, at an elevation of 2500 feet. The vein continues in a south-eastern direction across the shoulder where the surface slopes

45° upward. At an elevation of 3900 feet the slope of the outcrop decreases until an elevation of 4200 feet is reached whereupon the vein continues more or less level until it disappears. In most cases the vein uncovered by surface trenching was found to be badly altered and decomposed by oxidation and the constituent minerals could not be recognized.

Grains of arsenopyrite, pyrite, and at times galena are visible in the solid sulphides. Microscopic examination of the ore was conducted at the University of British Columbia by A.C.Rae and N.Morton. The following excerpts are taken from their report.¹ "Minerals Identified

1. Pyrite
2. Arsenopyrite
3. Sphalerite
4. Galena
5. Chalcopyrite
6. Pyrrhotite
7. Chalcocite
8. Tetrahedrite
9. Anglesite
10. Covellite
11. Calcite
12. Quartz
13. Boulangerite ?

Under the microscope it was found that the ore was

¹ Metallurgical Investigations of J & L Ore, Mineral Dressing Dept., University of British Columbia.

an extremely fine intergrowth of the minerals identified above. No gold was seen in any of the specimens examined under magnifications up to 2000 diameters."

"The ore is complex¹ and consists principally of the sulphides of arsenic, zinc, lead, and iron, with smaller quantities of copper and antimony. The gold is chiefly associated with the arsenopyrite and pyrite and the silver with the galena."

The following analyses of the J & L ore have been made by different investigators:

	<u>Sample No. 1</u> ²	<u>Sample No. 2</u> ³
Gold	0.52 oz./ton	0.37 oz./ton
Silver	3.50 "	3.72 "
Zinc	4.57 %	10.4 %
Lead	6.0 %	4.93 %
Copper	0.15 %	0.57 %
Arsenic	11.9 %	11.3 %
Iron	21.8 %	22.6 %
Antimony	0.22 %	
Insol.	16.38 %	15.9 %

¹Godard, J.S.: Mines Branch, Dept. of Mines, Canada, "Investigations in Ore Dressing and Metallurgy", 1926, p.13.

²loc.cit.

³Rae, A.C. and Morton, N. "Metallurgical Investigations J & L Ore" Dept. of Mineral Dressing, University of British Columbia.

*what other
Pinds of trenches are there?*

Samples of the massive sulphides were taken out of every surface trench and at 10-foot intervals in the adit and shafts. The gold values were found to vary from 0.2 to 1.5 oz. per ton. Silver values averaged about 5 oz. per ton although assays of 40 oz. per ton were found. The gold values in the schist hanging walls ranged from nil to 0.3 oz. per ton for a distance of 2 feet from the vein contact. No gold values other than a trace occur in the limestone footwall adjacent to the vein. The gold values were found to decrease with depth. On the other hand the silver values were higher underground than in the surface outcrops.

Another mineralized zone was found about 500 feet stratigraphically below. This zone consists of disseminated arsenopyrite and pyrite in quartzite for a width of 25 feet. A 10-inch vein of solid pyrrhotite occurs at the contact of the quartzite and a formation of grey sediments. Another outcrop of this vein was discovered about a 1000 feet south and along the same horizon. Samples of this lead showed only a trace of gold and silver. The values encountered did not warrant further work on this vein.

Several small stringers of sulphides occur to the northeast of the main showings. These stringers carry gold and silver values but they have not been explored.

A & E Group

The A & E group of mineral claims are owned by Mr. A. Kitson of Revelstoke. This group lies about 3 miles to the north of the J & L group and south of the north fork of Carnes creek. The eight claims of this property extend over the steep slope overlooking the north fork and cross the ridge to the Salisbury basin. This property is reached by a trail which branches off from the J & L trail about 4 miles from the highway. The trail is 10 miles long and follows the north side of the north fork.

The rock in this area consists mostly of black argillaceous schists and crystalline limestones of Precambrian age. The sediments strike approximately 20° southeast and dip 45° to the east. Mineralization similar to that of the J & L is encountered on this property. The lowest exposure of the massive sulphide occurs at an elevation of 6000 feet. At 6100 feet a tunnel is driven into the crystalline limestone. The vein is encountered 70 feet from the portal on the contact of the limestone and the sericite schist. The adit follows the vein for 60 feet. The width of the vein varies from 10 inches to 3 feet. The vein is conspicuous along the contact on the steep bluffs south of the adit. It can be followed across the ridge, elevation 7200 feet. Several surface cuts expose the vein on the southern slope. A second zone of mineralization occurs on a similar contact some 200 feet stratigraphically below. The vein is also exposed on the northern bluff. An adit, elevation 6500 feet, follows the vein for 50 feet. The lead does not

exceed 1 foot in width and pinches out at the end of the adit.

Visible minerals in the solid sulphides include arsenopyrite, pyrite, sphalerite, galena, and pyrrhotite. The ore resembles that of the J & L group. The gold values are lower and ^{range} vary from a trace to 0.6 oz. per ton. Silver values are likewise very erratic and vary from a trace to 40 oz. per ton. Random samples assayed as follows:¹

what is the value of a random sample?

Gold	Silver	Lead	Zinc
Ozs.	Ozs.	%	%
trace	0.8	3.4	10.6
0.01	0.7	2.6	13.1
0.01	2.2	7.1	9.5
trace	0.3	.....	4.1
0.32	5.1	2.7	10.5
0.17	1.1	1.0	9.6
0.45	14.4	20.5	3.1
0.54	35.1	.....	.....
0.01	2.6	.....	30.6
0.01	0.8	.....	.....
0.02	1.2	.....	.....

The work done on this property consists mostly of assessment work. The surface cuts and outcrops indicate a good continuity of the vein. Representatives of different mining companies have examined the property but their interest has apparently waned. *Is this justified?*

¹ McBean, E.E., personal communication, cited in Gunning, H.C., "Geology and Mineral Deposits of Big Bend Map-Area, British Columbia", Geol. Surv., Canada, Summ. Rept., 1928, Part A, p. 173a.

FUTURE of the PROPERTIES

This is not indicated by the text.

The J & L property is obviously a deposit of good grade lead and zinc ore. *poor result* In addition to this the values in gold and silver are important. The vein has been traced for 10000 feet and it has an average width of 2 feet. The lateral continuity of the lead is a good indication of continuance in depth. *Why?* The known difference of elevation between surface outcrops is over 1500 feet. An estimate of 2,000,000 tons of ore would be conservative. The dip of the vein and the character of the schist hanging wall may present some difficulties in mining as extensive timbering would be required.

The heavy growth of timber on the property would be sufficient for mining needs. The east fork of Carnes creek could be utilized for electrical power purposes.

It is doubtful if the A & E group could be profitably mined by an individual company. The tonnage developed to date would hardly warrant the erection of a mill. This property should, however, prove of considerable interest to the company that attempts to mine the J & L property.

The total values of this ore cannot be economically extracted at present. Various tests have been made on the ore from the J & L by different laboratories and metallurgists. Investigations¹ by the Mines Branch, Department of Mines, Ottawa,

¹Godard, J.S.: Mines Branch, Dept. of Mines, Canada, "Investigations in Ore Dressing and Metallurgy", 1926, p.13.

showed that the extraction of the gold and silver by cyanidation was negligible.¹ In the raw state, this ore cannot be successfully treated by the cyanide process. In a test to separate the sulphides of lead, zinc, and arsenic, it was found that only a rough separation could be obtained by selective flotation. The following conclusion is quoted:

"The flotation of the sulphides was not satisfactory, poor recoveries and poor separations being made in each case. The ore is slightly oxidized and this interfered with the flotation."

It would be well to point out here that a considerable amount of the tonnage of ore available is oxidized. The vein matter in the main tunnel was found to be oxidized 400 feet from the portal which would be approximately 500 feet below the surface.

Further investigators have shown that better recoveries² are possible by roasting and leaching methods. The following excerpts are taken from the report of Mr. E. Benson.

"(1) The J & L ore is not amenable to flotation by ordinary sulphide treatment.

(2) 98 % of the arsenic can be removed by a reducing roast.

¹Godard, J.S.: Mines Branch, Dept. of Mines, Canada, "Investigations in Ore Dressing and Metallurgy", 1926, p.14.

²Rae, A.C., and Morton, N., "Metallurgical Investigations of the J & L Ore", Dept. of Mineral Dressing, University of British Columbia.

Benson, E., "Investigations of the J & L Ore", Dept. of Mineral Dressing, University of British Columbia.

(3) 98 % of the lead can be recovered by volatilizing as the chloride at 750° C. Lead chloride can be smelted by ordinary means.

(4) 89 % of the gold and 84% of the silver are readily volatilized as chlorides at 950° C.

(5) 68 % of the zinc can be extracted as zinc chloride by roasting at 750° C. in the presence of charcoal.

(6) Zinc chloride can be dissolved in water and zinc oxide can be precipitated by the addition of lime."

These investigators conclude that a successful separation of the values in the ore can be obtained with standard metallurgical processes. The cost of the separation was not calculated and it is doubtful whether such a separation would be economical. No commercial process for the economic treatment of this ore has as yet been devised.

The future of both these properties lie in further metallurgical advances. This property cannot be mined profitably unless full recoveries can be realized. The tonnage of ore warrants the erection of a mill capable of total recovery. Laboratory research on the ore obviously becomes of greater consequence than further field explorations of the properties to the eventual exploitation of this mineral deposit..

Isn't these statements contradictory?

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Benson, E., "Investigations of the J & L Ore", Dept. of Mineral Dressing, University of British Columbia.

In general, good well
organized & presented.

Perhaps a little more regarding
the geology.

You should have the data to support
your statements

1. "The deposit has been traced
for 10,000 feet" is not
supported by the description.

Res. A.C. and Morton, R., "Metalurgical Investigations of
the J & L Ore", Dept. of Mineral Dressing, University of
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