OWEN LAKE

CANADIAN EXPLORATION LIMITED

REPORT

on

OWEN LAKE MINING PROPERTIES

BRITISH COLUMBIA

By:

B. I. Nesbitt, B.A.Sc., M.Sc.,

Geologist,

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I INTRODUCTION

During the summer of 1941, the writer spent two months making a geological examination of the Owen Lake Mining Property while it was being re-opened after a twelve-year shut-down. This report is written from information obtained during this examination and from a report by A. H. Lang of the Geological Survey of Canada who, in 1929, did the general geology of the area and spent some time at the property. While the writer made as detailed a study in the field as was possible under existing conditions, no laboratory work has been done by him on the rocks of the area nor on the vein-forming material. This cannot, then, be considered a full geological report for such would necessarily entail both detailed field work and accompanying detailed microscopic and chemical study.

The geological work accomplished this season consists of the following:

1. A study of the vein material found on the dump of the Earl Cross-cut adit with a view to finding in what minerals or groups of minerals gold and silver values are highest. This included having assays made of the various types of mineralized vein matter found there, assays of separate minerals segregated from such material, and the testing of 80-pound samples of the different types of possible ore by the Sampling Plant of the Department of Mines of B. C.

2. A somewhat similar study of vein material of the Cole dump.

3. A diamond-drilling program to extend the known length of the main Cole vein and to determine any changes in values or in

the type of mineralization at a depth of approximately 50 feet.

4. Systematic sampling of the main Cole vein, of the main Wrinch vein, and of the Portal veins of the Earl adit.

5. Detailed mapping of an area on the Cole group of Claims.

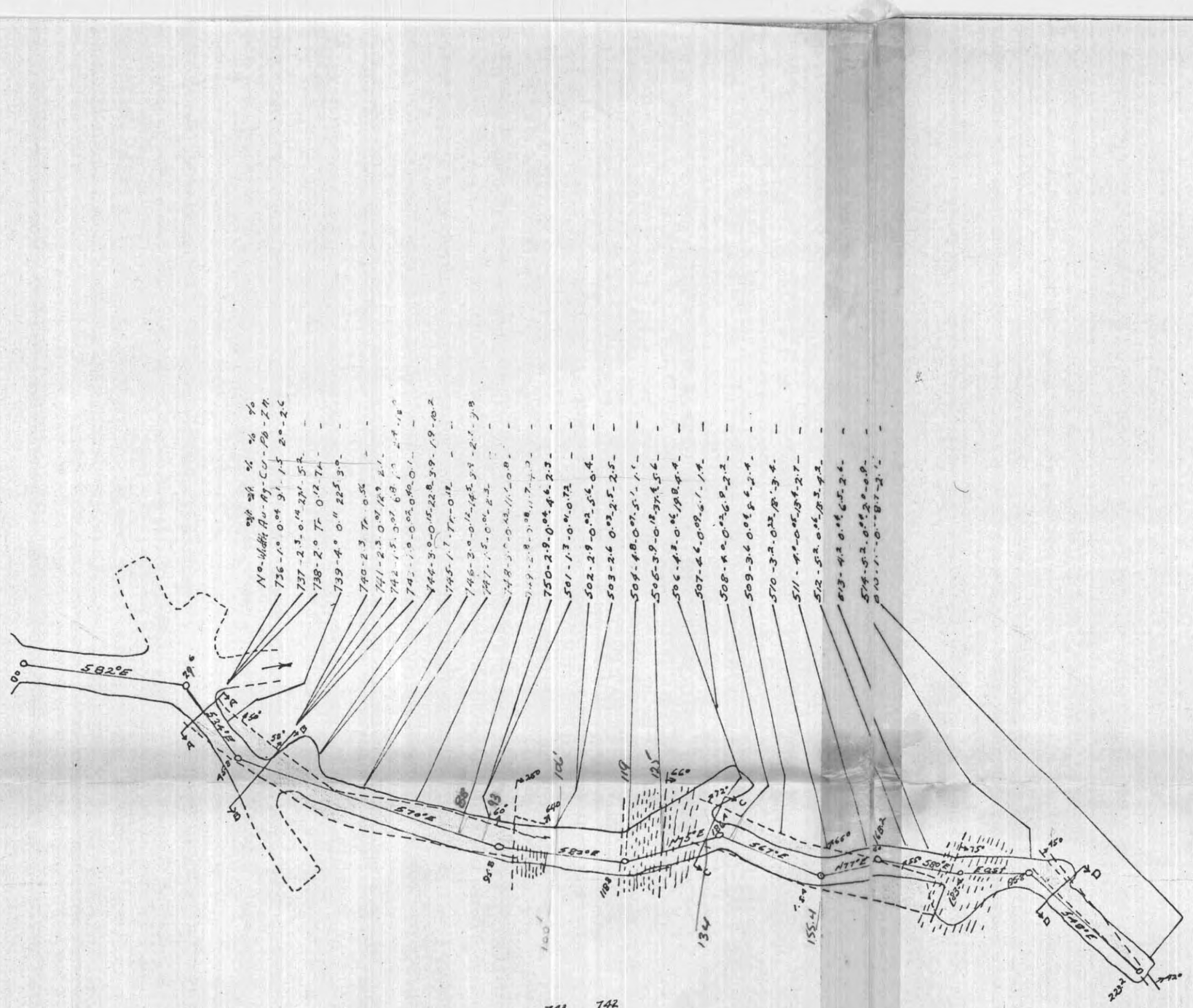
6. Detailed mapping of the first 850 feet of the Earl adit and of the veins from it.

7. Checking the boundaries of the microdiorite stock.

II REGIONAL GEOLOGY

The geological formations of the Owen Lake area were mapped by A. H. Lang in 1929 for the Geological Survey of Canada (Summary Report 1930, Part C). In 1938 and 1939 he mapped the surrounding area and published his report, the Houston Area, in 1941.

The Owen Lake area is some 30 miles east of the Coast Range batholith. The predominant rock-types found there are andesite porphyrites and associated tuffs and breccias of the Volcanic series. Overlying this series is a group of upper Cretaceous or later argillites and greywackes. Biotite granite cuts these sediments on Mount Nadina, and a microdiorite stock cuts the Volcanic series at the Owen Lake property. The relation of this stock to the Cretaceous sediments and the granite stocks is not known. The youngest rocks of the area are horizontal flows of tertiary basalt which unconformably overlie the Volcanic series.



accompanying Neabelle Report on Owen Lake.

CANADIAN EXPLORATION LI

WRINCH TUNNE

OWEN LAKE MI

HOUSTON, B.C.

Examined.- Oct/41. — B.J.

Scale- 20ft=1 in.

Nov 27 3

FORMATIONS

Period	Types	Thickness
Recent	Alluvium	
Pleistocene	Morainal and fluvioglacial debris	
Tertiary	Volcanics - vesicular and amygdaloidal basalt.	600'
	Hornblended granite stock.	
Probably Post-Cretaceous	Microdiorite stock.	
Upper Cretaceous	Indurated argillite and greywacke, conglomerate, carbonaceous material.	5,000'
Jurassic	Volcanic: andesite porphyrite, associated tuff and breccia.	8,000'

The Volcanic Series:

The Volcanic Series underlies 75% of the Owen Lake map-area. It includes an upper member consisting chiefly of andesite porphyrite, a middle member of andesite porphyrite breccia, and a lower member of light-coloured, fine-grained tuffs. The series trends northwest-southeast with a dip of 15 to 20° to the southwest.

Upper Cretaceous (?) Sedimentary Series:

Remmants of these rocks are confined to Mount Nadina. There they are cut by the biotite granite which forms the core of that mountain. They include a lower part containing argillite, greywacke, thin quartzite, and conglomerate, and an upper part consisting of massive, fine-grained, tuffaceous greywacke.

Post Cretaceous Intrusives:

Microdiorite Stock:- The most important mineral deposits

of the area are associated with this stock. It is poorly exposed but is apparently a single stock with some apophyses and numerous inclusions of Volcanic rocks.

The microdiorite is a fine-grained, massive, dark greenish-black rock. It weathers rusty-brown or dark grey. Microscopic examination by Lang reveals that it is composed of abundant lath-shaped phenocrysts of plagioclase feldspar averaging 1 to 2 mm. in length, in a groundmass of fine-grained anhedral plagioclase, some interstitial quartz, a small amount of hornblende and biotite. Pyrite is abundant. It is due to propylitization of femics. The plagioclase varies in composition between labradorite and andesine.

Granite Stocks:- Granite stocks are found on Mt. Nadina, on Tsalit Mountain, and near the junction of Owen Creek and the Morice River. The rock, a normal biotite-granite, is rather fine-grained, slightly porphyritic, and light pinkish grey in colour. The principal constituent is orthoclase, which often occurs as phenocrysts.

The stock on Mt. Nadina intrudes upper Cretaceous sediments and so has been classified as early Tertiary. No direct evidence has been found concerning the relative ages of the granite and the microdiorite stock, but it is possible that the soda trachyte dykes which cut the microdiorite were derived from the granite. For this reason, Lang suggests that the granite is slightly younger than the microdiorite, but that they are of the same period of intrustion.

Tertiary Basalt:- Horizontal flows of amygdaloidal and vesicular basalts overlie the Volcanic series.

Dyke Rocks:- Three groups of dykes are described by Lang:

1. Diabase porphyry dykes which cut the microdiorite. They are believed to be differentiates of the magma from which the microdiorite was formed.

2. Diaschistic dykes of granite and diorite associated with the granite stocks, and post-mineral soda trachyte dykes intruding the microdiorite and neighbouring andesite and possibly related to the granite.

3. A single large, fresh, fine-grained diabase dyke which intrudes the microdiorite and neighbouring andesite and is possibly genetically associated with the Tertiary basalt.

III GEOLOGY OF THE OWEN LAKE PROPERTY

1. General Discussion:

Although a heavy mantle of overburden covers much of this property, enough outcrops are present to indicate that it is chiefly underlain by a stock of microdiorite which intrudes and contains inclusions of andesite-porphyrites of the Volcanic series. This stock is elliptical in shape, with a north-south axis of 1¼ miles and an east-west axis of 1¾ miles. As can be seen from the accompanying map, almost three-quarters of this stock is on the company's property. A few outcrops of tuffs, breccias and flows of the Volcanic series are present and also dykes of diabase and of soda trachyte.

The vein-systems examined occupy shear-zones in the microdiorite and andesite. There are two major directions of

pre-mineral shearing; east-west and northwest-southeast. Dips vary from 30 to 70 degrees and are generally to the north. The veins have been cut by post-mineral spda trachyte dykes and displaced by strong faults. Examination of the Earl adit and the drift on the main vein in Wrinch Canyon reveals two major directions of post-mineral faulting, north 20 degrees west and north fifty degrees east. Generally in the former type the east side of the break has moved to the north and in the latter the south side has moved to the east. The few striations found on slickensides indicate that generally the horizontal movement has been less than the vertical. The order of events has been: formation of the veins, then intrusion of the soda trachyte dykes, and finally faulting.

There are four known groups of veins on the property: those encountered in the first 600 feet of the Earl cross-cut adit, known as the Portal Veins; the veins found in Wrinch Canyon, which are reported to be cut by the Earl adit and which apparently include the McKay Vein; the Cole Veins; and the midnight Vein. All of these were examined in 1941 except the Midnight Vein, and the Wrinch veins where cut (probably) by the Earl adit. The latter were not accessible because of the condition of the adit beyond 850 feet from the portal.

Two types of veins are found on the Owen Lake property; chalcopyrite-sphalerite veins, which generally carry good values in gold, silver and copper; and galena-sphalerite veins which offer little promise of containing ore-bodies where that type of mineralization is found. Evidence found this summer, however, suggests that the galena-sphalerite veins grade into the chalcopyrite-sphalerite type either along the strike or vertically.

The veins do not fill true-fissures but rather sheared zones and hence contain in many places appreciable amounts of

country-rock. The gangue material in both types consists of rhodocrosite, ankeritic carbonates, barite, chalcedonic and crystalline quartz, and varying amounts of included country-rock. The walls are generally free, somewhat sheared, and rich in secondary pyrite which carries very low values in gold and silver. The veins, which vary in width from mere stringers to nine feet, usually have sharp walls but are not as wide as the sheared zones they occupy. They show very marked banding and contain many vuggy cavities in which are present crystals of quartz, barite and some sulphides. Also noted in vein material from the Earl adit is a black pitch-like hydrocarbon. In some places this has been shattered and then veined by quartz. One specimen exhibits a perfect sphere of the hydro-carbon within a quartz crystal-lined vuggy cavity. Concentric deposition of colloidal appearance is very common.

The visible sulphides contained in the chalcopyrite-sphalerite veins include chalcopyrite, sphalerite, pyrite and tetrahedrite. In addition to these, Lang reports that alaskaite (Pbs. Ag_2S. Bi_2S_3) was identified under the microscope. The presence of arsenopyrite also is suggested by a chemical analysis by the British Columbia Department of Mines which shows 0.3% arsenic.

Assays of samples from these veins reveal that moderate to high gold and silver values occur only where copper is present but that they do not vary directly with the copper content of the veins. That is, gold and silver values are occasionally high where the copper content is low, and low where the copper content is high. It is probable, then, that the tetrahedrite and alaskaite, rather than the chalcopyrite, control the precious metals. Laboratory work would be necessary to determine the distribution definitely. Assays of hand-picked sphalerite and of chalcopyrite containing tetrahedrite

and probably alaskaite reveal that both the sphalerite and the chalcopyrite contain high values in gold and silver. It is evident that since these samples were hand-picked in the field and hence are not pure, the gold and silver are possibly not in the sphalerite and chalcopyrite themselves but in small amounts of other minerals contained in them.

The sphalerite-galena veins contain sphalerite, pyrite and galena in a gangue of rhodochrosite, barite, ankeritic carbonates, and chalcedonic and crystalline quartz. Assays reveal their gold and silver content to be very low. There are indications, however, that the galena-sphalerite type of mineralization may give way to the chalcopyrite-sphalerite type if these veins are followed far enough either vertically or horizontally. These indications were found in examining the Portal veins and the main Wrinch vein.

The wall-rock alteration is of a type known as propylitization. Such alteration is typical of epithermal (low temperature and pressure) mineralization. It causes the formation of much chlorite, carbonates, and wall-rock pyrite from the ferromagnesian minerals of the original rock.

The following points suggest that this is an epithermal base-metal deposit, as defined in Lindgren's Classification:-

1. Crustification, vugs, chalcedonic quartz, and colloidal deposition are all typical characteristics of low temperature and pressure hydrothermal mineralization.

2. The sulphide and gangue minerals of this deposit are typical of epithermal base-metal deposits in other parts of the world.

3. The wall-rock alteration, propylitization, is typical of epithermal hydrothermal deposits.

4. During this season the writer found a heretofore unreported hydro-carbon occuring as a vein-forming mineral. The temperature of deposition of the vein material must necessarily have been below the distillation temperature of the hydrocarbon. if they are of same age.

5. There are no minerals present which are formed only at high temperatures and pressures.

Epithermal base-metal type deposits must not be confused with other epithermal types such as mercury which seldom have a depth of more than 500 feet and are relatively small. Epithermal base-metal deposits have been mined to a depth of over 3,000 feet and for as much as 8,000 feet laterally. One vein in the Owen Lake deposit has an indicated but not explored length of at least 1,500 feet and backs of at least 500 feet with no limits yet established.

Lang suggests that the source of the hydrothermal solutions from which this deposit was formed is the microdiorite stock in and around which the veins are apparently localized. The writer believes that it is improbable that a low temperature vein could be formed in the hood of the magna from which it originated. Such an origin would require too long a time-interval between consolidation of the magma and extrusion of the end-product of its differentiation, the hydrothermal metal-bearing solutions. The writer suggests that the apparent localization of the veins around and within this stock was caused by the physical characteristics of the microdiorite rock which enabled it to fracture under stress more readily than the Volcanic series and to maintain passage-ways for the ore-bearing solutions.

2. The Earl Adit Veins:

These veins were discovered by a cross-cut adit and explored to the east of the adit by drifting. Work done during the summer of 1941 includes a study of the dump, and sampling and detailed geological mapping of the five drifts and 850 feet of cross-cut adit accessible at the time of examination.

Four types of possible ore were found on the dump:

1. Massive sphalerite with little galena or chalcopyrite.
2. Heavy specimens showing concentric banding and vugs and containing few sulphides.
3. Well-mineralized chalcopyrite-sphalerite vein material with small amounts of galena and tetrahedrite. The gangue varies from predominantly rhodochrosite to highly siliceous.
4. Wall-rock containing much fine-grained pyrite and which weathers to a peculiar yellow.

Assay results from these are:

Sample	Au	Ag%	Cu%	Pb%	Zn%	Description
1.	0.04	3.2		2.0	8.2	Massive sphalerite.
1.	Tr.	10.1		8.3	9.0	" " with galena.
2.	0.02	2.3	Tr.	1.1	5.2	Heavy non-metallic.
3.	0.28	156.6	8.7	0.7	3.3	Cobbed chalcopyrite-sphalerite type.
	0.40	34.5	017	1.0	35.7	Sphalerite from 3.
	0.52	106.5	17.3			Copper minerals from 3.
4.	0.03	0.28				Pyritized wall-rock.

In addition to these assays, two 80-pound samples were sent to the Government Sampling Plant at Prince Rupert for fuller

examination. One was of the massive sphalerite and the other of the chalcopyrite-sphalerite type. These samples represent vein material cobbed for shipping. The analyses given by the Sampling Plant are:

Sample	Au	Ag	Cu%	Pb%	Zn%	As%	Sb%	Fe%	SiO_2%	S%
Massive sphalerite	0.03	3.0	0.1	1.1	8.6	.02	Nil	13.7	11.6	8.0
Chalcopyrite-sphalerite	0.2	93.0	7.8	0.6	1.5	0.3	0.3	13.4	47.6	11.3

It is evident that the only material which may make ore is the chalcopyrite-sphalerite type. From it could be made a concentrate comparable in values to the assays of the segregated chalcopyrite and sphalerite.

The five veins examined have been designated as the Portal veins by Lang and classified by him, but not by the writer, as being all of the chalcopyrite-sphalerite type. They occupy east-west shear-zones in highly propylitized microdiorite, with dips varying from 30 to 70 degrees. Veins #1, #2, #3 and #4 dip to the north and #5 dips to the south. They vary in width from two inches to five and a half feet.

Vein #1 occupies a shear-zone 125 feet from the portal. It has been drifted on east of the adit and a short distance west. At 40 feet east of the adit a slightly narrower but highly cupriferous vein branches off from the south side of the main vein and continues parallel to it for another 40 feet. There it is terminated by a very strong fault. The main vein has a length of about 60 feet east of the adit and then becomes involved in a complex system of faults and finally is displaced by the same strong fault as is its branch vein. These two veins are of the chalcopyrite sphalerite type and contain

in many places high values in gold, silver and copper. The western limit of the main vein has not been reached. The dips vary from 30° to 35° to the north.

Vein Number 1 and Side-Vein

Au	Ag	Cu	Width	
0.02	4.5	0.3	3.9	Channel Sample of main vein.
0.09	18.0	1.1	3.1	" " " "
0.02	3.9	0.3	4.0	" " " "
0.12	23.5	2.3	3.7	" " " "
.01	8.0	0.4	2.4	" " " "
0.12	41.3	4.9	1.6	" " of faulted segment.
0.37	103.8	7.5	1.2	" # " "
.28	150.4	8.7	0.65	" " " "
.11	23.4	2.3	0.80	" " " "
0.27	76.8	8.1		Segregated copper minerals from faulted segments.
0.49	168.6	13.6		" " " " main and side-veins.
0.11	10.1	0.3		" sphalerite " " " "
0.12	32.4	2.4	3.2	Channel sample of side vein.
0.14	42.2	3.1	3.4	" " " "
.02	11.1	0.4	3.0	" " " "

Vein #2 crosses the adit 210 feet from the portal. Apparently it is cut by the northern branch of #1 drift near the adit, then is faulted slightly and continues in drift #2. Its dip and strike are the same as vein #1. The writer believes that it is the faulted continuation of the side-vein from #1 and that vein #3 is the faulted continuation of the main #1 vein. A diagramatic sketch accompanies this report which illustrates the manner in which these veins are considered to have been formed from an original single vein which

split into two and then rejoined to form a single vein five feet wide.

Vein #2 has a limited length of 130 feet shown in drift #2, plus 35 feet of supposed faulted continuation in drift #3. Both ends are displaced by very strong faults and several minor faults also. It is intruded, but not seriously displaced, by two dykes and irregular shaped masses of soda trachyte.

Where exposed in drift #1, vein #2 contains considerable chalcopyrite, but the first 75 feet of drift #2 show the galena-sphalerite type of mineralization and carry negligible values in gold and silver. The last 40 feet of the drift, however, show appreciable amounts of chalcopyrite and fair values in gold and silver over as much as five feet. A fault displaces the vein where it breaks into drift #3. The displaced portion in drift #3 shows strong chalcopyrite mineralization over a width of 5 feet for a distance of 35 feet. Then it is cut by a soda-trachyte dyke and strongly faulted. Much exploratory work in drifts #3 and #4 failed to pick this vein up again.

Vein #2

Au	Ag	Cu	Width	Description	
0.08	15.7	1.0	2.3	Channel sample of portion in drift	#1
0.05	3.2	Tr	1.2	"	#1
0.04	0.62	Tr	1.9	"	#2
0.04	1.1	Tr	2.5	"	#2
0.05	1.4	None	2.0	"	#2
0.01	1.3	Tr	2.8	"	#2
0.02	1.1	None	4.6	"	#2
0.02	1.9	None	3.0	"	#2
0.01	0.44	Tr	1.2	"	#2
0.02	3.6	Tr	3.0	"	#2
0.01	0.62	0.3	3.0	"	#2
0.03	4.8	1.1	4.5	#	#2
0.03	4.4	2.0	1.5	"	#2
0.04	3.5	0.3	5.0	"	#2
0.29	25.4	4.0	5.2	"	#2
0.11	17.9	3.5	5.0	"	#3
0.01	4.2	0.9	4.5	#	#3
0.54	13.4	12.9		Segregated copper minerals from portion in drift #3.	

From these assays it can be seen that the galena-sphalerite type of mineralization carries very low gold and silver values and that even fairly high copper content is not necessarily accompanied by high gold and silver values. It is also evident that the mineralization of a vein may change along the strike from galena-sphalerite to chalcopyrite-sphalerite.

Vein #3 crosses the main adit 210 feet from the portal. It is faulted out after being traced 50 feet east of the adit. It probably extends 80 feet to the west of the adit where it should be displaced by the strong fault which cuts the veins in drift #1. This vein averages slightly over one foot in width and dips 65° to the north. It is of the chalcopyrite-sphalerite type.

For 25 feet after this vein is faulted out there is no vein in #2 drift. Then the strong 5' wide faulted continuation of vein #2 is encountered. In the pressure face?

Vein #3

Au	Ag	Cu	Width		
0.08	9.6	1.8	1.4'	Chalcopyrite-sphalerite vein.	Channel sample.
0.04	5.7	0.8	1.3'	"	"
0.08	5.8	2.4	1.4	"	"
0.06	9.0	0.2	0.9	"	"
0.04	6.7	0.4	0.3	"	"

Vein #4 is narrow and sparsely mineralized with a little chalcopyrite, sphalerite and galena. It crosses the adit 380 feet from the portal and is exposed in drift 4 for 40 feet east of the adit to where it is faulted out. It dips 70° to the north.

Vein #5 is 420 feet from the portal and has been drifted on for 25 feet to the east of the adit. It averages 1-2 inches in width and contains chalcopyrite and sphalerite.

Au	Ag	Cu	Pb	Zn	Width	
0.01	0.56	0.1			1'	Vein #4. Channel sample.
Tr	0.30	None			1'	" #4 "
0.01	1.2	Tr			1'	" #4 "
Tr	0.12	None			5'	Pyritized microdiorite.
0.01	5.1	o.1	None	23.5	1-2"	Vein #5. Channel sample

The veins in drifts 1, 2 and 3 are the only ones of the Portal Veins which offer reasonable possibilities of containing ore. Of these, vein #1 is the only one of which the total length is not fairly definitely established and it cannot be drifted on for very far west of the adit before breaking through to the surface.

The variation from galena-sphalerite to chalcopyrite-sphalerite type of mineralization is a very important phenomenon, for it gives to galena-sphalerite veins in other parts of the property a much stronger possibility of containing ore. There is a strong suggestion in the character of the veins and in the distribution of the copper minerals that the veins were originally of the galena-sphalerite type and later certain zones in them received the chalcopyrite-sphalerite mineralization with accompanying values in gold and silver.

Nov. 25/55

3. Wrinch Canyon Veins:

Four veins are exposed in Wrinch Canyon. The lower three extend to the west of the canyon and the upper one to the east. It is

thought that a fault lies in and parallel to Wrinch Canyon and that the upper vein is the displaced continuation of the one below it. The veins strike northwest-southeast and no continuations of the lower three have been found on the southeast side of the canyon. They have been traced by drifts and by open-cuts.

The lower two are of the galena-sphalerite type and the results of exploration of them by other companies have proven disappointing. The upper two are of the chalcopyrite-sphalerite type and, as mentioned before, are thought to be parts of the same vein displaced about 90 feet horizontally. Because of the condition of the drifts and cuts on the other veins, the only work which could be done on these veins this summer was systematic sampling and mapping of the 220 feet of drift on the upper vein.

The lower chalcopyrite-sphalerite vein has been drifted on for 120 feet and traced on the surface with open-cuts for 400 feet. The upper one is known as the main Wrinch Canyon vein. It is followed 220 feet by a drift and is thought to have been cut by the Earl adit at 2600 feet from the Earl portal.

The vein occupies a shear in an andesite porphyrite inclusion in the microdiorite. It strikes northwest-southeast and dips from 45 degrees to 70 degrees north. It has an average width of between 3 and 4 feet and in one place is 9 feet wide. Steep, northerly dipping faults and shears which trend N 50° E displace the vein moderately but it is easily followed for the 220 feet so far opened up. Towards the face of the drift a fault which is very nearly parallel to the vein begins to cut it off, with the result that at the face the remaining portion of the vein is only one foot wide. The fault has a slightly flatter dip than the vein, so it is evident that the vein's full width should be restored at depth.

For assays of this vein see the assay-plan.

It is thought that the Mackay vein is the continuation of this vein and that it is cut by the Earl adit. If these assumptions are correct, the vein has an established but unexplored length of over 1,500 feet and backs of over 500 feet. Of this length, 400 feet are west of Wrinch Canyon. Projection of the Wrinch Canyon and Mackay portions of this vein, with due allowances for dip and difference in elevation, shows that the vein has not been disturbed by faults of large lateral displacement over the length east of the canyon. The projections check almost exactly with the stated intersection in the Earl adit. This vein is by far the most promising on the property. It averages between 3 and 4 feet wide in the Wrinch drift, is said to be 3 feet wide in the Earl adit, and is 2½ feet wide at the Mackay out-crop.

4. <u>The Cole Veins:</u>

Several veins of the galena-sphalerite type have been found on the Cole property. On the strongest of these an 80 foot shaft has been sunk and 123 feet of drifting done. Stripping has exposed this vein for 400 feet. Development work on the other veins consists of stripping and a few shallow pits.

Examination of these veins during 1941 included detailed surface mapping of the area about the veins, a study of material on the shaft dump, systematic sampling of the main vein, test-sampling of the more promising of the remainder, and 663' of diamond-drilling.

The main vein occupies a northwesterly trending, steeply dipping shear in a light gray-green porphyry very close to the contact between microdiorite and the porphyry. It is of very strong

appearance, with an average width of over 3 feet and a proven length of over 400 feet. It is made up of bands of mineralized vein-matter and pyritized country-rock. In some places the latter makes up 50% of the vein. This vein, as do all others on the property, weathers to a residual mass of iron and manganese oxides. The very black stain of the manganese oxides is so plentiful that it is a decided aid in prospecting. The rhodochrosite from which they form, however, weathers very easily and it is necessary to sink several feet on an outcrop before fresh, representative vein-matter can be found.

The sulphides present, in order of abundance, are galena, sphalerite, pyrite, and, rarely minor amounts, of chalcopyrite and tetrahedrite. The gangue minerals are rhodochrosite, ankeritic carbonates, barite, and crystalline and chalcedonic quartz. Vuggy cavities, comb-structure and concentric deposition of colloidal appearance are characteristic.

Examination of material on the shaft dump reveals the presence of other types of mineralization:

1. Grey quartz gangue containing much pyrite, chalcopyrite, and some tetrahedrite, galena and sphalerite. The pyrite in this sample is vein-pyrite, not the wall-rock type.

Au	Ag	Cu	Pb	Zn
0.16	14.5	5.3	None	1.9

2. Quartz and rhodochrosite containing much sphalerite and galena and considerable pyrite and chalcopyrite and a little tetrahedrite. This type contains a very nice mixture of sulphides.

Au	Ag	Cu	Pb	Zn
0.15	13.7	1.5	5.8	9.8

3. Bands of coarse cube-pyrite in the wall-rock. This material is easily recognized as wall-rock pyrite by the lack of hydrothermal gangue-minerals.

Au	Ag
0.05	1.5

4. Bands of vein material, probably gash veins, which lie in the wall-rock close to the main vein. These veinlets are ½ to 1½ inches wide and contain pyrite and chalcopyrite with lesser amounts of sphalerite, galena and tetrahedrite in a gangue of quartz and some rhodochrosite.

Au	Ag	Cu	Pb	Zn
0.09	4.3	1.8	None	1.1

5. This is a specimen of cobbed "ore" from the galena-sphalerite main vein at depth. It is very rich in galena and contains minor amounts of chalcopyrite and sphalerite. The gangue is composed of rhodochrosite, quartz and barite and the vein is identical in every way at a depth of 75 feet and at a foot or two from the surface.

Au	Ag	Cu	Pb	Zn
0.02	3.8	Tr	17.2	2.9

6. Similar to 5 but this type is rich in sphalerite and poor in galena.

Au	Ag	Cu	Pb	Zn
Tr	1.4		None	9.5

Examination of the assay-plan of the surface sampling and of the diamond-drill cores reveals that the assays of the dump material are the only ones that are near commercial grade. A study of them indicates that appreciable values in gold and silver ~~and~~ are present only where copper is present too. Sample 2 appears to have

come from the main vein and so it is probable that there are some "shoots" of copper bearing mineralization at a depth of 75 feet. This evidence plus the fact that on the surface it was noted that some chalcopyrite is present at the west end of the vein, are very strong indications that the galena-sphalerite veins may grade into the chalcopyrite-sphalerite type.

The diamond-drilling shows that this vein changes very little if at all at a depth of 50 feet. Some chalcopyrite is present at the western end, however, but none of the assays are near commercial grade. As can be seen from the cross-sections, several other veins were discovered by the drilling but these are similar in character and values to the main vein. The drilling shows also that the vein is cut by the same type of soda-trachyte dykes as are found in the Earl adit.

The other veins of this system, as can be seen from the map, are of the galena-sphalerite type and contain very low values in gold and silver. They all lie within the microdiorite stock and have not been opened up beneath their oxidized capping.

5. The Midnight Vein

This vein was not examined by the writer nor was any other work, aside from the taking of a few grab-samples, done on it this year. These few samples, and assays reported by the British Columbia Department of Mines, however, make this vein worthy of mention.

Au	Ag	
0.16	23.1	Average sample from dump.
0.11	5.5	" "

The above samples were taken in 1941. According to the Annual Report of the B. C. Department of Mines for 1928, two

car-loads of hand-sorted ore were shipped from this vein in 1915. The following assays are given:

Au	Ag	Pb	Zn	
0.30	20.0	1	18	Selected collar sample
0.40	5.2	Nil	20	Average grab-sample of dump.
0.08	29.2	11.4	29.5	Average reject of hand-sorting.

The vein had two shallow inclined shafts sunk on it in 1914-1915. No further work has been done on it. The shafts are 70 feet apart. The sulphides are said to be chiefly sphalerite and pyrite, with minor amounts of galena. The gangue minerals are barite and quartz but rhodochrosite is suggested by the presence of much manganese stain in the oxidized capping, and by the presence of a deposit of bog manganese which assays 30% MnO_2.

IV CONCLUSION

The results of investigations of the Owen Lake Mining property to date indicate the following conclusions:

1. The deposit is made up of epithermal base-metal veins which occupy shear-zones in a microdiorite stock and its bordering volcanic rocks.

2. Of the two types of mineralization found in these veins, the galena-sphalerite type does not give much promise of containing sufficiently high precious metal values to form ore-bodies but the chalcopyrite-sphalerite type does.

3. Both types of mineralization have been found in single veins and hence may occur in any of the veins.

4. Values in the chalcopyrite-sphalerite type of veins are high enough to warrant exploration of these veins.

5. Veins have been found in various parts of the stock and in the surrounding volcanics. It is probable that many more veins exist in the unexplored parts of the stock and its border-rocks.

6. Oxidation has not reached far below two feet from the surface. This is shown by the fact that fresh rhodochrosite is present in all the underground workings. This mineral oxidizes so readily that even after sitting on the dump for a few years it becomes masked by a coating of black manganese oxides. Since there is no evidence of oxidation we may conclude that there has been no leaching nor surface enrichment of the veins where exposed in the tunnels.

7. There are good chances that these veins will go down to at least 1,000 feet and possibly 2,000 feet. This is indicated by the absence of the higher-temperature manganese minerals such as helvite, tephroite and alleghanyite which begin to appear at a depth of 2200 feet in the Sunnyside Mine of San Juan County, California.

These minerals have not been reported by Lang who did microscopic work on the ore in 1929, but perhaps no special search was made for them. A careful laboratory search for them would certainly be of great value in estimating the possible depth to which these veins will go.

8. The main Wrinch vein is by far the most promising of those examined so far. The writer recommends that an attempt be made to develop an ore-body in it before much work is done on the other veins. It could be readily explored by diamond-drilling over its entire length from the surface, and by drifts and raises underground. The Portal veins and the Midnight vein also are promising but for a limited program, concentration on the Wrinch vein seems

advisable, accompanied by a drilling program on the Midnight vein. Development of Ore in the Portal veins is a sinking proposition and hence should be left till later on.

(Signed) B. I. Nesbitt, B.A.Sc., M.Sc.,
C.I.M.M., A.I.M.E.