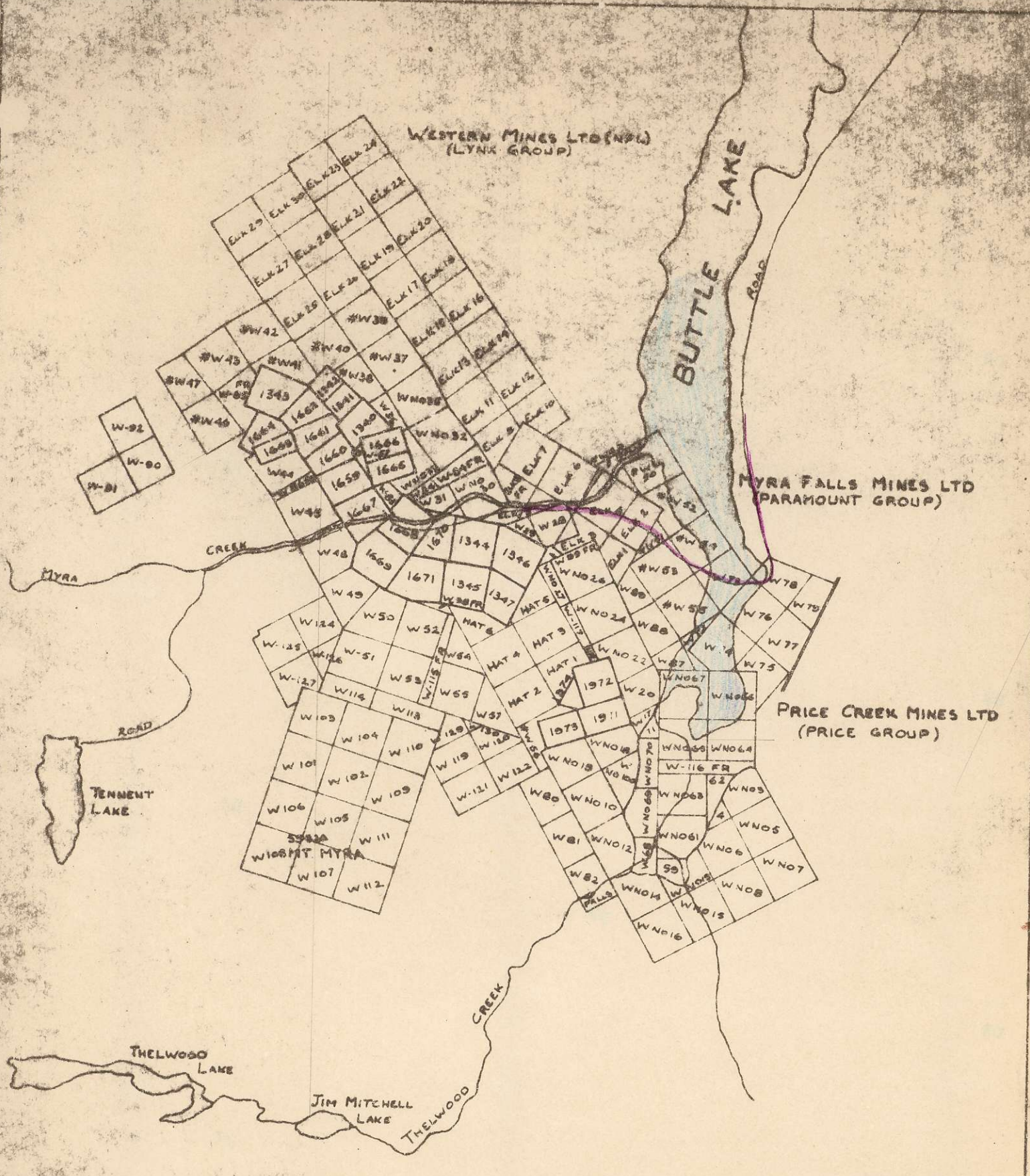

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MINERAL CLAIM LOCATION MAP

1.25" = 1 MILE OCT 1-1966

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Feb. 19/69

GEOLOGY OF WESTERN MINES

A Progress Report

SUMMARY:

Discret irregular shaped bodies of massive sulfides of Cu, Pb and Zn occur within and along the walls of a steep elongate alteration zone in rhyolite breccia and tuff. The alteration is essentially a bleaching of breccia which normally is green and purple rhyolite. The bleaching probably results from the conversion of silicate iron to pyrite.

The unmineralized rocks flanking the altered zone show little if any sign of the existence of near-by massive sulfides.

Numerous faults within the altered zone, strong foliation and the habit of the ore suggests that much of the complex pattern of ore distribution is due to breaking up of fewer larger primitive sulfide masses.

Host rocks for the deposits are unmetamorphosed Permian or older volcanic breccia tuffs and flows probably correlative with Sicker Group rocks. The Buttle Lake area seems to be the northern limit of an interupted belt of Sicker rocks which extends southeast to Duncan.

GENERAL GEOLOGY:

Stratigraphy

Permian: " Mt. Sicker"

Rocks in and near the mine are intermediate to silicic, green and purple volcanic breccias tuffs and flows with an aggregate thickness of at least 4,000 feet.

Volcanic breccias are composed of lithic fragments over 1½ inch maximum dimension in a matrix of finer lithic fragments. The breccia fragments and the matrix may be green or purple or more commonly mixtures of the two colors. Lapilli tuffs refers to rocks with a maximum dimension of

fragments from ¼ to 1½ inch. Fine to course tuffs are recognized by their particulate nature and fine bedding and laminations of well sized units. Rocks called cherty tuffs are chert-like in appearance and color laminated. Cherty tuffs are generaly green, lithic and lapilli tuffs are green and/or purple.

Period	Group	Formation	
Triassic	Vancouver	Karmutzen	Basalt flows and pillow breccias
Permian	Sicker		Limestone Intermediate to silicic breccias, tuffs, flows
			base not exposed

Definite volcanic flows are medium green fine grained, porphyritic (augite) and characteristically veined by white carbonate and discolored by epidote and hematite.

Fine grained green dikes and sills, some similar in appearance to the above flows are common along faults and contacts between litholgic units.

Fossiliferous Permian limestone overlies the volcanic sequence and is in turn overlain by Karmutsen formation.

On the basis of lithogy and stratigraphic position other writers have suggested the correlation with Sicker Group rocks named after Mt. Sicker near Duncan.

Triassic - Karmutsen

Massive basalt flows and pillow breccias of the Karmutsen formation lowest unit of the Vancouver Group overlie the Permian rocks. Road cuts along Buttle Lake opposite Wolf River offer excellent exposures of these rocks.

Intrusives

Dark green gabbroic sills and irregular tabular masses up to 800 feet thick intrude the Permian limestone and underlying volcanics. These rocks are probably intrusive equivalents of the Triassic flows.

A large granitic mass with a northwesterly trending contact lies one mile west of the mine. This granodiorite intrudes the Karmutsen and older rocks.

Structure

A broad arch or antiform with a gentle north plunge is outline by the exposures of Permian limestone on the ridge east of the south end of Buttle Lake and the ridge west of Wolf River.

Most faulting occurs along one of three directions, north, east, and northwest. North trending faults cut the northeast faults. The relative age of the east faults which are most evident in displacements of the granodiorite contact is not known.

Lynx Mine

History:

Three areas of surface showings called the Price, Paramount and Lynx are aligned in a northwest direction and spread over 2½ miles.

Paramount Mining Company of Seattle drilled 10 surface holes and drove an 80 foot drift at the Paramount in the 1920's. Granby drilled 1,900 feet in four holes in the same area, in 1952. In 1956, Strathcona Park was designated a Class "A" park. Heustis and Associates drilled two holes at the Paramount in 1959 to gain evidence to support their contention that the class "A" boundary should be redrawn to allow exploration and development of the property. Succeding at this, Heustis and Associates sold the property to Western Mines Limited in 1961. Surface mapping lead to drilling of the Lynx zone in July. The operation developed from that time to its present mill rate of 1,000 tons per day.

Mine Layout:

Mine - coordinate north is 45 degrees east of True North (set Brunton declination pointer at 336° Az or N 24°W) With this arrangement, the altered zone and contained ore zones run mine east-west. Nine levels of development begin at 1,500' A.S.L. with 8 level and number

downward to 16 Level at 320' A.S.L. Access and haulage is by 10 Level from which an internal 3- compartment shaft extends to the sump below 16 Level. The shaft and approximate "centre of gravity" of underground workings are at 5900 E and workings extend west to 4600 E on 8 Level and east to 8000 E on 13 Level.

The open pit headwall is presently at about 5800 E at elevation 1,800' and the bottom is 6500 E at elevation 1,150'.

Mine Geology:

Within the valley of Myra Creek, the general picture is one of block faulting in generally flat to low dipping strata. Most local flexures can be related to drag on steep faults. There are two exceptions where steep altitudes prevail; in the immediate vicinity of the altered zone along its known length of 7000 feet including Lynx and Paramount and in a zone extending 1/4 mile from the granite contact. Both foliations strike mine west.

Unaltered Rocks

On the southside of the upper 800 feet of the altered zone contacts between flows and fragmental rocks dip 60 to 80 degrees south. High on the north side of the altered zone layered fragmental rocks appear to have a moderate north dip. On both flanks, the unaltered volcanics have undergone considerable faulting - the intensity of faulting appears to increase as one approaches the altered zone.

Altered Rocks

The altered zone is 400 to 800 feet wide and at least 1400 feet high. It is mass of sencitized chloritized variably bleached silicic volcanic breccia and tuffs. Shades of pale to medium green, grey to off white, cream to tan are common. Foliation is intense in a number of altitudes. Numerous faults with up to 4 feet of gouge. Original breccia fragments can be extremely attenuated along horizontal axis.

Although it appears impossible to map lithologic units within the altered zone, there are volumes of homogeneous rock which may represent segments of original units. Pyrite is widely distributed in the altered zone and is more abundant in some alteration types than others.

Ten specimens that approximated the range of alteration colors were scanned with a deffractometer. All specimens were predominately sericite with lesser chorite and quartz with no indication of other clay minerals or talc.

Ore

Mineralogy:

Metallic minerals are chalcopyrite, sphalerite galena bornite and pyrite. The late Professor R.M. Thompson identified tennantite, stromeyerite (CuAgS) and trace amounts of two other minerals one of which he suggested may be stannite. Barite is the only significant non metallic gangue mineral.

Habit:

Fine grained massive mixtures of sphalerite chalcopyrite and pyrite represent the bulk of the metal in the mine. A smaller proportion of ore occurs as massive chalcopyrite-pyrite mixture. A third type occurs as fringe zones to massive highgrade and consists of chalcopyrite fillings of close spaced tension fractures in soft sarecitic phyllite.

Much of the ore contains lithic "fragments" in various stages of preservation. Many of these "fragments" are reduced to phyllitic thumb-nail like shapes. Rounded cobble-like shapes of rhyolitic compesition up to 2 feet across occur in certain ore exposures.

Form of sulfide masses:

On the south side of altered zone, the sulfide masses are curved tabular sheets out in a number L sub parallel zones which dip steeply south. These zones are sharply defined massive sulfides which can terminate in strike or dip directions by simply pinching down to several inches. Prominent color streaking of sulfides is common in this ore. The most continious single sheet L sulfide known to date is located along the south wall of the altered zone. In many places this does not make ore. However, it does maintain a position adjacent to a distinct lithologic unit which lies in direct contact with the south side of the ore. In other words, if you approach the altered zone from the south between 8 level and 13 level, you may traverse a number of different sequences L breccias flows and tuffs. However, in each case immediately prior to ore and sericitized breccia you will encounter a particular green rock. This is a green foliated rock with clear quartz eyes scattered irregularly through a predominately sericite matrix. Chert-like layers and lenses of jasper are common adjacent to the sulfides in some sections. Fine laminations of sulfide are common in the cherty layers.

This back to back relationship between ore and a green quartz eye rock has shown up in several other parts of the pit but to date, we haven't arrived at an explanation for its reoccurrence. One main occurrence was related to a thick flat slab of ore which was mined in the open pit. The upper side of this important ore body was in direct contact with bleached highly foliated steep but flat lying green quartz eye rock.

From the standpoint of reconstruction ore other sulfide-host rock relationships deserves mention. High on the north side of the pile recent testing has indicated a relatively flat sheet of sulphides which lies sandwiched between moderately to weekly altered rhyolite breccia and flows below and an andesite flow or flow-breccia above. The andesite is overlain by low dipping unaltered lapilli and lithic tuffs. The lapilli tuff unit immediately above the andesite flow has in several cores

contained a few scattered masses of mixed sulfides.

For the time being, we can leave off at this point and let you make some of your own observations.

J. Munro

Manifold and Sheppard - Geology Report

Steeply dipping zone of schistose rocks with concordant discontinuous massive sulphide bodies contained within the zone.

The southwest or hanging wall of the schist zone is well known and the known orebodies occur close to this contact. The northeast zone is undefined, but the zone is about 500' wide. Dips 65° SW. Irregular HW - dips vary - near vertical to -30°

The hangingwall rocks are massive or lightly sheared flows, tuffs and breccias. Contact between these rocks and the quartz sericite chlorite schists is sharp.

Unsheared rocks are probably massive pyroclastics - breccias and flows, and siliceous tuffs.

Sheared rocks are composed of chlorite, sericite, talc, other micaceous minerals and quartz and have varying degrees of foliation

Below 1075 level there are zones of massive purple volcanic breccia within the shear zone - Near horizontal along strike

ORE CONTROLS. 1. Changes in dip of hangingwall

* 2. Axes of folded schist structures
* 3. Upper flanks and the vicinity of tops of masses of unsheared rock contained within the shear zone

TRANSVERSE AND STRIKE FAULTING CLOSE TO ORE ZONES

STRIKE PARALLEL TO ORE ZONE & FOLIATION.

Cross faults displace ore up to 10's of feet - steep.

low angle faults rare

Limited disseminated ore. Generally massive.

Schisted rocks may be originally shallow-water volcanic sediments

Local structural control important

(1) Ore may come from batholith 2 miles west.

(2) Small mineralized zones along margins of basic dykes. Sulphides localized by structures within the faults such as drag folds

HYDROTHERMAL DEPOSITS THAT REPLACE CRUMPLED SCHISTS WITHIN A SHEAR ZONE

WESTERN MINES

ROY PHENDLER - 1969

MINERAL DEPOSITS

(1) General The mineral deposits of the Lynx and Paramount Mines occur as massive sulphide bodies composed of sphalerite, chalcopyrite galena, pyrite and minor bornite. The ore is in the form of irregular pods and vein-like bodies with sharply-defined footwalls and gradational hanging walls.

The footwall or north side of some of the ore zones are composed of fissile grey sericite schist which is generally incompetent and the hanging wall is somewhat silicified and firmer with abundant pyrite.

Some stopes presently under preparation for mining, show that the downdip limit of the ore terminates against relatively flat-lying faults.

Mineral traces on which the ore bodies occur are often continuous for many hundreds of feet with some drill hole intersections showing only a foot or so of weak sulphide mineralization.

All known ore bodies occur within the steeply dipping zone of schistose rocks referred to as the shear zone. The great majority of all ore discovered to date lies within 300' of the southwest or hanging wall of the shear zone and generally in the vicinity of masses of unsheared volcanic breccias or andesitic flows.

The altered schistose rocks within the shear zone are composed of quartz sericite schist, quartz chlorite sericite schist and quartz chlorite schist or some degree of silicification of these rocks.

← An examination of the geology plans (2c' to 1") suggest that the ore bodies are spatially associated with the least competent of these rock types, the quartz sericite schist. The presence of competent, unsheared rocks and relatively fissile sericite schists may be an important ore control.

A complex undulating contact of the shear zone with numerous lenses of unsheared rocks appears to be favourable for the formation of ore bodies. This would suggest cross-folding and longitudinal, cross and thrust faulting. A simple linear contact of the southwest edge of the shear zone with the unaltered volcanic flows is not an hospitable loci for ore deposition, although a mineral trace may be present.

The relatively flat plunge of the ore bodies has long been recognized and recent studies and projections of the ore reserve blocks indicate that the entire Lynx ore zone plunges to the northwest at about 17.5°. The accompanying longitudinal section shows this. None of the thirteen drill holes drilled below an imaginary limit line intersected ore grade mineralization. All indications are that the most favourable direction to explore for additional ore within the 300' wide zone along the southwest side of the shear zone is to the northwest.

(2) Mine levels Comments on the setting of the mineral zones on each level of the Lynx Mine follows:

8 Level: The few ore bodies on this level are located within fifty feet of the south limit of the shear zone. For four hundred feet west of the ore zones six drill holes well cover the ground with discouraging results. The following six hundred feet of ground is unexplored and warrants some drilling. The westernmost drill hole shows a decided increase in the amount of unsheared rocks and may indicate a constriction of the shear zone. One drill hole shows the presence of a mineral trace a the north side of the shear zone and is undoubtedly the extension of the recently-uncovered "G" zone.

9 Level: all mineral zones are located within an area 300 feet wide by nine hundred feet long. The last drill hole on the west end of the level intersected six feet of mineral assaying 11.6 g Ag and 26.7 % Zn and should be investigated.

10 Level - although the area in which the ore bodies occur is well explored, the west end warrants additional work. A new mineral trace has been intersected and should be drilled off at 50' intervals. A six-hundred foot long crosscut to the north side of the shear zone is presently exploring the downdip extension of the "G" zone. Hitherto, all ore in the Lynx area has been found on the south side of the shear zone. To date, ten drill holes have explored the north side of the shear zone on four of the mine levels and two intersected mineralization at or near the contact area.

11 Level - The contact area on the 11 level is very complex between the unaltered volcanics and the schistose rocks with ore bodies scattered along a strike length of 1400'. Closely-spaced drilling has encountered much ore and the last or western most hole has intersected 16.0' of mineralization assaying 2.2 g Ag. 1.4% Cu and 13.2% Zn. Exploration in this area is warranted.

12 Level - Extensive diamond drilling has proved up more than 300,000 tons of ore averaging 2.3 % Cu, 1.5 g Ag and 7.5 % Zn. Most of this tonnage is situated on one continuous, narrow vein-like mineral zone that is traceable for 1400' along strike. Some drilling is warranted on the east end of the level where the principal mineral zone is lost in the south wall.

13 Level - The east part of this level does not appear to be favourable for the discovery of additional ore zones. The few holes drilled to date suggest that a simple contact with no mineral trace exists and is probably below the lower limit of ore as shown on the longitudinal section. As on the 12 level, the mineral zone is continuous for over 1200' along strike and the ore is relatively narrow. The mineral zone continues west of the present workings and exploration in this direction is warranted.

14 Level - This appears to be the most promising level for the discovery of new ore. The few holes drilled west of the shaft into the favourable 300'-wide band of sheared rocks encountered ore grade material as follows:

Drill hole No	g Ag	% Cu	% Zn	Width
13-49	6.0	2.4	20.0	14.0'
14-19	6.1	2.5	27.5	4.0'

The complex nature of the contact is similar to where large quantities of ore-grade material has been found on the 10, 11 and 12 level. Drilling on 75' centers with flat and angle holes west of the shaft will probably encounter substantial tonnages of ore. Additional tonnages should be found above the level to the east.

15 Level - It is not surprising that little or no ore was encountered on this level. The four flat holes drilled to date showed a weak mineral trace near a simple straight contact. One down hole from

the 14 level intersected 11.0' of mineral assaying 3.7 oz Ag, 1.8 % Cu and 14.8 % Zn, but above the lower limit of ore. Exploration to the west will undoubtedly encounter substantial tonnages of ore.

16 Level It is unfortunate that more than 1600' of drifting was done prior to any exploratory diamond drilling. The line-drive drift is best located if kept within 50' of the shear zone but within the unaltered volcanics. The east drift has been permitted to wander 400' south of this contact making close-spaced drilling for ore exploration prohibitively costly. However the present study suggests that no further work be done on the east end of the level at this time.

The west drift appears to be short of the most hospitable area by a hundred feet or so but up hole drilling may encounter ore grade material. Drilling on 75' centers west of the shaft should be carried out through the 300' thick favorable zone to cover the possibility of undulations in the lower limit of the ore zones.

To summarize, one may say that the apparent lower limit of ore has been entered on the 12, 13, 15 and 16 levels. The most extensively developed levels, #12 & #13, show continuous mineralization along a strike length of 1700', but there is no indication of the upper or western limit of the ore being encountered, assuming that it too has a relatively flat westerly plunge. There is no reason why ore pods cannot persist to the west on all levels at least to the down plunge extension of the west ore limit on the 8th level. It is known that schisted rocks persist up the slope to the west of the 8 level portal for at least 2000' but the mineralized panel in which the Lynx orebodies occur is probably restricted to only a portion of the shear zone - possibly where the contact area has been folded and faulted, as observed in the productive sections of the mine. One must study the geological setting of known ore bodies to be able to say where similar conditions are most likely to occur again.

If the upper limit of ore plunges down to the west at 17° from the presently known westerly limit of ore on the 8th level, there is no reason why an additional 1500' of ore-bearing mineral zone cannot be encountered west of the present workings on the 12 level. It is unlikely that the shear zone will be ore-bearing in its entirety.

(3) ORE CHANGE WITH DEPTH.

Following is a level-by-level distribution of diluted ore reserve tonnages with grades (1967 Reserves):

Level	Tons	oz Au	oz Ag	% Cu	% Pb	% Zn
8	6200	0.10	3.4	1.0	1.7	9.6
9	64900	0.06	2.4	1.7	0.9	8.9
10	96600	0.06	3.7	1.9	1.1	10.2
11	264500	0.05	1.7	2.1	0.8	7.7
12	307500	0.05	1.5	2.3	0.6	7.5
13	72900	0.04	1.5	2.1	1.0	9.6
14	700	0.04	1.5	0.6	0.4	5.4
15	1800	0.02	1.5	1.3	0.6	7.9

With insignificant tonnages from the 14 and 15 levels, the grades are not meaningful. Results from the other levels show a definite decrease in average grades of Au, Ag, Pb and Zn - low temperature minerals and a sharp increase in Cu - a high temperature mineral. This is encouraging with copper a far more valuable mineral than lead and zinc.

(4) G Zone. Mineralization has been intersected in 10 out of 19 surface holes drilled to explore the north contact of the shear zone. Indications are that the ore dips about 20° to the north, parallel to the overlying unaltered volcanic flows & breccias. The mineral has been traced by drilling for a length (E-W) of 1400' and present surface work has exposed the zone in preparation to open pitting.

A crosscut on 10 level has crossed the shear zone and drifting towards the surface expression of the zone is underway. Drill-indicated reserves are 25-30,000 tons of open pit ore and 40-50,000 tons of underground ore.

PARAMOUNT MINE

The Paramount Mine lies 3000' to the southeast of the Lynx Mine in the continuation of the sheared volcanic schists. The mineralization is similar in nature to that found in the Lynx Mine other than that it lies close to the north wall of the shear zone. The shear zone is about 200-300' wide but narrows down to about 100' on the 9 level. The ore appears to be somewhat erratic with appreciable faulting. Continuity of ore downdip is not good but drill hole intersections ahead of the 9 level indicate that additional development work is warranted.

DEVELOPMENT - The mine is serviced by a 1300' - four-compartment vertical shaft with openings to seven levels. The four upper levels, the 8, 9, 10 and 11 have surface access.

Horizontal development along the shear zone is 3600 feet but the longest level (13) is little more than 2500' long.

Most of the development and exploration work is confined to the southernmost 300' of the shear zone with only ten drill holes extended across the entire shear zone. The north side of the shear zone may become a major area of exploration in the future but it appears to be somewhat preliminary considering how much prime prospecting area within the south side of the shear zone is unexplored.

To date, very little ore has been taken from the underground workings. Most of this is development muck from stope preparation as four stopes are in the early stages of production.

Stoping method being planned is cut and fill using mill tailings for back fill. It is doubtful whether the mill can provide sufficient back fill for much more than a 500 ton per day mining operation. Other sources of back fill may have to be found.

Normal shrinkage stoping was attempted but the broken muck failed to run properly. With a host rock of quartz-chlorite-sericite schist the fine muck cements itself on contact with water and broken muck will stand vertically without support.

Blast hole stoping is being attempted with one stope prepared with sub levels, draw points and vertical drill raises completed. This method has a good chance of succeeding, but the narrow widths and irregular ore limits in the Lynx mine make it suitable for only a small number of orebodies. Most orebodies are narrow and tabular. Possibly a method of long holing in cut and fill stopes may speed up production.

ORE RESERVES AND POSSIBILITIES

1 GENERAL During the recent examination the ore reserve calculations were checked and found to be reliable. In most cases the tonnage estimates were conservative and the dilution factors strictly adhered to.

The last complete ore reserve calculation was completed in Sept 1967 and totalled by computer. In Sept, 1968 the ore reserves were adjusted and recalculated manually taking into account the following changes:

1. The final pit outlines were expanded and 166,600 tons of ore were transferred from underground to pit ore classification.
2. 60,600 tons of new underground ore had been proved.
3. Pit production was 330,223 tons

2 CALCULATIONS

Following are essential points concerning ore reserve procedures and calculations:

1. Tonnage factors used range from 9·0 to 10·5 cu feet per ton depending on combined percentages of copper, lead and zinc - up to 25%.
2. Minimum mining width of five feet was used.
3. Dilution used was two feet on each side of orebody taken to assay 0·3% Cu, and 0·6% Zn.
4. No blocks included in the reserves have values less than $10 per ton - net smelter return based on following values Au - $30·00, Ag - $1·00 Cu $0·20, Pb $0·05, Zn $0·05.
5. High erratic assays of gold and silver are cut to three times their average grade in the block or surrounding blocks.
6. Published reserves include Proved and Probable ore as follows:

   Proved ore is ore exposed in mine workings projected 25' or 40', if cut by drill holes and 25' past the drill hole.

   Probable ore may be projected 25' beyond proved ore in mine workings and 25' beyond a series of three or more ore grade drill hole intersections, if holes are not spaced more than 50' apart.

   Pillar ore cannot be mined at present because it forms a surface (pit), shaft or main haulageway pillar.
7. Unpublished reserves are mineral zones which are only partly explored or are inferred from geological knowledge. They include possible ore (projected), low grade ore or potential ore

To Summarize, Reserves as of Sept 30, 1968

Classification	Tons	oz Au	g Ag	% Cu	% Pb	% Zn
Pit Ore	437500	0.04	1.5	1.9	0.7	6.8
Pit Pillar Blocks	178900	–	1.6	2.2	–	6.7
Mineable Blocks	399600	–	2.0	2.2	–	9.0
Uneconomic Blocks	12900	–	2.9	1.4	–	8.3
New U.G ore 67-68	60 600	–	–	–	–	–
Paramount U.G ore	34 000	0.07	3.8	0.8	1.6	9.0
G Zone Ore	30 000	–	–	–	–	–
Broken Reserves	99 900	0.02	0.8	1.0	0.3	5.0
Unaccounted	32 400	–	–	–	–	–
Total-Western Mines Ltd.	1,285,800	0.05	1.7	2.0	0.7	7.9
Total Mined to Sept 30, 68	560,300					
Total Found to Sept 30, 68	1,846,100					

Until additional ore controls become apparent, there is no reason to assume that changes will take place in the ore picture at depth within the Lynx Mine. Evidence to date on practically all levels shows that ore possibilities are poor to the east and good to the west. The presence of a strong mineral trace in a complex contact area is sufficiently encouraging to warrant further exploration in this direction with reasonably good chances of success.

Detailed study on five levels east of the shaft strongly suggest that the lower limit of ore within the Lynx mineral zone plunges down to the west at about 17°. Insufficient data does not permit a discussion of the western, or upper limit of ore but the 8 level shows a distinct weakening of mineralization a few hundred feet west of the portal.

A conservative estimate of ore potential within the Lynx Mine is as follows.

Level	Tonnage Potential	Comment, Location
9	50,000	west of present workings
10	75 000	" " " "
11	200 000	" " " "
12	50 000	above & west of present face
13	250 000	west of present workings
14	250 000	east and west of shaft & west of face
15	250 000	west of shaft.
16	250 000	west of present face.
	1,375,000	

One level fully developed and drilled off each year should develop and prove up as much ore as is being mined, with about five years of ore available before shaft sinking be considered.

It is recommended that the 14 level be drilled off at 75' centers through the 300' wide favourable zone with flat & up holes from the present workings. Upon the completion of this work the west heading should be continued for at least 1000' accompanied by diamond drilling.

One other level, possibly the 12 or 16 should also be carried out to the west for about 1000' accompanied by drilling.

REPORT ON

EXPLORATION AT WESTERN MINES' PROPERTY

BUTTLE LAKE, B.C.

July 29, 1968 L. Telfer

Rossland, B.C.

Report on

Exploration at Western Mines' Property

Buttle Lake, B.C.

INTRODUCTION AND SUMMARY:

A review of previous geological reports and an examination of the surface workings at the Lynx, Paramount and Price properties was carried out from July 23rd to 26th, 1968. Ted Nurare, who is doing detailed geological mapping as part of a thesis, showed some of the significant features. The objective of the visit was to review previous reports to see if targets for exploration had been recommended and, if possible, assist in laying out an exploration program. The urgency for accelerating exploration is the phasing out of the openpit near the end of 1969 and the probable inability of the mine to maintain mill throughput without additional stoping areas.

The following areas are recommended for exploration:

Lynx - Extension of either the 10th or 12th level to explore the shear above this level beyond the mine workings. - 1000 feet.

Paramount - Continuation of the 10th level and possibly the 9th to explore the narrow ore zone shown bydrill holes beyond the fault and to provide a drilling base for testing for the wide part of the shear below these levels. - 1000 feet.

- Continuation of the 13th level east to test the shear under the Myra Creek valley and beyond to the southeast. - 3000 feet.

Price - Diamond drilling to determine the significance of the mineralised intersection in D.D. No. 7.

Diamond Drilling -3000 feet.

GEOLOGY:

The Buttle Lake area is underlain by a thick series of volcanics with minor sedimentary beds and gabbroic intrusive rocks. The general section is:

Triassic

Karmutsen Group - Pillow lavas, breccias and basaltic flows.

Permian

Sicker Group (10,000 feet) - Limestone, minor sandstone and argillite, up to 1,100 feet thick.

- Upper part - Coarse bedded tuffs and agglomerates with some andesitic flows. Intruded by sills and coarse grained gabbroic rocks.
- Lower part - Well bedded and laminated, green, brown and purple tuffaceousrocks which have a siliceous appearance.

The above volcanics are described as the result of submarine eruptions near Buttle Lake which built up the volcanic pile almost to sea level.

GEOLOGY (Con'd):

About two to three miles west of the mine this volcanic series is intruded by a granodiorite batholith.

Local:

In the vicinity of the mine the country rock is the tuffs, agglomerates and andesitic flows of the upper Sicker Group, some hundreds of feet below the gabbro sills which cap the hills to the north and south of the mine. These rocks are usually gently dipping with fold axes striking north-north-west.

The shear is a steep dipping structure, up to 500 feet in width, striking northwest-southeast with dips varying from 70° to 30° southwest, but in the deeper levels it appears to have a reverse dip to the north-east. It consists of quartz-chlorite-sericite schists with minor talc and epidote. It appears to apex at about the 2000 foot contour, several hundreds of feet below the gabbro sills, being concealed except in the sides of the valley of Myra Creek and on the steep northwest wall of the Buttle Lake valley where the Price showing occurs. Dikes of various types (felsite, andesite, feldspar porphyry) intrude the shear and on the lower levels the intensity of alteration is shown by the development of migmatite.

Faulting is common; longitudinal faults, with considerable gouge, parallel the foliation on a northwest trend and some mineralization is associated with these faults; steep dipping cross faults, with an east-west strike, offset the shear and there are occasional low angle faults with some evidence of thrusting.

The principal sulphides are chalcopyrite, sphalerite, and pyrite, with lesser amounts of galena, bornite and rarely tennantite, covellite, digenite and stromeyerite. Barite occurs as pockets and lenses. Pyrite is wide spread, occurring with the ore bodies in massive lenses and as disseminations throughout the shear, occasionally carrying sufficent chalcopyrite to form low grade ore. The massive sulphide bodies are banded with the banding usually parallel to the schistosity but occasionally cutting cleanly across it. The orebodies occur as steep dipping lenses along the hangingwall of the shear, as gently dipping bodies in drag folds or adjoining unsheared horses of rock within the shear and also along some of the concordant longitudinal faults.

Origin:

Most the writers agree that these are massive sulphide deposits replacing favorable parts of a shear zone, the banding being due to a fluctuating concentration of metals during deposition. The mineralization is from some unknown, deep seated, granitic source.

Muraro favors a syngenitic origin, that is, the ore bodies are part of the volcanic sequence, deposited in an andesitic to rhyolitic environment and since remobilized in part to occupy their present position. The shear would thus develop due to the sulphides being the weakest part of the volcanic pile and the banding would be a primary feature.

EXPLORATION POSSIBILITIES:

The workings on the shear are in three areas: the Lynx, and Paramount, about 4000 feet apart, separated by the valley of Myra Creek, and the Price, 7000 feet southeast of the Paramount, separated from it by a ridge that goes up to an elevation of 3500 feet giving up to 1500 feet of cover on the shear.

The Lynx workings have explored the shear over a 1000 foot vertical range and ore bodies have been found to occur between the 1500 and 925 foot levels, that is over a vertical range of 700 feet. Most lead-zinc sulphide bodies have a much narrower vertical range if depths attained due to the plunge of the structure are not included. The ore bodies appear to occur where the shear intersects a series of agglomerates and tuffs whose contact with the shear would appear to have a gentle plunge southeast. If the localization of the ore shoots is limited to the low pressure areas caused by rocks of varying competence intersecting the shear, this particular sequence is also limiting in vertical range so it may be concluded that the possibilities for a reoccurrence of ore at depth are poor.

Laterally the possibilities are unknown but encouraging features are:

1. The shear and wall rocks are similar on the Lynx, Paramount and Price.
2. Mineralization is of the same type at all three showings, and if favorable structures occur, ore bodies might be developed.
3. If the particular tuff-agglomerate sequence, mineralized at the Lynx, is a significant control, it might re-occur elsewhere along the shear since the fold axes of the volcanics trend north-north - east and transect the northwest striking shear at about a 20° angle so this sequence could be at various elevations in the shear wall, depending on whether the dips of the formation are to the east or west.
4. The upper Paramount workings appear to be near the apex of the shear and what mineral showings have been found are near the north-east wall along one of the longitudinal faults. The wide part of the shear should occur in the fault block to the southeast at some slight depth and mineralization may occur along the southwest wall as it does on the Lynx property.
5. Although there are some reasons to believe that the vertical range of mineralization is limited, there are no limits set for its lateral extent, so possibilities also exist northwest of the Lynx workings.

METHODS OF EXPLORATION:

Unfortunately, due to the thick cover rocks and the wide spread dissemination of pyrite in the shear, it is unlikely that the usual geophysical methods would prove of any value. Geochemical methods also would be of little value in evaluation of the shear zones. Detailed geological

METHODS OF EXPLORATION (con't)

mapping of the showings and possibily mapping of the longitudinal and cross faults between the Paramount and Price would be of most help in planning development.

T his makes the present method of extending one or more headings into the unexplored portion of the shear, with pattern drilling, the best method of exploration of the concealed sections of the shear. It may be noted that where fairly substantial ore bodies occurred along the hanging wall part of the shear at the Lynx mine, the mineralization spread to include other favorable structures within the shear. In general, where mineralization is weak, only the most favorable structure is involved but as the intensity increased other favorable structures are also mineralized. For want of other criteria the intensity of mineralization on the shear wall may help localize where to concentrate drill footage and explore the full width of the shear. It would be hoped that exploration of the shear zone would discover one or more other centres where the intensity of mineralization is comparative to that at the Lynx.

If, as assumed, the mineralization occupies a relatively flat lying zone throughout a 700 foot vertical range, two headings, 300 feet apart, are adequate for exploration and to provide ventilation. Drill stations at 200 or 300 foot intervals would be adequate for preliminary testing of the shear. The program proposed is to test about 1000 feet of the shear beyond the known mineralization, with the results of this program being used to evaluate the exploration possibilities of the shear.

PROPOSED EXPLORATION:

1. Lynx - Extension northwest of a level to explore beyond the mine area. Either the 10th or 12th level could be used and the drill pattern would be mainly upward to explore the upper portion of the shear.

2. Paramount - (a) Extension of the 10th level across the fault to follow out the mineralization located by the drill holes from the 9th level and possibly extension of the 9th level to drift out this mineralization. Once its dip is established, a short crosscut could be driven into the hanging wall to provide a drill base to explore for the wide bulge in the shear anticipated below this level.
(b). Continuation of the 13th level southeast for mining purposes and to provide ventilation.

T here is a fair possibility that enough ore will be found by the above development to pay for much of the cost but the main objective is to explore for another centre of mineralization within the shear comparative to the Lynx.

3. Price - T he upper Price zone, at an elevation of 2000 feet, is a wide altered shear zone with two small galena-sphalerite-chalcopyrite-barite showings near a fault zone occupied by a creek. Northeast of this, at an elevation of 1300 feet, is a similar mineralized showing near a fault in a parallel creek which is known as the Lower Price zone.
In 1965, eight holes, totalling 4571 feet, were drilled. Numbers 1 to 6 were angle holes across the projected shear zone

PROPOSED EXPLORATION (cont)

exploring for extensions of surface mineralization with negative results except for some minor mineralization near the collars of holes Nos. land 3. Based on the surface mapping and results of these holes it is concluded, "The hydrothermally altered quartz, sericite schist zone lying between elevations of 1900 and 2100 feet is 600 feet long northwest, 200 feet wide and extends to depths from a few tens of feet down to 200 feet."

Drill hole No. 7 was drilled vertically on the southwest side of the shear. This cut disseminated and and massive sulphide bands dipping 70° and localized along silicified sections of tuff and agglomerate at the following footage: 127-128, 515-520, 588-591, 627-628, 681½ - 685, plus thinner bands from 700 to 711 feet. Assays given show:

Footage	Au ozs.	Ag ozs.	Cu%	Pb%	Zn%
515-520	.03	3.95	.90	1.60	11.85
588-591	.59	17.55	.20	6.30	20.35
681½-685	.08	10.00	.18	2.55	7.20

Bands of mineralization were intersected from 515 feet to the hole bottom at 711 feet, i.e. for 196 feet.

The high silver assays make this intersection of interest at present silver prices. It also occurs in an altered tuff-agglomerate rock sequence like that occurring at the Lynx. The best mineralization is at an elevation of about 1300 feet (Buttle Lake 750' elev.) or at about the same elevation as the Lower Price showing.

Preliminary exploration would probably require four angle holes totalling 3000 feet drilled from the downhill side of the showing to determine its dip and true width. If a mineable ore body were found, it would open another point of approach to explore the shear zone at about the elevation of the Paramount 10th level.

REMARKS:

The above is a summary of the reports reviewed, which are listed in the Appendix, where any suggestions concerning exploration are noted. The recommended exploration is to explore the shear laterally, for about 1000 feet beyond the known ore showings using at the most two headings which would provide a drill base to test most of the assumed vertical range of 700 feet of mineralized country.

It is also recommended that further exploration be carried out on the Price showings.

Submitted by,

July 29, 1968.

Box 221,
Rossland, B.C.

L. Telfer.

APPENDIX

The foregoing report includes many of the observations made by the following writers and a brief summary of their reports follows. The only report that is concerned mainly with exploration is that by C.R. Saunders and this is summarized in some detail.

I. Observations on the Geology and Mineralization of the Lynx Mine, Myra Falls, Buttle Lake, V.I., B.C. -

Daniel M. Basco.

This describes the geology, faults, folds, dikes and the ore deposits. It liststhe local controls as;

1. Southwest limb of the close anticlinal fold within the west wall.
2. Drag folds.
3. Pressure minima in southwest part of the shear zone.
4. Volcanic breccia or other open structures, particularly at higher levels.

2. Lode Metals in British Columbia, Department of Mines and Petroleum Resources- 1962, 1963 and 1964. -

W.G. Jeffery

This describes the geology, structure and ore mineralization and includes a plan and section of part of the mine workings.

3. Geological Evaluation of Ore Potential and a Proposal for Long Range Exploration and Development at Western Mines, Myra Falls, B.C.

January 1967- C.R. Saunders.

This describes the geology, structure, ore bodies, ore controls and lays out an exploration program. He concludes;

"The best possibilities for early ore development and stoping are the 12th level east (Lynx), 9th level Paramount and Lynx below the 12th level. Projected ore reserves for 13, 14, 15, and 16 levels at Lynx are 400,000 tons per level."

His exploration objectives are;

A. Add additional ore to the reserves as quickly as possible.

B. Explore and develop projected ore zones.

C. Explore favorable areas for which there is little information.

D. Explore unknown areas with exploration based on geological interpretation.

Program.

Mine	Heading	Footage (Objective) 1967	1968	1969.
Lynx	8W	800(C)	-	2,400 (D)
	12W	400(D)	-	1,200 (D)
	12E	800(A &B)	-	-
	13W	300 (B)	-	-
	13E	3,500(C&D)	3,200(C&D)	1,600 (C&D)
	14W	300(B)	-	-
	14E	900(B)	800(B)	-
	16W	700(B)	-	1,200(B)
	16E	1,300(B)	3,200 (B)	1,600(B)
Paramount	8E	-	1,600 (D)	-
	9E	1,400(D)	1,600 (D)	-
	10E	400(D)	1,600 (D)	-
Totals		12,000	12,800	8,000

In addition to the drifting, the drill footage is estimated as 2½ feet per foot of drift or would add about 50% to the cost of drifting.

The program as outlined is heavier than the mine can stand and in part that on the lower levels and 13th level is greater than warranted. In this type of mineral occurrence tons per level (400,000) is not as informative as tons per section which would at least show where the main centre of mineralization is located.

4. Geology and Diamond Drill Exploration of the Upper Price area conducted by Western Mines, Ltd., July to October, 1965.
Daniel M. Basco.

A review of the 1965 drill program on the Upper Price showing recommends further investigation of the mineralized section of drill hole No. 7.

5. Western Mines Operations, Buttle Lake, V.I.
(Unsigned)

This is a paper dealing with the geology and ore deposits and is accompanied by slides. There is also a summary of the same paper. The writer gives reserves as:

1,487,000 tons - .09 ozs Au, 3.37 ozs Ag, 1.8% Cu, 1.2% Pb, 9.8% Zn

The ore bodies have widths of 5 to 40 feet, lengths of 100 to 400 feet and several hundred feet of vertical extent. Those near the western contact appear to be more regular and follow the contact quite closely but away from the contact they seem to be associated with folds with a predominant plunge to the north.

6. Report on the geology of the Paramount, Lynx and Price Properties of Northwest Ventures.
A.C.Skerl, July 19,1956.

Describes geology and the occurrence of drag folds in the shear. Recommends a self potential survey and a flat hole drill program to explore the drag folds on the Paramount which he estimates will provide 200,000 tons of openpit ore.

These folds plunge from flat to 10°NW or SE and he expects the ore bodies to have a similar plunge. He notes premineral cross faults which may be important in localizing the ore.

7. Geology and Exploration at Western Mines.

T. Muraro, July 17,1968.

Recommends continuing the geological mapping and the interpretation of the fault pattern. Describes the geology and the association of the ore with certain kinds of breccias and tuffs - those with rhyolitic affinities.

Lynx - Recommends solving of the fault pattern.
Paremount - Recommends drilling from 9th level to find the wide section of the shear moved to the right by the east-west fault. Considers that any ore above the 10th level will be narrow beyond the fault.
Price - Recommends remapping and relogging of the holes prior to a drill program.

8. Tectonic History of the Insular Belt of British Columbia -C.I.M.M., Vol. 8.

A. Sutherland Brown.

Gives geology and tectonic history of the volcanics in the vicinity of Buttle Lake.

there is good reason by virtue of drilling or geological information to do so. These classes may be subdivided into two major groups - published and unpublished reserves.

PUBLISHED RESERVES:

These are the reserves which are submitted for the Annual Report and which are calculated from the most complete and accurate data available.

PROVED: (Carmine Red)

Ore exposed in mine workings with projections up to 25 feet from such workings. Projections up to 40 feet from workings may be made if intersected by drill holes which indicate continuity of the orebody. Maximum projection is 25 feet beyond such drill hole intersections.

PROBABLE: (Orange)

A. Ore projections up to 25 feet beyond proved ore where warranted by drilling or known geology.

B. Ore projections up to 25 feet from a series (three or more) of drill holes spaced not more than 50 feet apart, where it can be reasonably assumed that all intersections are on the same geological structure. If the structure is drilled at 50-foot intervals but only one or two of the holes contain ore values, this ore may still be placed in the probable class.

PILLAR: (Light Blue)

Ore which cannot be mined at present because it forms a surface, shaft or main haulage way pillar.

UNPUBLISHED RESERVES:

These are orebodies or portions of orebodies which are only partly explored or developed or are inferred from geological knowledge. They are calculated for internal use by the Geology and Engineering Departments to assist in long range planning.

POSSIBLE: (Yellow)

A. Ore projections to reasonable limits beyond Probable Ore limits based on known or assumed continuity of favourable geological structures.

B. Ore projections between a series of drill hole intersections assumed to be on the same geological structure but more than 50 feet apart.

C. Ore projections from isolated drill hole intersections.

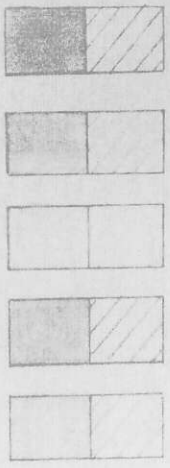
LOW GRADE: (Light Green outlined in Red, Orange or Yellow)

Ore which fits one of the preceding classes (proved, probable pillar, possible) but which has a value of less than $10.00 per ton.

POTENTIAL:

Ore inferred from known or assumed geological structure such as ore below the bottom mining level.

6 - 3 LEGEND FOR PLANS AND SECTIONS:



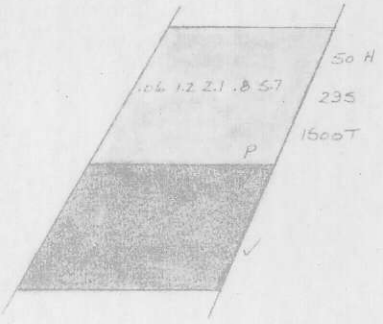
PROVED - in plane of plan or section

PROBABLE - not in plane of plan or section

POSSIBLE

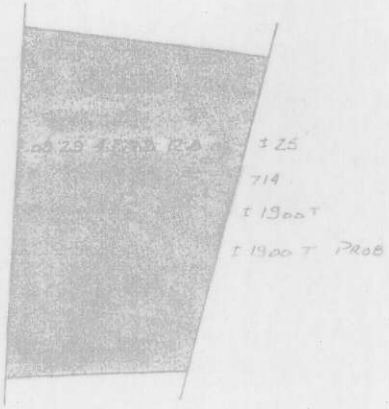
PILLAR

LOW GRADE



SECTION:

- calculated grade of block as shown
- Horizontal distance of ore block about plane of section = 50 ft.
- Planimetered area in sq.ft. = 295
- Calculated tonnage = 1500
- P - pit ore
- ✓ ore block calculated elsewhere



PLAN:

- 1900 ton block of ore extending 25' above level plus similar block extending 25' below level.
- Similar blocks of probable ore as extensions of proved ore.

Western Mines, Ltd.
Feb 27, 1969

SECTION 6:

ORE RESERVES

6 - 1: ANNUAL ORE RESERVE CALCULATIONS:

1. The report on ore reserves consists of a written comparison with the previous reserves and a discussion of reserves plus production. Included summaries and charts are:

   (a) Reserves by levels
   (b) Reserves by ore zones
   (c) Reserves by stopes
   (d) Production plus reserves by levels
   (e) Chart showing production plus reserves by levels
   (f) Graphs showing various grade relationships.

2. Broken ore tonnage and stockpiled ore tonnage will be obtained from the surveyors for inclusion in the reserves. They will be included with Proved Ore.

3. Tonnage factors are based on the combined percentage of copper, lead and zinc:

i	Less than 5%	- use 10.5
ii	5% to 15%	- use 10.0
iii	15% to 25%	- use 9.5
iv	Over 25%	- use 9.0

4. Grades will be calculated to a minimum mining width of five feet. Where ore structure does not permit mining to this minimum, such as in a flat lying orebody, the minimum width will be established as whatever is practical for the ore zone in question.

5. No ore will be included in the published reserves below the lowest workings on any particular zone, or below a zone where the next workings are more than two levels below. Such ore can be included in an unpublished ore class.

6. Dilution is assumed to be contained in any grades derived from the results of stoping. It will be included elsewhere in individual ore reserves calculations by adding four feet to the ore widths (two feet on each side of the orebody). Unless low grade assays exist for this two or four foot width it will be assigned the following grade:

   Au = 0.0 oz., Cu = 0.3%, Pb = 0.0%, Zn = 0.6%

   Occasionally, information available (stoping, drilling) may suggest that more than two feet should

be added for dilution (and, rarely, less than two feet). A logical width should be applied in such cases.

7. Net smelter return values on which to base grade cut off determinations are as follows:

   Au = $30.00, Ag = $1.00, Cu = $0.20, Pb = $0.05, Zn = $0.05

8. The lower value (and hence grade) limit of ore blocks included in the reserves will be $4.00 per ton based on the net smelter return values above. All blocks with values under $10.00 per ton will be considered low grade and will be indicated (coloured) as such.

9. Ore tonnages should be recorded to the nearest 100 tons and grades to the first decimal place except for gold for which the 2nd decimal place is required.

10. Apparent erratic high assays of gold and silver may be cut to three times their average grade in the block or surrounding blocks. Do not cut assays for copper, lead or zinc.

11. All reserves will be outlined on either a plan or a section of the underground or open pit workings. Individual blocks of ore will be based on the best geological interpretation that is consistent with the known information. All calculations and assumptions will be noted on the appropriate plan or section. Sub-section 6-3 indicates the manner in which ore classification, grades, tonnages, etc., will be marked. Working place names should be printed on all ore zones.

12. All plans and sections should be brought up to date before prints are made for ore reserve calculations.

13. The set of plans and sections comprising the annual Ore Reserves should be maintained during the ensuing year as an active file of interpreted geology and should receive the fullest use by the Geology, Engineering and Mining Departments. Working place outlines should be brought up to date as required. Where major changes in reserves are evident during the year, a new calculation should be made at the time of the mid-year calculations.

14. It is obvious that the above statements cannot be applied strictly to every ore zone. Any deviation from these guiding principles must be noted on the pertinent plan or section.

6-2 ORE CLASSIFICATIONS

Blocks of ore are grouped into several reserve classes based on the degree of probability of their existence, their accessability, and their value. An ore class should not be added merely as an extension of a higher class, but because

Copy to Mr Jewitt

July 17/68

To: W.G. Jewitt & J.B. Magee

From: T. Muraro

Re: Geology & Exploration at Western Mines

SUMMARY:

The potential for additional significant reserves at Western Mines is good. In time, the bulk of these reserves will be realized. The most important single geological deterent to relatively low cost and early location of these reserves is faulting. Faults are easy to map but difficult to solve. To understand the effect of faults, it is necessary to know enough about the sequence of rocks to be able to recognize displacement.

Current work emphasises mapping peripheral to local information at the Lynx and Paramount. This is a first test for obvious structure outside of the drilling to date. Moving into each property, the fringe drilling is being logged systematically to define rock units; hopefully units which will reveal important faults by their displacement. This phase provides the best information but is the most time consumming. Within the shear zone correlation is mor e difficult, but to some extent possible. Most important here we can learn the sense of movement on the various sets of faults and apply this knowledge to stronger faults of the same set but having greater offsets. A period of carefull and continuous mapping of the Pit is necessary to develope this information. Once a certain understanding is achieved and the important faults are identified, the mapping will be easier and less time consuming. This mapping should extend over the full exposure of the Pit until a working level of understanding is achieved.

INTRODUCTION:

This note summarizes some features of local geology which are considered important in the search for new ore and sketches some ideas on which to base this search. For the sake of brevity and purpose, certain statements deriving from geological interpretation will not be supported here.

GENERAL:

The ore at Western (Lynx, Paramount and Price) is developed in or on piles of fragmented volcanic rock which accumulated during sub marine eruptions. Regionally, such eruptions commonly occur in a linear zone, along the trend of an underlying crustal fracture. The emplacement of the ore and the bleaching of the host rocks (conversion of iron in silicate minerals of the rocks to pyrite by sulfur) is a stage in the volcanic cycle. The point here is that the ore is a very early feature and therefore is party to all geological phenomena affecting these rocks following their accumulation.

The structual style for the region can be summarized as slight tilting with faulting along three important directions. As one might expect, the earliest faulting in the newly developed series of ore bearing rocks was very much influenced by the old fracture direction responsible for the alignment of eruption centres. Failure along this N.W. direction is enhanced by and amplified within relatively incompetent bodies of mixed sulfides and altered rock. With geologic time and the development of younger series of rocks, the regional stress picture changes such that north-south, east-west and to a lesser extent, north-east faults developed. We know that the north-south and the north-east directions offset ore. We have no definite reading on the east-west set with respect to ore.

It should be emphasized here that folding on a regional scale is unimportant. Folding we do we see in the workings results from adjustments adjacent to faults, or possible drapeing over breccia piles. It is <u>not</u> drag folding in the sense of repetative isoclinal folding.

To return to our favourite direction - a zone extending northwest from the Price to the Lynx can be thought of as a ridge of coalescing piles of volcanic breccia, tuff and some flows. Flanking this linear pile to the east is a great thickness of water lain fine to cherty tuffs - originally fine volcanic material distributed over the basin

floor away from the erruption centres. A strongly developed northwest shearing or foliation dominates both the altered rocks and some rocks adjacent to the "shear zone". In this sense, it is reasonable to expect the shearing to persist between the Price and Lynx and also beyond both ends. And it is also probable that one or more faults may be traced over the same distance. However, it may not be correct to assume that a 500 foot or so width of highly altered pyritic "shear zone" is continuous over this distance (not with standing off-setting faults). Nevertheless, the existance of the Price showings demonstrates that there was mineralizing activity in the breccia piles at least that far south. One final point should be made here- there seems to be a tendency for sulfides to associate with certain kinds of breccias and tuffs- those of rhyolitic affinities. With the above frame work, we might consider some possibilities.

EXPLORATION THOUGHTS:

LYNX

The generally erratic distribution of ore bodies at Lynx is more or less due to post-ore deformations. Of immediate concern should be the manner in which the largest ore bodies are terminated. If it can be shown that important tonnage is terminated by faults, then an early goal should be the solving of such faults and testing for extensions. In most cases, it is impossible to solve structures with out a knowledge of the strategraphy. This can only be achieved by a careful logging and mapping and a continuing effort to correlate and interpet the results.

PARAMOUNT

The mass of altered rock ("shear zone") at Paramount is known to be faultered twice by a pair of parallel north-south faults. The most easterly fault not only produces apparent right hand off-set but effects considerable apparent vertical displacement, down-dropping the block to the east. Known ore at Paramount is at the

"roof" of the shear and to some extent, dragged down its north side by a splay fault. The roof region of the down dropped block should provide similar ore. Surface mapping at the Paramount is expected to provide some information on the amount and sense of displacement on these faults.

Drilling from 9 level indicates a narrow altered mineralized zone beyond Slide Fault extending down to 1225' elevation. This leaves little in the way of backs for the Paramount 10 level. From this aspect, 10 level may not be a good elevation for following the "shear zone" south.

Relogging, surface mapping and interpretation are now in progress on both Lynx and Paramount.

Some consideration should be given to drilling a - 40° or - 50° hole from the end of 9 level at Paramount in or near the plane of drill holes 9-16 and 9-17. At -40°, such a hole shoul enter the shear zone at a length of about 500 feet at an elevation of 1050 feet.

PRICE:

This requires re-examination on the ground and logging core from holes 1-7. With this data, it may be possible to select a site on the hillside and drill low dipping holes to cross the projection on the zone in which these altered mineralized masses occur. This would require holes 1200 to 1500' long.

Some work is planned for the Price during the week of July 22-26.

JBM:v

Feb. 19/69

GEOLOGY OF WESTERN MINES

A Progress Report

SUMMARY:

Discret irregular shaped bodies of massive sulfides of Cu, Pb and Zn occur within and along the walls of a steep elongate alteration zone in rhyolite breccia and tuff. The alteration is essentially a bleaching of breccia which normally is green and purple rhyolite. The bleaching probably results from the conversion of silicate iron to pyrite.

The unmineralized rocks flanking the altered zone show little if any sign of the existence of near-by massive sulfides.

Numerous faults within the altered zone, strong foliation and the habit of the ore suggests that much of the complex pattern of ore distribution is due to breaking up of fewer larger primitive sulfide masses.

Host rocks for the deposits are unmetamorphosed Permian or older volcanic breccia tuffs and flows probably correlative with Sicker Group rocks. The Buttle Lake area seems to be the northern limit of an interupted belt of Sicker rocks which extends southeast to Duncan.

GENERAL GEOLOGY:

Stratigraphy

Permian: " Mt. Sicker"

Rocks in and near the mine are intermediate to silicic, green and purple volcanic breccias tuffs and flows with an aggregate thickness of at least 4,000 feet.

Volcanic breccias are composed of lithic fragments over 1½ inch maximum dimension in a matrix of finer lithic fragments. The breccia fragments and the matrix may be green or purple or more commonly mixtures of the two colors. Lapilli tuffs refers to rocks with a maximum dimension of

fragments from ¼ to 1½ inch. Fine to course tuffs are recognized by their particulate nature and fine bedding and laminations of well sized units. Rocks called cherty tuffs are chert-like in appearance and color laminated. Cherty tuffs are generaly green, lithic and lapilli tuffs are green and/or purple.

Period	Group	Formation	
Triassic	Vancouver	Karmutzen	Basalt flows and pillow breccias
Permian	Sicker		Limestone Intermediate to silicic breccias, tuffs, flows
			base not exposed

Definite volcanic flows are medium green fine grained, porphyritic (augite) and characteristically veined by white carbonate and discolored by epidote and hematite.

Fine grained green dikes and sills, some similar in appearance to the above flows are common along faults and contacts between litholgic units.

Fossiliferous Permian limestone overlies the volcanic sequence and is in turn overlain by Karmutsen formation.

On the basis of lithogy and stratigraphic position other writers have suggested the correlation with Sicker Group rocks named after Mt. Sicker near Duncan.

Triassic - Karmutsen

Massive basalt flows and pillow breccias of the Karmutsen formation lowest unit of the Vancouver Group overlie the Permian rocks. Road cuts along Buttle Lake opposite Wolf River offer excellent exposures of these rocks.

Intrusives

Dark green gabbroic sills and irregular tabular masses up to 800 feet thick intrude the Permian limestone and underlying volcanics. These rocks are probably intrusive equivalents of the Triassic flows.

A large granitic mass with a northwesterly trending contact lies one mile west of the mine. This granodiorite intrudes the Karmutsen and older rocks.

Structure

A broad arch or antiform with a gentle north plunge is outline by the exposures of Permian limestone on the ridge east of the south end of Buttle Lake and the ridge west of Wolf River.

Most faulting occurs along one of three directions, north, east, and northwest. North trending faults cut the northeast faults. The relative age of the east faults which are most evident in displacements of the granodiorite contact is not known.

Lynx Mine

History:

Three areas of surface showings called the Price, Paramount and Lynx are aligned in a northwest direction and spread over 2½ miles.

Paramount Mining Company of Seattle drilled 10 surface holes and drove an 80 foot drift at the Paramount in the 1920's. Granby drilled 1,900 feet in four holes in the same area, in 1952. In 1956, Strathcona Park was designated a Class "A" park. Heustis and Associates drilled two holes at the Paramount in 1959 to gain evidence to support their contention that the class "A" boundary should be redrawn to allow exploration and development of the property. Succeding at this, Heustis and Associates sold the property to Western Mines Limited in 1961. Surface mapping lead to drilling of the Lynx zone in July. The operation developed from that time to its present mill rate of 1,000 tons per day.

Mine Layout:

Mine - coordinate north is 45 degrees east of True North (set Brunton declination pointer at 336° Az or N 24°W) With this arrangement, the altered zone and contained ore zones run mine east-west. Nine levels of development begin at 1,500' A.S.L. with 8 level and number

downward to 16 Level at 320' A.S.L. Access and haulage is by 10 Level from which an internal 3- compartment shaft extends to the sump below 16 Level. The shaft and approximate "centre of gravity" of underground workings are at 5900 E and workings extend west to 4600 E on 8 Level and east to 8000 E on 13 Level.

The open pit headwall is presently at about 5800 E at elevation 1,800' and the bottom is 6500 E at elevation 1,150'.

Mine Geology:

Within the valley of Myra Creek, the general picture is one of block faulting in generally flat to low dipping strata. Most local flexures can be related to drag on steep faults. There are two exceptions where steep altitudes prevail; in the immediate vicinity of the altered zone along its known length of 7000 feet including Lynx and Paramount and in a zone extending 1/4 mile from the granite contact. Both foliations strike mine west.

Unaltered Rocks

On the southside of the upper 800 feet of the altered zone contacts between flows and fragmental rocks dip 60 to 80 degrees south. High on the north side of the altered zone layered fragmental rocks appear to have a moderate north dip. On both flanks, the unaltered volcanics have undergone considerable faulting - the intensity of faulting appears to increase as one approaches the altered zone.

Altered Rocks

The altered zone is 400 to 800 feet wide and at least 1400 feet high. It is mass of sencitized chloritized variably bleached silicic volcanic breccia and tuffs. Shades of pale to medium green, grey to off white, cream to tan are common. Foliation is intense in a number of altitudes. Numerous faults with up to 4 feet of gouge. Original breccia fragments can be extremely attenuated along horizontal axis.

Although it appears impossible to map lithologic units within the altered zone, there are volumes of homogeneous rock which may represent segments of original units. Pyrite is widely distributed in the altered zone and is more abundant in some alteration types than others.

Ten specimens that approximated the range of alteration colors were scanned with a deffractometer. All specimens were predominately sericite with lesser chorite and quartz with no indication of other clay minerals or talc.

Ore

Mineralogy:

Metallic minerals are chalcopyrite, sphalerite galena bornite and pyrite. The late Professor R.M. Thompson identified tennantite, stromeyerite (CuAgS) and trace amounts of two other minerals one of which he suggested may be stannite. Barite is the only significant non metallic gangue mineral.

Habit:

Fine grained massive mixtures of sphalerite chalcopyrite and pyrite represent the bulk of the metal in the mine. A smaller proportion of ore occurs as massive chalcopyrite-pyrite mixture. A third type occurs as fringe zones to massive highgrade and consists of chalcopyrite fillings of close spaced tension fractures in soft serecitic phyllite.

Much of the ore contains lithic "fragments" in various stages of preservation. Many of these "fragments" are reduced to phyllitic thumb-nail like shapes. Rounded cabble-like shapes of rhyolitic compesition up to 2 feet across occur in certain ore exposures.

Form of sulfide masses:

On the south side of altered zone, the sulfide masses are curved tabular sheets out in a number L aub parallel zones which dip steeply south. These zones are sharply defined massive sulfides which can terminate in strike or dip directions by simply pinching down to several inches. Prominent color streaking of sulfides is common in this ore. The most continious single sheet L sulfide known to date is located along the south wall of the altered zone. In many places this does not make ore. However, it does maintain a position adjacent to a distinct lithologic unit which lies in direct contact with the south side of the ore. In other words, if you approach the altered zone from the south between 8 level and 13 level, you may traverse a number of different sequences L breccias flows and tuffs. However, in each case immediately prior to ore and sericitized breccia you will encounter a particular green rock. This is a green foliated rock with clear quartz eyes scattered irregularly through a predominately sericite matrix. Chert-like layers and lenses of jasper are common adjacent to the sulfides in some sections. Fine laminations of sulfide are common in the cherty layers.

This back to back relationship between ore and a green quartz eye rock has shown up in several other parts of the pit but to date, we haven't arrived at an explanation for its reoccurrence. One main occurrence was related to a thick flat slab of ore which was mined in the open pit. The upper side of this important ore body was in direct contact with bleached highly foliated steep but flat lying green quartz eye rock.

From the standpoint of reconstruction ore other sulfide-host rock relationships deserves mention. High on the north side of the pile recent testing has indicated a relatively flat sheet of sulphides which lies sandwiched between moderately to weekly altered rhyolite breccia and flows below and an andesite flow or flow-breccia above. The andesite is overlain by low dipping unaltered lapilli and lithic tuffs. The lapilli tuff unit immediately above the andesite flow has in several cores

contained a few scattered masses of mixed sulfides.

For the time being, we can leave off at this point and let you make some of your own observations.

J. Munro

GEOLOGICAL EVALUATION OF ORE POTENTIAL and a PROPOSAL FOR LONG RANGE EXPLORATION AND DEVELOPMENT AT WESTERN MINES LTD. (N.P.L.), MYRA FALLS, B.C.

C.R. Saunders January, 1967

INTRODUCTION

The purpose of this report is to indicate the ore potential at Western Mines by geological inference from present information and to suggest an exploration programme to check these potentialities. The timing of the various portions of the programme is dependent on known and assumed ore reserves, rate of ore depletion, rate of development advance, and the physical capabilities of the mine to handle such a programme. As geological and mining information increases there will be some changes in theory and thinking which will have an effect on any exploration and development programme that has been started. Consequently, such a programme will have to be reviewed periodically.

CONCLUSIONS:

1. Exploration of the Lynx-Paramount shear zone is essential to the life of the mine.
2. The results of any proposed exploration can greatly affect future mine planning and development and therefore the programme proposed must be given equal priority with other mine development.
3. The best possibilities for early ore development and stoping are 12th level east (Lynx), 9th level Paramount, and Lynx below 12th level.
4. Projected ore reserves for 13th, 14th, 15th and 16th levels at Lynx are 400,000 tons per level.
5. The physical aspects of the known orebodies at Lynx are such that large production tonnages are not easily obtainable. Many new stoping areas must be developed and ready for mining when the open pits are depleted if a steady ore flow is to be maintained.

RECOMMENDATIONS:

1. Start the exploration programme outlined in this report.
2. Emphasise ore development on 12th level east (Lynx), 9th level Paramount, and Lynx below 12th level.

GEOLOGIC SETTING AND ORE OCCURRENCE AT LYNX AND PARAMOUNT

Although information at the Paramount mine is sketchy, it appears that the geologic setting and mode of ore occurrence is the same as at the Lynx mine. It also appears that the two mines

are contained within the same general geological structure.

The regional geology in the vicinity of the mines consists of a thick series of Permian volcanic rocks composed mainly of agglomerates, tuffs and andesitic flows. Intruding this series one to two miles southwest of the mines is a relatively barren, coarse-grained granodiorite of Cretaceous age. Both the volcanics and the granodiorite but more commonly the volcanics, are intruded by gabbroic (diabase) dikes and sills. One such sill, several thousand feet in areal extent, occurs northwest of the Lynx mine.

Basically, the mine geology consists of a zone of shearing in the volcanics striking in a northwest-southeast direction and dipping steeply to the southwest. The sheared volcanics in this zone have been hydrothermally altered in varying degrees to quartz, chlorite and sericite schists. The width of the shear zone is not definitely known but is probably in the range of 500 to 1000 feet although there may be areas both narrower and wider. Long diamond drill holes from underground workings will define the zone more definitely. The southwest contact of the shear zone with the unaltered volcanics is reasonably well-defined. (Most of the orebodies occur near this contact). It is quite sharp and moderately regular although locally large blocks of the volcanics are partially or completely contained in the sheared ore host rocks.

Faults are widespread throughout the mine. The most common type are longitudinal faults which dip steeply and contain up to five feet of mud and rock gouge; they are frequently adjacent to ore grade mineralization. Cross faults locally displace the ore a few feet, and some low angle faults show evidence of thrusting. These faults cause weak ground conditions and result in difficult and expensive mining and considerable dilution of the ore.

Folds are apparent in the schists although they are not clearly visible underground. They are generally broad with relatively flat crests and gentle plunges. Sulphide mineralization in places is concordant with these folds and is heaviest near their crests. The open pit between sections 59+00E and 63+00E and its possible extension farther east consists of large sulphide masses occurring in such folds.

The Lynx and Paramount ore occurs as massive and disseminated sulphide bodies composed of pyrite, chalcopyrite, sphalerite, galena and minor bornite. No variations due to depth in this mineralogical assemblage have been noted in the present underground workings and none are expected down to the lowest level (16th) available for development. Changes in the ore composition at greater depth are expected to be minor.

The orebodies occur in the form of discrete lenses, masses and vein-like bodies, contained by the altered host rocks and broadly concordant with the shear zone. Dimensions of the orebodies vary considerably over short distances and continuity between widely spaced exposures is not assured. Widths vary from two feet to one hundred feet (on fold crests) and lengths from less than one hundred feet to as much as eight hundred feet. Sulphide situated adjacent to or near the main hangingwall of the shear zone has proved to be more consistant than in the orebodies farther from the hangingwall.

The orebodies of the Lynx and Paramount mines are classified as massive sulphide replacement deposits. The ore replaced the schists where there were zones of least pressure within the shear zone. The origin of the metals is at unknown depths but is probably related to the granodiorite batholith exposed to the southwest.

ORE CONTROLS:

From the foregoing description of geology and ore occurrence, some ore controls can be surmised. The shear zone is the most obvious and is the major controlling feature. Its lateral and vertical extent are not known but it is assumed to be quite continuous because of its probable mode of formation. The shearing is thought to have been caused by severe stresses resulting from intrusion of the granodiorite batholith to the southwest. Considering the size of the intruding mass the stresses must have occurred over considerable distance, and hence, the shear zone could also extend for a somewhat equivalent distance.

The localization of ore within the sheared and altered zone was probably a result of relative pressures within the zone. In low pressure zones channel-ways would be more open resulting in easier migration of the mineral-carrying fluids, and the same low pressure areas would be more amenable for mineral deposition. Ore could also have been localized by selective replacement of the host rocks. In some instances capping by impervious rock could have been a controlling feature.

Low pressure zones resulted from the relief of high stresses within the shear zone by folding, faulting and more intense shearing in localized areas and particular rock types. We have no information to date to indicate that such conditions were confined only to the Lynx and Paramount areas.

The rock type which we define as quartz-sericite schist contains the bulk of the ore at Lynx and is in a general way a target in the search for ore. It could well occur elsewhere in the shear zone.

Capping by impervious rock types is mostly a theoretical possibility although it may have been responsible in part for localization of ore in the sheared rocks adjacent to their southwest contact with the competent unaltered volcanics.

POSSIBLE LOCATIONS FOR ADDITIONAL ORE:

The bulk of our present ore reserves is contained within the developed portion of the Lynx mine between sections 55+00E and 68+00E and from 8th level down to 12th level. A small tonnage is outlined at the Paramount mine at the 9th level adit horizon. At both mines, it can be said with only slight reservation that the known ore limits are not defined along either direction of strike, nor up or down dip.

Very little exploration has been done beyond the ore-bearing zone at Lynx and no exploration has been done from Paramount. Because of our limited information, we have no reasons, other than theoretical possibilities, to believe that sulphide mineralization will not be found in unexplored areas of the shear zone. These areas are:

1. Above the 8th level information at Lynx.
2. Below 12th level Lynx (and below 16th level at which elevation the shear zone is known to exist).
3. West of the Lynx orebodies.
4. Between Lynx and Paramount.
5. Above, below and east of the Paramount adit.

If ore exists in one or more of these areas in appreciable quantities it will have considerable effect on mine development. Therefore, logical exploration to determine the potential of these areas should proceed at a high rate and such exploration should be considered a part of our mine development programme.

EXPLORATION AND DEVELOPMENT OBJECTIVES

A. Add additional ore to the reserves as quickly as possible.
B. Explore and develop projected ore zones.
C. Explore favourable areas for which there is little information.
D. Explore unknown areas with exploration based on geological interpretation.

PROPOSED EXPLORATION AND DEVELOPMENT HEADINGS

The headings listed below are those which can be worked in the near future (during 1967 or 1968). Some, because of their length, will take several years to complete. Information obtained from some or all of these proposed headings will result in further exploration and development drifts for which it is presently impossible to suggest any footage, timing or rates of advance. It is thus obvious that our development schedule will have to include an appreciable footage of exploration and development drifting each year in the foreseeable future.

LYNX:

8th Level West (to section 44+00E) - Diamond drilling with long inclined up-holes has intersected some ore values at and near the west end of this level. Further drifting is required before the ore can be properly outlined. (800 ft.) (Objective "C").

8th Level West (West of section 44+00E) - Assuming the drift on 8th level is still in or near the ore favourable shear zone at section 44+00E, it should then be advanced farther to the east for purely exploration purposes. It is the uppermost level in the Lynx mine from which exploration can be done. (800 - 3000 feet). (Objective "D").

12th Level East - The drift now ends at section 68+00E. Mine-able ore is indicated to the limit of information at section 70+00E and should extend even farther east. The drift can be driven until it approaches overburden in the valley bottom or until it is beyond mineable ore. (400 - 1200 feet). (Objectives "A" and "B").

12th Level West - This is an exploration drift proposed to explore the favourable shear zone west of the Lynx orebodies and approximately 550 feet below the 8th level west exploration drift. (1600 - 4000 feet). (Objective "D").

13th Level Lynx - The drift has to be advanced west (section 56+00E) and east (72+00E) to develop the downward projection of the Lynx orebodies. (1600 feet). (Objective "B").

13th Level East - It is assumed that this will be the highest level which will connect the Lynx and Paramount mines underground. Surface drilling information concerning the depth of overburden in Myra Creek valley will be available before the drifting has progressed to the critical valley area. This drift will explore the shear zone between the Lynx and Paramount orebodies and will also explore the downward projection of the Paramount sulphide bodies. Further drifting east of Paramount will explore the assumed continuation of the shear zone towards the Price mineral showings. (5000 - 10,000 feet). (Objectives "C" and "D").

14th Level Lynx - Similar to 13th level Lynx. (1200 - 2000 feet) (Objective "B").

15th Level Lynx - Similar to 13th level Lynx. (1200 - 2000 feet) (Objective "B").

16th Level Lynx - Similar to 13th level Lynx but extending 400 feet farther east and west (sections 52+00E to 76+00E) to check for possible plunges or lengthening of the Lynx orebodies. (2,000 feet). (Objective "B").

16th Level West - This is the lowest level on which exploration can be done from the Lynx shaft. The drift west would be 600 feet below the proposed 12th level west exploration drift. Information obtained from the drift on 12th might have some influence on the advancement of the 16th level drift (and vice versa) but the vertical interval between the drifts virtually dictates that both be driven to explore the respective horizons. (1,000 - 4,000 feet). (Objective "D").

16th Level East - This drift is 450 feet below the exploration drift on 13th east and may be influenced somewhat by information obtained on 13th. If ore is found on the 13th level horizon at Paramount 16th level would be the logical level to explore a continued downward projection. Drifting farther east under the Price showing is also a possibility. (1,000 - 10,000 feet). (Objective "D").

PARAMOUNT:

8th Level East - Dependent on information obtained on 9th level. (500 - 2,000 ft.) (Objectives "A" and "B").

9th Level East - This is the only opening into the Paramount zone. Although we know little about these orebodies we must assume they contain a potentially large tonnage and will consequently have a considerable effect on mine planning and development. Correlation of the present information plus exploration to the east (farther into the mountain) must be done in order to properly assess the zone. Information obtained will also aid in planning the location of drifts advancing from Lynx such as 13th level east. (1,000 - 3,000 feet). (Objectives "A", "C" and "D").

10th Level East - Dependent on information obtained on 9th level. (1,000 - 2,500 feet). (Objectives "A" and "B").

EXPLORATION DIAMOND DRILLING

The erratic size and nature of the sulphide bodies necessitates considerable diamond drilling to define them adequately for proper development and planning. The present average figure for "tons of ore developed per foot of diamond drilling" is less than 10 tons per foot.

Diamond drilling from all development and exploration drifts will be done on a pattern designed to locate any orebodies of appreciable size and to give the information required for good geological interpretation. This basic pattern will average approximately two and one-half feet of diamond drilling per foot of drift. Information from this drilling pattern will determine whether further drilling is required.

PROJECTED ORE RESERVES

From ore reserves calculated in the explored portion of the Lynx mine, an estimate of expected reserves on the levels 13th to 16th can be determined. An average figure is 400,000 tons per level. However, actual ore found on each level may vary considerably (higher or lower) from this figure and such variations will certainly affect mine planning. Therefore, the sooner this information is obtained the more effect it will have on logical mine development.

It is impossible and would be highly misleading to estimate projected reserves at Paramount because of a very minimum of information. However, we must assume that the ore potential at this mine is appreciable until proved otherwise.

There is no information for other portions of the shear zone, so for these areas as well no projected reserve figures can be determined.

DEPLETION OF ORE RESERVES

A study of reserves, stope development, rates of mining and other limiting factors indicate that new ore on 13th, 14th, 15th and 16th levels at Lynx and 9th level at Paramount must be made available at the earliest possible date. Nothing less than a crash development programme will bring these levels into production by the time they are required.

Estimated production from all levels at Lynx will have to be supplemented by ore from other sources by the beginning of 1974. This allows eight years to explore and develop these sources and if the lower levels at Lynx contain less ore than projected, this exploration and development period will be drastically shortened. The only conclusion we can make is that exploration for and development of new ore sources must be given the highest priority.

PROPOSED EXPLORATION AND DEVELOPMENT SCHEDULE

The following table is a summary of the proposed lateral development for 1967, 1968 and 1969 shown on the accompanying longitudinal section:

.... pg. 8

		FOOTAGE		
	HEADING	1967	1968	1969
LYNX				
	8th W	800	-	2,400
	12th W	400	-	1,200
	12th E	800 (?)	-	-
	13th W	300	-	-
	13th E	3,500	3,200	1,600
	14th W	300	-	-
	14th E	900	800 (?)	-
	15th W	300	-	-
	15th E	900	800 (?)	-
	16th W	700	-	1,200
	16th E	1,300	3,200	1,600
PARAMOUNT				
	8th E	-	1,600 (?)	(?)
	9th E	1,400	1,600	(?)
	10th E	400	1,600 (?)	(?)
TOTAL		12,000	12,800	8,000+

LEGEND

WESTERN MINES LTD. EFFECTIVE – MAR. 1966

Ore Reserve Sections
Proven
Probable
Possible
low Grade
low Grade, Possible

735 OVERBURDEN

PRIMARY ROCKS (RELATIVELY UNALTERED)

742 AGGLOMERATE
964 TUFF
742½ FLOW
958 DIKE (ANDESITE, ETC.)
Gabbro

ALTERED ROCKS (SHEAR ZONE)

747½ QUARTZ SERICITE SCHIST
953 QUARTZ CHLORITE SERICITE SCHIST
947
738½ QUARTZ CHLORITE SCHIST
745½ MIGMATITE (?)
COBALT BLUE QUARTZ ; SILICIFICATION

745 MASSIVE ORE
745 DISSEMINATED ORE: HEAVILY (25-50%); MODERATELY (10-25%); SPARSELY (<10%)
737 PYRITE

STRUCTURAL SYMBOLS

FAULT: WELL DEFINED; APPROXIMATE; STRIKE-SLIP; U D F.W-UP, H.W-DOWN

SLIP: STRONG; WEAK JOINT: J ?

CONTACT: WELL DEFINED, SHARP; APPROXIMATE, GRADATIONAL

SCHISTOCITY: (VERTICAL) BEDDING:

ORE BANDING:

DRAG FOLD: