105-G-3

Appendix - A
to the application of
Tintina Silver Mines L
executed on

013953

GEOLOGICAL REPORT

ON

TINTINA SILVER MINES LIMITED

BY

W. W. MOORHOUSE, Ph. D.

Toronto, Ontario

April 19, 1963

TABLE OF CONTENTS

GEOLOGY OF TINTINA SILVER MINES LTD.

GEOLOGY OF THE MINE AREA

FAULTING

MINERALIZATION

DESCRIPTION OF INDIVIDUAL MINERALIZED ZONES

THE CONTROLS OF MINERALIZATION

MAPS IN FOLDER

MAP 1 - Sketch Map of Geology, VICINITY OF TINTINA SILVER MINES LIMITED

Scale 500 feet = 1 inch

MAP 2 - Stereographic Diagrams of STRIKES, DIPS and LINEATIONS

MAP 3 - Geology of TINTINA SILVER MINES LIMITED - (Map in 3 parts)

Scale 1 inch = 100 feet

MAP 4 - Geology of TINTINA SILVER MINES LIMITED

Scale 1 inch = 200 feet

MAP 5 - TINTINA SILVER MINES LIMITED showing - Boundaries of Areas within which Strikes and Dips Analysed - and Areas of Northwest Plunge of Lineation.

Scale 1 inch = 200 feet

MAP 6 - CROSS SECTIONS of TINTINA SILVER MINES LIMITED LOOKING NW

Showing Sections Through A,B,C,D,E,F,G,H,I,J,K,L,M,N,O,P.

Scale 1 inch = 100 feet

MAP 7 - CROSS SECTIONS of TINTINA SILVER MINES LIMITED LOOKING NW

Showing Sections Through 0 + 00W, 4 + 00W, 8 + 00W,

12 + 00W, 16 + 00W

Scale 1 inch = 100 feet

MAP 8 - CROSS SECTIONS of TINTINA SILVER MINES LIMITED LOOKING NW

Showing Sections Through 20 + 00W, 24 + 00W, 28 + 00W

32 + 00W, 36 + 00W, 40 + 00W

Scale 1 inch = 100 feet

GEOLOGICAL REPORT

TINTINA SILVER MINES LIMITED

BY

W. W. MOORHOUSE

[illegible]

Silver-lead-zinc mineralization occurs in the following forms on the property of Tintina Silver Mines Ltd.:

1. In pockets, lenses and disseminations of erratic distribution in limestone at or near the overlying contact with argillite.
2. In narrow shear zones, locally silicified, in the limestone.
3. In lenses, streaks and disseminations in highly sheared argillaceous limestone, for the most part just above major planes of thrust movement.
4. In sheared, re-crystallized limestone, sometimes with quartz veins, silicification or silication.
5. In narrow, generally low-grade quartz veins in sheared argillite.

The mineralization is so erratic that sampling is a very serious problem. It is probable that in zones such as zone 8, the only way to obtain a true picture of the grade would be by bulk sampling. The nature of the mineralization is such that no estimate of ore dimensions and grade is possible. However, one cannot help being impressed by the number and variety of occurrences of mineralization in the area mapped. Consequently, it cannot be stated that possibilities of the property have been [illegible] investigated. Unfortunately, there are no clear indications of definite targets for further work, and isolation and expense of exploration make "wild-cat" investigations unattractive.

DEVELOPMENT PROPOSALS:

The property has not been fully prospected. It is recommended that a prospecting party should be put to work, with particular attention to the following features:-

1) The approximate course of the dislocation or thrust zone underlying the argillaceous limestone unit should be traced out wherever it is exposed on the property, to see if there is a repetition of conditions such as are found on zone 8 and on the West Mountain zone.

2) The outcrops of the limestone bands which are mineralized in zones 1, 2, 3, 4, 5, 6 and 7 should be carefully examined on the East slope, Facet ridge, and in the valley between them, for signs of mineralization.

3) The hornfels areas around the granitic intrusion should be prospected for scheelite. None has so far been discovered in lamping specimens collected, but the conditions seem favourable for this type of mineralization.

If in the future, a major program of exploration is contemplated, the following projects merit consideration:-

1. The "Mineral fault" appears to have served as a control of mineralization, and drilling into the fault, particularly to intersect the lower limestone horizon, is recommended.
2. Bulk sampling, and the sinking of a deep pit from surface on zone 8 would give a better picture of the true grade and attitude of this zone.

3. Shallow drilling in the vicinity of zone 13 deserves consideration, although the mineral occurrences in this area are apparently very erratic and generally of small dimensions.

4. An EM survey of the mineralized area proved unprofitable. The wide distribution of mineralized float makes it seem unlikely that geochemical methods would provide suitable targets for further exploration. It is possible that a self-potential survey along favourable structures might provide more useful information.

W. W. Moorhouse

GEOLOGY OF TINTINA SILVER MINES LTD.

LOCATION and ACCESS:

The property of Tintina Silver Mines Ltd. comprises a total of 302 claims, located in the St. Cyr Range, Yukon, 130 miles east - northeast of Whitehorse. Access is provided by plane to lakes in the vicinity, and during the summer of 1962 an airstrip was maintained six miles south of the camp. Equipment for the mining and drilling operations of 1962 was brought in along a winter road from the Alaska Highway, some 110 miles to the south.

PURPOSE of the GEOLOGICAL PROGRAM:

The program, of which this report is the result, was primarily to determine the geological setting of the silver-lead-zinc deposits already known on the Tintina Silver Mines Ltd. property, as an aid to the development program. The mapping was continued after the suspension of underground development and diamond drilling, to produce a reasonably complete picture of the geology of the mine area, and to determine if anything further could be learned about the localization and distribution of mineralization. Some interesting features developed out of this mapping (on a scale of 100' to the inch), although, as is to be expected, a number of important questions remain unanswered.

METHODS and CONDITIONS OF SURVEY:

Picket lines in the main mineralized area and northwest of the main area were used as a base for geological mapping. Picket lines in the south area were 100 feet apart; in the northwest grid they were 200 feet apart. Alternate picket lines (i.e. 400 feet apart) were extended to the northeast beyond the second grid, to permit mapping of the hornfels area. Areas outside of the picket lines were mapped by chain and compass. No reliable contour maps were available for this detail of mapping, consequently the contours given are strictly diagrammatic, based upon an unreliable altimeter and elevations calculated from chain and compass measurements. The contours on the 500 foot to the inch sketch map are however from the form lines of the aero map.

Because of the high altitude and latitude, snow persisted everywhere but on south-facing slopes until well into July, and drifts still survived in sheltered hollows until mid-August. This seriously restricted the accessible areas, particularly in the cirque in which the underground work was done, until the summer was nearly half over. Also, as the snow disappeared, it was found necessary to recheck certain parts of the area, to map outcrops which had been covered during the initial work.

ACKNOWLEDGMENTS:

The progress of the work was made possible by the co-operation and assistance of P. R. Heenan and Art Ashton. Messrs. W. G. Hainsworth and Al Crocker provided information and assistance as required. I am grateful to Paul Hammond for the opportunity of working in this interesting area, and for many favours during the summer and since.

REGIONAL GEOLOGY:

The area has been mapped only in a reconnaissance way by the Geological Survey. It is located southwest of the Tintina fault, which is regarded as continuation into the Yukon of the Rocky Mountain Trench. The terrain is mountainous, the mountains consisting of folded and faulted sediments, believed to be of early Paleozoic, possibly Precambrian age in part, which have been intruded by granitic rocks.

In the vicinity of Tintina Silver Mines Ltd., the geology (and topography) is dominated by a granodiorite plug, which is exposed in a series of high peaks just north of the camp. It has an east-west extent of about 1½ miles, and a north-south width of about a mile, on the crests. In the valley it extends south for half a mile, probably more, beyond the contact exposed on the crests. The plug is surrounded by rusty hornfelses for a horizontal width of at least ½ mile. To the south, the hornfelses grade into less intensely metamorphosed argillites and limestones. A thick mass of argillaceous limestone appears to have been thrust over metamorphosed and unmetamorphosed rocks. Reference to the regional sketch map shows that the argillaceous limestone forms the peak of the West Mt., the crest of Cornice Ridge, the top of Facet Ridge, and Hornfels Ridge, up to the granite contact. The ridge and crest of Ramp Mountain is also probably of the same material, although it was not traversed. To the south, at Penthouse Peak on Cornice Ridge, and on West Mountain, the argillaceous limestone is overlain by a massive limestone (Peak Limestone) and dolomite, probably with a thrust contact. On Cornice Ridge the Peak limestone is separated from the argillaceous limestone by green and pink, platy shales.

The main structure appears to be anticlinal, the main area of mineralization being located near the crest of the structure. The structure is much complicated by minor folds and many faults, and is somewhat modified by the thrust mass to the southwest. The anticlinal structure appears in the cliff face south of the East Ridge, and on the west face of Facet Ridge.

GEOLOGY OF THE MINE AREA

STRATIGRAPHY:

In working out the stratigraphy of the area, it is necessary to confine our attention to the rocks south of the hornfels zone. Within the hornfels zone itself, as we shall see, the formations are so distorted and smeared out that the stratigraphic sequence is no longer evident.

The formations at the bottom of the section consist primarily of brown to purplish-brown argillite, which contains locally thin layers of argillaceous limestone and log-shaped boudins of similar material. Since the bottom of this unit is not known, we can only say that it appears to be at least 300 feet thick.

This unit is succeeded by a limestone bed, which in the cirque and in the adit, is a streaky, often sheared and fractured grey limestone, mottled with white. It weathers with a yellowish-brown colour, which becomes more obvious towards the head of the cirque. This appears to result from an increase in the amount of argillaceous and ferruginous material in the limestone, for here the mottled grey limestone appears to form lenses several feet in long diameter, enclosed in sheared argillaceous limestone. Fossils, usually appearing as white rings and conical bodies within the massive grey mottled parts of the limestone band, appear to be Archeocyathid corals and seem to suggest that this phase of the limestone is of reef origin and of Lower Cambrian age. On the east-facing slope of the ridge east of the cirque, the limestone outcrops repeatedly, due to small minor folds. Similar, massive grey mottled limestone again occurs, but it is associated with laminated argillaceous limestone which is in the outcrop rather difficult to distinguish from some of the brown argillites. To the northwest, near the granite contact, the limestone becomes strongly recrystallized, locally with a scattering of garnets in it. In the mine area, this limestone unit has a thickness of approximately 100 feet, based upon one drill hole. To the east the bed thins drastically to between 25 and 50 feet. It is suggested that this variation is due to sedimentary thinning of the bed, but reduction of thickness by shearing cannot be excluded. In its northernmost exposure, this bed has thickened to about 250 feet. This may be due to folding, which cannot be detected because of the massive, recrystallized nature of the limestone here, but it seems more likely to be a consequence of localized thickening by recrystallization flow.

The lower limestone unit is overlain by another argillite band, which appears to be roughly 100 feet thick in the vicinity of the adit, but to the north thickens to 150 feet. In the eastern section, on the other hand, it appears to have thinned, like the limestone, ranging from 10 to 50 feet. For the most part this is a grey to brown argillite, schistose, with obscure bedding which is only observable on the weathered surface. Locally, for instance west of zones 5 and 6, it contains black sections, which are spotted with dark, altered cordierite grains. An outcrop just north of zone 6 is strongly seamed with narrow (¼ to ½ inch) veinlets of quartz, and is bleached to a grey, altered-looking rock. North of the adit, it is greyish in colour, and contains widely disseminated arsenopyrite.. West of zone 6, it is cut by a number of narrow quartz veins, a few inches to 2 feet wide, striking roughly east-west, and dipping south, mineralised erratically with galena, sphalerite, pyrite, chalcopyrite, and sulphosalts. In the north section, between the Sidehill zone and zone 11, the argillite is massive, brown, with a fibre rather than a schistosity. Still further north, the argillite grades into hornfels.

The argillite is followed by a second limestone unit. Like the lower one, in the mineralized area it is a grey, mottled limestone, rather spiny on the weathered surface due to particles and streaks of quartz, probably secondary. This limestone differs from the lower one, however, in the absence of the yellow-weathering, argillaceous phase. It appears to be 30 to 50 feet thick in the mineralized area; one drill hole, S-1, suggests an even greater thickness. To the east and north it thins considerably; this is very obvious in the southeast corner of the map-area, where it changes within 200 feet or so from 15 feet to 2 feet, and then increases again further to the south. The change of thickness in this area at least appears to be a primary sedimentary feature. The failure of this limestone bed to outcrop in the cirque east of zone 7 may be attributed to poor outcrop, as the slope in this area is covered with argillite talus, or it may actually have pinched out. To the north of the camp, this upper limestone band appears to be around 15 feet thick.

Overlying the upper limestone is a black, carbonaceous, highly sheared argillite. This outcrops on the ridge which forms the east side of the cirque, but is everywhere covered by talus on the west side. Its thickness appears to be very variable, probably for structural reasons. From the structural sections it would seem to be between one and two hundred feet thick. The very much greater thickness in the northern part of the map is thought to be largely a consequence of repeated folding. Bedding is rarely if ever visible in the black argillite. Foliation is everywhere strongly developed, not infrequently in two directions. Many outcrops, presumably on the crests of folds, are characterized by pencil structure in the argillite, caused by bedding-cleavage or cleavage-cleavage intersections. The black argillite appears to have been a very active structural zone, as most of the thrust faults have been observed, or inferred within it. The contacts with the underlying limestone are marked in many places by quartz lenses and veins. On the East Ridge at the south side of the detailed maps, the black and grey argillites appear to be irregularly mixed, possibly due to faulting.

Above the black argillite lies a strongly bedded, dark grey unit of argillaceous limestone. The beds vary from a few inches to a foot or so thick, and they are intersected by one or more cleavages, and strongly folded into small anticlines and synclines with wave-lengths of a few tens of feet. No estimate can be made of the thickness of this unit, as the folding is so complex, and no younger formation occurs within the area mapped in detail.

The major thrust mass which overlooks the cirque on the west on Cornice Ridge, appears to be composed of the same material, and it seems reasonable to consider the two occurrences of argillaceous limestone as the same unit. If this is the case, the unit changes in character somewhat as we go up in the section, becoming more platy and yellow weathering. To the south it is overlain by variegated argillites and massive limestones and dolomites (Peak limestone). It is only possible to say that the unit is at least several hundred feet thick.

The hornfelses of the contact metamorphic aureole around the granitic stock (actually a quartz monzonite) are extremely varied in character. The most prevalent are purplish-brown to black hornfelses, many of which contain a large amount of cordierite. Among these are coarse, foliated cordierite rocks, which differ little in character from the normal hornfelses, except for the abundance and grain-size of the cordierite. Bands of white to green lime silicate hornfelses, containing plagioclase, diopside, garnet, zoisite, locally scapolite and vesuvianite, and usually some iron sulphides, occur as thin seams and as bands up to several feet wide in the normal hornfelses. Bands composed almost entirely of garnet, or garnet and vesuvianite, also are interbedded with the hornfelses, usually in association with the lime silicate zones, and with limestone layers. The limestone in the hornfels area vary from a few inches to 180 feet thick. The thin layers are fine-grained, grey to black, and appear to be parallel to the steep, nearly vertical foliation and bedding of the hornfelses. Near the north end of the mapped area, just south of the intrusive contact, however, there are numerous patches and distorted masses of limestone in the hornfels, which appear to be rather gently dipping, for the most part. The thick limestone bands show intense folding in some outcrops. West of the hornfels zone, the black argillites have locally developed crystals of andalusite and cordierite (now altered). As mentioned above, the limestone units have been strongly recrystallized, and the argillites between and below the limestones are also hornfelses, some with coarse cordierites up to ½ to ½ inch long, producing a rock which weathers like the dalmatianite of the Noranda area. Green streaks of lime silicate hornfels are also present in them. The most puzzling feature of the hornfels zone is the absence of metamorphism of the argillaceous limestones where they overlie it. Rounded grains of scapolite are the only prominent metamorphic mineral occurring in them, although on the West Mountain, across from the camp, above the small cirque lake, a few dikes cut the argillaceous limestone above the thrust zone, and there zones of green diopside rock appear on their contacts. These evidences of metamorphism are limited, and for the most part this unit is relatively unaffected by contact metamorphism.

There are many dikes in the area, of three types. In the hornfels zone, near the intrusive stock, dikes of light coloured granite, from a few inches to several feet thick occur. A few of these appear to have steep dips, but many of them have a marked dip to the north. A wide diorite dike, with an irregular strike, cuts the thinly bedded hornfelses, with thin limy interbeds, just behind the camp. A similar dike, which may be connected with it, although there are no outcrops joining them, outcrops on the face of Hornfels Ridge, in the hornfels zone to the northeast, and appears to occupy a fault which has displaced the limestone band. A somewhat more basic diorite outcrops west of zone 6, and may be traced south to the top of the cirque head. Most abundant of all are the lamprophyres. These vary in character from dikes which resemble altered diabase or basalt to typical mica lamprophyres (minettes). They range in thickness from a few inches to 25 feet, and strike in almost all possible directions. Many of these dikes contai rounded pebbles of granite, some of which reach the size of boulders 3 feet in diameter. In others the granites have largely disintegrated, but are represented by corroded grains of quartz and feldspar, which give the weathered outcrop of the dike a sandy appearance. Some of the dikes appear to occupy fault zones, although they are, with one exception, apparently younger than the main faulting.

Quartz and carbonate veins are widely developed. Lenses or veins of quartz-carbonate up to 100 feet wide (apparent width) cut the argillaceous limestone on the crest of the ridge which forms the southwest limit of the map area. There are several such veins and lenses in this thrust block, and the float from these bodies, which weathers yellow (presumably the carbonate is ankeritic), colours the slopes of this ridge. There is virtually no mineralization visible in these veins. Similar coarse-grained, yellow weathering carbonate, with quartz, occurs in the argillaceous limestones, near their contact with the black argillite, at the south side of the map area, on East Ridge on the east side of the cirque. Veins of pure quartz up to 6 or 8 feet wide occur here also, and one lens of quartz, associated with one of these large veins, is patchily mineralized with chalcopyrite, sulphosalts, etc. There is an abundance of carbonate veins and stringers, some with a little chalcopyrite and copper stain, in the base of the thrust block of argillaceous limestone, just northeast of the Crest zone. Many shatter zones, shear zones, and some faults, are seamed with carbonate and/or quartz.

STRUCTURE:

The dominant structure in the Tintina Silver Mines area is anticlinal. The adit, and the mineralized zones 1, 2, 3, 4, 5, 6, 7, 8 and various subsidiary zones, occur in the limestones in the undulating crest of this structure. The anticline is complicated by the thrust block of argillaceous limestone which has been thrust over it from the southwest, and on the east by a series of minor folds, each of which itself appears to be complicated by still smaller folds. The complex fold pattern has been rendered still more obscure by cross-faults and by suspected thrusts, which can be observed in the outcrop locally, but which have to be inferred, for the most part, from anomalous relationships of the various units. To the north, the crest of the anticline, or a parallel one, is visible on the slope above the road from the camp to the adit. The structure can be followed to the northwest corner of the map area, but only the east limb remains, the west limb being hidden in the drift of the broad valley to the west of camp. The anticline may reappear to the west, in hornfelses on the West Mountain, but the structure here may be the effect of granitic stock, which crosses the valley at this point.

THE CROSS-SECTIONS:

A series of cross-sections has been prepared to illustrate the fold patterns. These cross-sections are drawn in a direction parallel to the cross-lines of the north grid (#2), and are spaced at intervals of 400 feet along the base line. South of the base-line # 2, on grid # 1 (south grid), the sections are drawn in the same direction, and are spaced at 500 foot intervals, with partial sections, showing the cirque basin, and East Slope, spaced at 250 feet from them. Thus for the area of greatest complication, there are effectively sections every 250 feet. The sections have been drawn on a scale of 100 feet to the inch, and are all drawn looking north.

For Grid # 2 there is a large amount of conjecture in the sections as drawn. Several features have to be explained. One is the very marked contrast in structure between the hornfels zone surrounding the granitic stock, and the lower area to the west. This will be referred to in more detail on a following page. Another is the broad extent of black argillite and hornfels derived therefrom which lies between the hornfels zone and the main limestone unit. In drawing the sections, it has been assumed that the width of the black argillite is due to repeated small folds in the underlying limestones, which maintain the limestone at a relatively shallow depth. The same effect might be produced by the presence of the granite at shallow depth. The metamorphism of the hornfelses and the presence of a few granite dikes in the black argillite and limestone support this possibility.

The displacement of the limestone outcrop to the north at lines 30 and 34 west have been interpreted as minor folds, although there is no evidence in the outcrop of the crests of these folds. It is possible that the limestones have been faulted rather than folded.

The minor fold at zones 11 and 11n is pretty well documented, as the crest appears to be exposed. The main anticline, as noted above, is exposed in the slope above the road to the adit. Only the flat west limb of the structure, in the lower limestone, is identifiable with certainty. The east limb appears to be represented by a very narrow band of sheared limestone, and by a right angled flexure in the hornfels-thin limestone outcrop just southeast of the camp. If this is just a minor crumple, and not the anticlinal limb, then the latter must have been obscured by faulting. I think the interpretation shown in the sections is probably the correct one.

Sections 8 + 00 and 4 + 00 W. show the first appearance of the major thrust. This is shown at the extreme left side of the section, and as a shallow plate at the base line. The latter has been introduced because of the almost complete disappearance of the black argillite between the limestone units and the argillaceous limestone to the east, and because of the highly contorted and carbonate-veined character of the argillaceous limestone in the assumed remnant of the thrust plate. It will also be noticed that at the extreme right of 36 + 00, 32 + 00 and 28 + 00 W., on Hornfels Ridge, the beginning of another segment of the thrust-mass on the summit is shown. There is very little evidence of faulting here, except for the strong shearing of the rocks, and the sharp discontinuity in apparent intensity of metamorphism. There is a marked change in attitude as well as lithology, although this is not very marked at the contact itself. This is thought to be the continuation of the fault block on West Mountain, across the valley; if it is the continuation of the block west of the cirque (mentioned above), there has been upwarping of the block (nearly 1000 feet), which I believe is the case.

The relationship between the hornfels block and the rocks (hornfelsed and unmetamorphosed alike) to the west and south is obscure. In a few sections, the contact appears to be occupied by a fault, and this may be the situation throughout. There is however, little direct evidence to support this view. The structure of the hornfels body will be discussed more fully later.

Apart from the appearance of the southwest thrust block, sections 0 + 00 W and AB are similar to those to the north. In CD I have carried the same structure through, but it is cut off by the east-dipping thrust fault, which also appears at the east side of AB, but now as a steep-dipping structure. This anomalous structure is discussed under "faulting". In the sections southeast from AB, the two limestone units appear nearly horizontal, slightly warped. Section CD shows two minor anticlines on the east-dipping flank of the structure, before it is cut off by a fault. The fault appears to outcrop on the nose of the east ridge, being occupied by a quarts vein, and brings the black argillite against a syncline of argillaceous limestone. Another syncline of argillaceous limestone lies just to the east, and to accommodate this, a rather large anticline in the black argillite and limestones (unexposed here) has been shewn as tapering out between them. The limestones and brown argillite (rather hornfelsic) outcrop at the base of the east slope on this section. On section EF a second thrust fault has been introduced below the above one, to account for the thickness of the black slate in this area. In section GH these two faults appear to come together, and the lower one is thought to be occupied by a dike or sheet of lamprophyre, which outcrops here. In the same section another fault (presumably thrust) appears near the crest of the east slope; it appears as a crush zone in argillite one or two feet wide, which can be traced for some distance in outcrop. It is assumed to be a thrust fault, again. Complicated folding is apparent in the limestones below the lower faults in this section, and the same pattern continues to the end of the series of sections. A syncline of argillaceous limestone appears at the crest of the ridge on EF, and thickens to an immense outcrop which continues out of the map area.

In KL the thrust faults begin to merge into one. In section MN the structure in the vicinity of the thrust is very complicated, due to a number of faults, some of considerable magnitude, but the direction of strike does not lend itself to representation on the section. In OP two new faults appear, one near the base of the east slope, the other a steep fault which is nearly in the plane of the section, marking the contact between the black argillite and argillaceous limestone for a part of its course.

BEDDING, CLEAVAGE and LINEATION:

Over 1000 measurements of bedding, cleavage, and lineation were made during the mapping. These have been plotted on stereographic diagrams. In order to compare the structures in the various parts of the map area, it was divided up into several areas, the East Slope Area, the Adit Area, the Thrust Block Area, the Saddle Area, and the Hornfels Area.

In the Adit Area, covering the cirque basin south of the Mineral Fault, the bedding planes were not easily observed. In a few outcrops of the intermediate argillite, vague traces of bedding could be observed, due largely to the weathering out of carbonate grains. In the limestones, beddinf is usually obscure, expect where, in a few outcrops, thin layers of argillite outlined it, or where the argillite limestone contact could be observed, or where there was reason to believe that the argillite had been barely stripped from the limestone surface by erosion. This surface has a curious corrugated, wash-board appearance. Bedding in the black argillites was never observable with certainty. Plotting the bedding on the stereogram gives a peculiar double girdle, probably due to warping of the fold axis. The striking feature is the essential continuity of the girdle of points, a feature to be expected in view of the broad, open character of the fold.

Foliation in the Adit Area shows a strong concentration (indicating predominant southwest dips) in the northeast quadrant, which is expectable with the strong overturning to the east. The reverse northeasterly dips which are noticeable, are probably due to the effects of faulting and possibly, of refraction of the cleavage at contacts. The dominant plunges are to the east, but there are a considerable number to the west. The significance of the westerly plunges is discussed under mineralisation. The lineation in this area consists of bedding-cleavage intersections, plunges of small folds, etc.

In the Saddle area, north of the Mineral Fault, the bedding poles are not distributed in a continuous girdle. There is a complete absence of intermediate northeast dips. There are many southwest to horizontal dips, and many steep northeast dips. Since many if not most of the bedding measurements were taken on the argillaceous limestone member, the moderately overturned small wave-length folds, with southwest dipping and near vertical limbs, result in this distribution of bedding poles. The cleavage pattern for this area is nearly the same as that for the Adit area. There is a small displacement of the cleavage maximum to the north here, and the only north dipping cleavages were found in black argillites. In general the black argillites have more irregular cleavage directions than the other units. An interesting feature of the argillaceous limestones in the Saddle area is the local occurrence of siliceous seams along the cleavage planes. These have been interpreted as "old cleavage", but in this area, there is no indication of a significant difference between these and the cleavages which lack these fillings. No significance can therefore be attributed to the "old cleavage" in this area.

In the East Slope area, bedding, particularly in the limestones, shows more scatter than in the Adit or Saddle areas. Probably the numerous faults in thi area account for this scatter. There appears to be a small gap in the girdle of bedding poles near zero dips. This is possibly due to the relatively small number of dips measured, but it is also no doubt a consequence of the fact that on the crests of folds such as those illustrated on the sections, flat dips are not characteristic, rather the crestal areas appear to be made up of many small compressed folds. The foliation poles have a similar distribution to the Adit and Saddle areas, and like the latter, most of the northeasterly dips are in black argillite. Lineations are similar in their distribution to the Adit area.

The bedding in the thrust block for the most part dips gently southwest, although there are some moderate to steep northeasterly dips, corresponding to the noses of the folds. The folding is strongly overturned, and although major structures are not visible Cornice Ridge, on the face of West Mountain, tight recumbent folds can be seen in the argillaceous limestone, confirming the type of folding represented in the cross sections diagrammatically and the evidence of the stereographic plot of the dips. The foliation, although in the same general direction as in the other areas, has a considerably shallower dip to the southwest, which is to be expected in the thrust block. So-called "old cleavages" were distinguished where possible from the general cleavage, and in this block show a considerably greater spread than does the general cleavage. This is taken to mean that the "old cleavage" has been displaced or even folded during the thrust movement. There is a considerably greater spread in the direction of the lineations in this block (and in the Saddle area) than in any of the other areas; in both it is conceivable that the variations result from differential movements on the thrust plane.

The Hornfels area displays a drastic difference in the distribution of bedding and foliation. Here both are restricted to steep dips, indifferently north and south. Thus, we have here a very different structural picture than in the rest of the map area. It is inferred that this is due to flow of the rocks, imposed on them during metamorphism and intrusion by the quartz monzonite. Where gentler dips occur, it seems probable that they are underlain by relatively flat intrusive contacts.

FAULTING

Faulting is responsible for much of the complication of the structure, and this is not made easy by the difficulty of identifying and tracing even major structures for any distance. Talus and drift cover many areas where major faults are suspected. and therefore the picture here presented is by no means complete

THE MAIN THRUST:

This structure does not definitely outcrop on the Cornice Ridge, although it does appear on Hornfels Ridge and on the face of West Mountain. It is believed to be visible near the end of the drive under the # 8 zone, where there are two main shears, intensely crushed, in black argillite, and probably many more minor shears. These shears, 3 feet apart, drilling from the end of the drive, indicate a variable dip 17° southwest, or less. There is, however, reason to suspect that the plane of the fault is considerably steeper than this (as it is on West Mountain), although locally it appears to flatten and even dip gently north, as for instance beneath the patch of the sole of the fault shown in the saddle. The rocks here are intensely veined with carbonate, shattered, and contorted. Locally shattering and veining is visible in the argillaceous limestone along the foot of the cliff east of # 8 zone. The presumed fault over the hornfels zone, however, does not show much contortion, only shearing is evident. On West Mountain also, where the contact is visible, it is tight, although there is some contortion in the argillaceous limestones and underlying argillites.

There is not any marked stratigraphic anomaly associated with this thrust on Cornice Ridge, or on West Mountain, for the argillaceous limestone lies mostly on the black argillite, which is believed to underly it in the normal stratigraphic sequence. The contact with the hornfelses is necessarily stratigraphically discordant. It is therefore thought that though the movement on this thrust may have been considerable, it has been largely restricted to the black argillite, where it has behaved as a glide surface. It is tempting to attribute this fault to the lateral displacement of the underlying formations caused by the intrusion of the quartz monzonite body; this hypothesis could be tested only by a regional study which was not possible in the present investigation.

OTHER THRUST FAULTS:

Another intensely sheared zone in black argillite is found underground, at station 1-14, where the argillite overlies the main limestone unit. The fault consists of several feet of intensely crushed, crumbly, carbonaceous material, and has a variable dip, probably about 25°, if it has the relationship suggested in the cross-section.

A series of branching thrust faults have been inferred from the geological relationships on the East slope. One of these faults, at least, can be seen in the outcrop, as mentioned earlier; others are occupied by lamprophyre, quartz veins, and silicified zones; two are also required by the disappearance of certain units, or unusual and otherwise inexplicable thicknesses of others. It should be emphasised that it is not known that these are thrust faults; where the fault appears in outcrop, it has a rough east-west strike and a southerly dip of 40°, which is not inconsistent with a thrust movement. Otherwise the dip and direction of movement has simply been inferred from the properties of the Main thrust.

THE MINERAL FAULT:

This very interesting structure appears to be a thrust fault at least on its westward extension. It was inferred from the abrupt change in structure between the limestones and black argillites exposed in the vicinity of zones 1, 2, 3 and 4, and the cliff of argillaceous limestone and black argillite just to the northwest. It is thought that there may have been a vertical movement of perhaps 300 feet, but this is sheer guess-work. There is considerable distortion and much carbonate veining in the argillaceous limestone near the fault. Its dip is unknown but is thought to be at least 40°. The fault appears to follow the creek downhill to the east. Where it is exposed in the creek bed, on the East slope, it is not particularly prominent, but consists of a brecciated zone perhaps 5 feet wide, healed with carbonate.

In this area, a measured dip of 67° to the east was obtained, and a lateral displacement of only 14 feet in the argillaceous limestone - black argillite contact was determined. It is thought likely that as the fault curves to the south the displacement increases and becomes more characteristically a thrust fault. It may be a hinge fault, for downhill to the east the displacement appears to increase and to be in the opposite sense from the movement in the adit area. I suspect that this fault, which dips in the wrong direction for a thrust fault, if it has been formed at the same time and under the same stresses as the Main thrust, resulted from the resistance of the relatively thick limestone units in the Adit area. These warped only slightly, instead of folding incompetently. To the north of the fault, the limestones may have been thinner, and become more strongly plicated due to the intrusion of the quartz monzonite plug. This, of course, is only a theory; but we do know that the limestones vary rapidly in thickness, and this mechanism would account for the presumed direction of movement, opposed to that of the main thrusting. The apparent change in direction and amount of movement as it is followed downhill to the northeast, is probably due to the thinning, and more intense folding of the limestone beds to the east.

The extension of the Mineral fault to the south is not known, disappearing, as it does beneath talus from the Cornice ridge. Minor faults and strong joints in the south face of the ridge (# 8 zone cliff), which strike south to southeast and dip east may represent the continuation of the fault, but they do not appear to continue across the ridge.

The Mineral fault is an interesting structure in that mineralised zones 1, 2, 3 and 4 occur close to it, in the supposed hanging wall, zone 9 occurs in the footwall, and the Fall zone occurs in the fault itself. Also of interest is the behaviour of two large lamprophyre dikes which strike into the fault zone. Here they splay out into a number of narrow, irregular dikes, apparently because of shattering along the fault. It seems necessary to conclude that they are younger than the fault, like the mineralization.

TRANSCURRENT FAULTS:

Transcurrent faults are recognizable in most parts of the map-area. They were most abundantly observed in the East Slope area, probably because of the good exposure and more rapid lithological changes. A stereographic plot of strikes and dips indicates considerable variation but a majority of these faults appear to strike northeasterly and dip south. The displacement in the majority of these structures is only a few feet, where it is measurable. The movement on these structures is variable; in most the south side appears to have moved west. In some, changes in thickness of units across the faults suggests that vertical movements is considerable.

MINERALIZATION

There are several types of mineralization in the area. The mineralization which was the object of development during the spring and summer of 1962 was silver-lead-zinc consisting predominantly of sphalerite and galena. Pyrite is erratic in its occurrence, and chalcopyrite rather spasmodic. The silver is thought to be chiefly in the form of freibergite. The mineralization is in part in massive lenses and streaks, in part in rather streaky disseminations. The country rock in this type of mineralization is one of the limestone units or the argillaceous limestone.

Quartz stringers and lenses, usually striking roughly east-west, and dipping south, occur in the cirque south of zone 6. The quartz is irregularly mineralized with galena, sphalerite, pyrite, chalcopyrite, and sulphosalts. They vary from an inch or two to 2 feet thick, and unfortunately carry only low values in silver. The stringers at # 7 zone, and related streaks of mineralization to the west, strike in the same direction as the quartz veins, but are in limestone, while the quartz veins are in argillite. Disseminated mineralization was intersected in one drill hole in the limestone. Similar, erratically mineralized quartz veins, one a lens up to 5 feet wide, occur on the east boundary of the claim group. Good values are obtained from well mineralized samples, but chip samples across the wide vein gave only low assays.

A little chalcopyrite occurs locally in carbonate and quartz-carbonate veins associated, apparently, with the sole of the thrust block. Veinlets up to 4 inches thick, heavily mineralized with chalcopyrite also occur west and below the quartz veins on the east boundary of the claim group. None of these appears to have any economic significance.

A vein heavily mineralized with arsenopyrite occurs in brown hornfels northeast of mineralized zone 13. This mineralization does not appear to contain values of interest. Disseminated arsenopyrite is widely distributed in the brown intermediate argillite west and north of the adit. Samples of this were assayed, but contained negligible amounts of gold.

Near the contact of the quartz monzonite, limestone bands and patches in argillite are rimmed with pyrrhotite, which is generally quite massive. Pockets and disseminations of pyrrhotite are widespread in hornfelses and lime-silicate bands, but they appear to lack economically interesting minerals such as chalcopyrite or scheelite.

The mineralization may also be classified on the basis of structure and country rock, as follows:

1. lenses, pods, and disseminations in the upper and lower limestone units, at the contact with overlying argillite (either black argillite or the brown intermediate argillite). Includes zones 1,2,3,4,5 and F, 11,

lln, Sidehill, and possibly 6.

2. streaks and disseminations along shears in the two limestone units (zones 7, 5a, 5b, 6 (in part), 6e, 12, 13, 15) and in argillaceous limestone (zones 9, Fall) associated with the Mineral fault.
3. Masses, bands, streaks and disseminations in sheared and fractured, generally gently dipping thrust fault zones in the argillaceous limestone (e.g. # 8, Cornice, Ridge, and West Mountain zone).
4. Fracture fillings, usually narrow, but locally widening into blobs up to [illegible] feet in diameter, in the upper limestone unit (# 7 zone)
5. Narrow quartz veins erratically mineralized, as described above (at [illegible] cirque, in argillite and argillaceous limestone, and at west boundary of property).

The direction of mineralized zones (excluding zones 1, 2, 3, 4, and 5) were plotted on a stereographic net. They have a similar distribution to fault directions, which is not really surprising since all the [illegible] measured occur in sheared, fractured, or faulted structures.

DESCRIPTION OF INDIVIDUAL MINERALIZED ZONES:

Zones 1 and 2:

Mineralization occurs in the upper limestone unit, just west of the contact with black argillite. Massive sphalerite and galena is exposed in a rock trench on this zone. Surface sampling in the fall of 1961 was restricted to packsack drilling. Assays from this drilling were generally low, except for a few short high-grade sections. In the summer of 1963, 4 vertical holes were drilled through the mineralized section. Assay results, as reported by [illegible]insworth, again were generally low, but there was one high-grade section 1 foot thick. There is some silicification or silication at the contact of the limestone and argillite.

Zone 3:

The mineralization occurs in limestone, around its curving contact with a small syncline of overlying black argillite. Assays of 40 to 50 oz. Ag. were obtained over widths up to 7 feet in three trenches in the 1961 program. No further work was done on these showings during the summer of 1962.

Zone 4:

Three trenches were put down on mineralization in limestone on the north side of the same syncline of black argillite in 1961. Three packsack drill holes were also drilled at that time. Except for two short sections, values were generally lower than in zone 3. Two packsack holes, 15 and 17, drilled close together, intersected interesting values, up to 92.7 oz. Ag., at a depth of about 20 feet. Limestones bordering the argillite south of # 4 zone are unmineralised. Thus the prospects of finding mineralization in commercial quantities beneath the black argillite capping do not seem particularly promising.

Zone 5:

This zone is a crescent shaped mineralised area, in the lower limestone unit, apparently just below the overlying argillite, which outcrops just to the east of the east side of the crescent. Best assays and widths were obtained from a trench at the center of the crescent. As Rainsworth has reported, the zone does not appear to extend much below the outcrop.

Zone 5a:

A mineralized section was encountered underground in the 101 and 102 crosscuts. In the latter, the mineralization was unusual in its siliceous character, and in the relatively high silver, and low lead and zinc. On surface, a discovery of float lead to the uncovering by trenching of about two feet of sulphides and mineralized quartz, striking in approximately the same direction as the 5a underground.

Zone 5b:

A shear zone along the side of the limestone outcrop was revealed by trenching to be at least 2 feet wide. It was mineralized with galena and sphalerite. Similar mineralization was found about 25 feet to the south, in a cleft between limestone outcrops. The shear strikes about 110° and dips about 70° S.

Zone 6:

This mineralization again is located in limestone at the contact with the overlying argillite. As mentioned by Hainsworth, drilling from underground indicates that this contact is quite flat. The situation is complicated by the presence of a vein or lens of quartz, 1½ to 3 feet thick. Since the vein was not encountered underground, it is probably only a lens. Some good values were obtained from this mineralized zone (up to 174.9 oz. Ag.), in 1961.

Zone 6a:

This zone was discovered during mapping in 1962. It has been exposed by trenches over a length of about 70 feet, direction about 100°. At the west end, 2 feet of heavy galena and sphalerite are exposed on the edge of the outcrop. Intermittent occurrences of mineral were found to the middle of the zone, where scattered lenses of sphalerite and galena occur over a width of at least 5½ feet in sheared, argillaceous limestone. At the east end of the shear, a trench revealed about 2 feet of weathered sphalerite and galena.

Zone 7:

This consists of two parallel seams of sulphide in the lower limestone unit, for the most part a few inches wide, but locally widening out to 1 foot. The strike of the seams is 76° to 78° and the dip is vertical or steep south. High assays, up to 149 oz. Ag., were obtained in 1961 from narrow widths (up to 6 inches) on this zone. Similar narrow seams, with local expansion into pods a foot or two thick, occur on the same outcrop as # 7, to the west.

Zone 8:

The # 8 zone differs from all those hitherto described in its location in the highly contorted argillaceous limestone above the thrust on the Cornice ridge. The mineralized zone strikes about 140°, has an undetermined dip, probably less than 40° to the southwest, and an exposed length of nearly 400 feet. The mineralization is very irregular, consisting of streaks and lenses of massive sphalerite and galena, from a few inches to 2 feet or so wide, apparently cutting across the schistosity, and streaks and disseminated zones parallel to the schistosity. There is a few mineralized quartz veins, one with chalcopyrite. Widths range from a few inches to as much as 20 feet, but in the larger widths, bands essentially unmineralized occur within the zone. Measurements of strike of individual lenses and streaks range from 75° to 165° and dips from 29° SW to steep south. It is unlikely that these represent the strike and dip of the zone as a whole.

The irregular distribution of the mineralization makes the problem of sampling a difficult one. A further difficulty is that since the true dip of the zone is not known, the true width is also not certain. It seems that the only way in which an accurate idea might be obtained would be to bulk sample the zone, by means of a number of surface pits. One of these could be sunk to a sufficient depth to get some idea of the attitude of the zone as a whole.

Zone 9:

This rather short zone is found on the footwall of the Mineral fault, in argillaceous limestone. A width of 8 feet of siliceous mineralization is exposed in one of the trenches. Good values were obtained in two of the trenches on this zone in 1961. Another zone, possibly an extension of # 9, was uncovered in 1962 about 50 feet to the south. It strikes about 125° and has an exposed length of 29 feet. A chip sample, of sphalerite and galena, over 1.3 feet yielded 8.2 oz. Ag., 12.2% Pb., and 7.9% Zn. on assay.

Zone 10:

This small exposure of mineralization is believed to be in the upper limestone unit. It may be in a large boulder.

Zone 11:

This is a rather irregularly mineralized area in limestone and contact metamorphosed limestone, where the contact of limestone and argillite is transected by a diorite dike.

Zone 11n:

Along the contact between the brown intermediate argillite and the limestone, apparently folded into a small anticline, a quartz vein nearly 20 feet long and a little over a foot thick, together with silicified limestone, is mineralized with galena, sphalerite and pyrrhotite.

Zone 12:

This is a vein-like series of lenses of massive sulphides, striking at 65°. Some disseminated sulphide occurs in the limestone walls, and in contact silicates along a pegmatite dike, which cuts across the zone. Maximum width of mineralization is about 2½ feet, exposed length about 22 feet.

Zone 13:

This zone is located in recrystallized, sheared, silicated limestone. The mineralization, as elsewhere, consists of massive lenses and veins, and disseminations. In one trench, some 9 feet of mineralization is exposed. Five inches of massive galena and sphalerite at the east end gave 31.2 oz. Ag., 8.3% Pb., and 23.4% Zn. A chip sample over eight feet, from there to the end of the trench, gave 9.8 oz. Ag., 3.1% Pb. and 2.6% Zn. A massive section 8" thick at the west end gave 31.4 oz. Ag., 14.3% Pb., and 7.8% Zn. At the south end of the same outcrop, a 6" thick seam of massive sphalerite gave 11.0 oz. Ag., 4.4% Pb. and 26.0% Zn. Trenching off the ends of the outcrop with the bulldozer failed to locate bedrock.

About 250' to the east of this showing, on the north side of a prominent limestone knob, seams of massive sulphide up to 13" wide, and a few feet long were trenched during 1962. An assay over 13" of one of these gave 9.56 oz. Ag., 6.4% Pb. and 6.0% Zn. A narrow vein of arsenopyrite, 250 feet northeast of zone 13 gave .04 oz. Au., no silver.

Zone 15:

It is not certain if this mineralization is in place. It was opened up in 1961, and appears to consist mostly of seams of sphalerite and galena along fractures in crystalline limestone. Trenches were made with the bulldozer in the vicinity of the showing, but no definite outcrop was encountered, and very little further mineralization.

Zone F:

This zone of quartz and sulphides is about 2 feet wide, strikes 157° and dips 62° W, in a small outcrop of the upper limestone unit.

Cornice Zone:

This is located in talus between 5900 and 6000' on the Cornice ridge. It is difficult to know the trend or dimensions of this mineralization because of the heavy talus and the presence of permanently frozen gossan. There are lenses of massive sulphides and streaks and patches of sphalerite, in shattered argillaceous limestones. A chip sample over 2.1' gave 6[illegible].8 oz. Ag., 40.8% Pb. and 19.8% Zn., while a grab sample of heavy sulphide gave 38.8 oz. Ag., 51.4% Pb. and 17.7% Zn.

Fall Zone:

This is located on the East Slope, in the bed of the creek, in a breccia zone on the Mineral Fault. The sphalerite occurs in seams and fractures in the argillaceous limestone. The mineralized zone appears to have a length of about 1[illegible]0 feet, although most of it is inaccessible because of the steepness of the slope. A grab sample from the bottom of this zone gave 37.0 oz. Ag., 20% Pb. and 38.9% Zn.

Ridge Zone:

Trenching in the vicinity of a prominent occurrence of mineralized float, revealed argillaceous limestone, much fractured, and seamed with sphalerite veinlets. A chip sample over 1.6 feet in this zone gave 12.3 oz. Ag., 14.1% Pb. and 13.3% Zn. The mineralization does not appear to be very extensive, although the outcrop is heavily mantled with talus here, so that clear exposures are few.

Sidehill Zone:

This zone was opened up in 1961, and the trench reveals a 3 foot lens of heavy sulphides, apparently in the upper limestone unit. A 3-foot chip sample of this showing gave 10 oz. Ag., 6.2% Pb. and [illegible] Zn. Outcrop extends for 60 feet southwest of the showing, but no further mineralization appears in it.

West Mountain Zone:

This zone was discovered late in August 1962. It is well exposed on virtually bare rock on the mountain side, easily and safely accessible when the snow is gone. The mineralisation is rather irregularly and erratically distributed over an area at least 400 feet long and up to 100 feet wide at its western end. It is located at the contact (believed to be a thrust fault) of argillaceous limestone and black argillite, in this respect strongly reminiscent of the # 8 zone. It appears to be located at a warp in the thrust plane. The mineralisation is varied in character; some is associated with silicified material. Some very striking mineralization contains pyrrhotite. Eleven chip and grab samples were taken from various lenses and bands of ore. Silver assays were generally low, the best being 14.7 oz. from 2.8 feet of massive galena and sphalerite. The longest chip sample taken, over 42 feet, gave 2.00 oz. Ag. A chip sample over 3.1 feet of massive sulphides gave 9.22 oz. Other assays were less than this. The most significant consideration regarding this mineralized zone is the similarity to the # 8 zone, indicating that the base of the thrust block of argillaceous limestone is a favourable location. for mineralization.

QUARTZ VEINS AT HEAD OF CIRQUE:

There are 10 or 11 veins in this category, mineralized with galena, sphalerite, pyrite, sulphosalts, and locally, chalcopyrite. They range in thickness from an inch or two to 2 feet, averaging perhaps 6 inches. They strike in a general east-west direction, and dip to the south. All are located in argillite above the lower limestone unit, except one lens to the southeast, which is in argillaceous limestone of the thrust block. For the most part assays from these veins were disappointing. The best was from a vein containing massive galena, of which only a few feet are exposed, viz. 79.0 oz., with 52.4% Pb., over 5½".

VEINS ON THE EAST BOUNDARY:

These veins were visited by helicopter with Nels Hals. The main showing consists of two lenses of quartz, one 3 feet wide and 9½ feet long, striking 93° and dipping 70° south, and another, 9½ feet north of this, 5 feet thick and 19 feet long, striking at 95° to 115° and dipping 54° S. A streak of heavy sulphide mineralization extends north along the hillside for a few feet, from the west end of the lens. A chip sample over 5.8 feet of the large lens gave only 0.46 oz. Ag. and a trace of gold, although it contained well-mineralized streaks. A grab sample of the well-mineralized streak to the north gave 17 oz. Ag. and .06 oz. Au. Another vein (possibly a boulder) outcrops to the east, across a small stream.

THE CONTROLS OF MINERALIZATION

There does not appear to be any well-defined zoning in the mineralization so far discovered. It is true that the West Mountain zone, so similar otherwise to the # 8 zone, appears to have much lower silver values than the latter, and it is much closer to the quartz monzonite intrusive. On the other hand, the mineralization in zone 13 seems to carry just as much silver as zones much farther from the granite. It occurs in recrystallized and silicated limestone, enclosed in hornfelses, suggesting that the quartz monzonite is not far away.

The main structural environments of mineralization have already been summarized. Two structures seem to be associated with a majority of the mineralized zones; one of these is the Mineral fault. Close to it are zones 1, 2, 3 and 4, and possibly zone F. Zone 9 and the Fall Zone appear to be actually in it. It is tempting, then, to regard this structure as a major line of movement of mineralization. For this reason, in any future program of development, the intersection of this fault, particularly with the lower limestone unit, should be probed by drilling.

The other important structure is the thrust fault or dislocation at the base of the overthrust argillaceous limestone. In this structure, or close to it, are the # 8 zones, the Ridge zone, and the West Mountain zone. The Cornice zone occurs some distance above the sole of the Thrust, but it is impossible to deduce the shape of this sole, and it may be much closer to the thrust plane than is evident from the surface geology or suggested in the cross-sections. It seems likely, from the fracturing and strong folding along this thrust, that irregular zones have been made accessible to mineralizing solutions in this way. Since the overthrust argillaceous limestones are extensive, it appears that a considerable length of favourable contact remains to be prospected. Unfortunately, much of this contact is obscured by drift and slide-rock, so that the task of finding more mineralization is not likely to be an easy one.

Other mineralised zones appear to be related to minor shears in the limestone units; among these are 5a, 5b, 6a, and 7. Except for 5a, underground none of these appear to offer any prospect for profitable development.

The mineralization in zones 10, 11, 11n, 12, 13 and 15 seems to be patchy and erratic. In zone 13, to be sure, a fair width of mineralisation appears to be exposed, but it appears to peter out in both directions on the outcrop; overburden is thick and hampers prospecting. Prospects do not look good for this section, as there appear to be no pointers to a target area.

One feature which seems to be shared by a number of mineralized occurrences is the local reversal of plunge of lineation. These reversals are found particularly along zone # 8, but there are also some indication of reversals near # 3, # 4, # 5, # 6, # 7 and # 9 zones, and the Ridge, Sidehill, and Cornice zones. Zones 11, 11n and 12 on the other hand, are characterized by normal easterly plunges. In addition to this, there is some suggestion that there is a flattening and even slight recurving of the thrust-fault surface just below the mineralized zone on West Mountain, although the plunge of minor folds above the zone appear to be to the east. There are one or two places where reverse plunges were observed, and no mineralization is known to exist. It is possible that such places might warrant further investigation.

Toronto, Ontario.
April 19, 1963.

W. W. Moorhouse, Ph. D.