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OBSERVATIONS

on the

GEOLOGY, STRUCTURE AND MINERALIZATION

of the

CORONATION ZONE POLYMETALLIC HORIZON

LARA PROJECT

1988 UNDERGROUND EXPLORATION PROGRAM

by

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Summary

An underground exploration program was completed over the Coronation Zone polymetallic horizon during the months of May to September, 1988. Numerous discoveries were made with regard to the structural characteristics and geological peculiarities of the deposit, which are summarized in this brief report.

It was confirmed that several potentially economic, continuous pods of zinc and gold rich mineralization were present along the Coronation Trend. The origins of the deposit probably lay with Kuroko-style mineralization, although extreme cataclasis with its attendant remobilization and recrystallization effects have obscured most of the primary sulphide textures.

The Coronation Zone encountered during the underground program was divided into four distinctive structural and lithological domains, which differed from each other with regard to structural complexity, and mineralization styles and content. Sheeted, low-angle thrusting, followed by a later episode of high-angle crossfaulting, dominated the structural picture.

It was hoped that the information contained in this report could help in the future geological interpretation of drillsections within this complex mineral occurrance, and would provide a sound basic understanding of the geometry of the deposit at the 600m level.

Respectfully submitted,

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1. Introduction

During the period of May to September, 1988, an underground exploration program was completed on the Coronation Zone polymetallic horizon within the LARA property, located roughly 15 miles west of the village of Chemainus, B.C. The exploration crew was staffed by geologists from Abermin Corporation for the duration of the underground work.

Primary objectives of this project were to confirm the presence of potential economic widths of gold and zinc rich Kuroko-style mineralization identified by Abermin's surface drill programs, and to investigate the overall geometry and structural characteristics of the ore system. It was understood that this program was not intended to locate additional ore reserves, nor to move drill-indicated ore from possible-probable to proven catagories. It was hoped that the information drawn from this project could aid in the future interpretation of drill intersections within this complex mineral occurrance.

The program involved accessing the target mineralization by a combination of downramping and crosscutting, followed by drifting on the orebody and crosscutting at 25m intervals. Four raises were driven up the ore to aid in the resolution of past drillsection interpretational difficulties, and to confirm the updip continuity of the massive sulphide facies. The new workings were carefully mapped and sampled by a variety of techniques which were designed to overcome the structural and mineralogical peculiarities of the zone.

This report deals mainly with the results and conclusions drawn from the geological mapping section of the project. Preliminary assay trends are also discussed. Current budget constraints did not allow for a detailed analysis of the various sampling methods and overall assay repeatability trends.

2. Program Targets and New Workings Descriptions

Polymetallic mineralization of potentially economic grades and widths within a felsic volcanic package was identified on the LARA property during the years 1982 - 1987 by a combination of humus sampling, trenching and surface diamond drilling. In the fall of 1987, a decision was made by the directors of Abermin Corporation and Laramide Resources Ltd. to conduct a program of underground exploration and bulk sampling on the most promising of a group of three polymetallic horizons in the southeast of the property, known as the Coronation

Zone. The zone was assumed to be stratiform and to contain variably-spaced high-grade sections along its 2km-long, strongly mineralized trend.

The zones of interest were accessed on the 600m level by a footwall-side ramp and crosscut (1-3630EXC). Headings were then driven simultaneously to the west (with the intention of drifting on the ore) and to the east (with the view to drifting 10 metres to the south of the mineralized section within the footwall assemblage, followed by drilling and then advancement of northwest-trending crosscuts. The crosscuts and raises bear the name of the easting coordinate at which they were collared.

The initial 50 metres of the West Drift were diven in the northerly hangingwall rocks, with the mineralization being intersected by two southeast-trending crosscuts (1-3606EXC and the 1-3578EXC). The mineralized horizon was picked up by the West Drift 10 metres to the west of the 1-3578EXC and was followed westwards to the 1-3442EXC location, where the drift was halted in strongly pyritic mineralization. Seven more crosscuts were driven perpendicular to the West Drift at 25 metre intervals. Three raises were driven up the ore on this west side : the 1-3602E RSE, collared in the 1-3606EXC and driven directly updip on the ore for 15 metres, and the two 1-3577E RSES, a Y-shaped configuration of raises collared in the 1-3578EXC and driven to the west and east obliquely up the mineralization for 25 metres each.

The East Drift was advanced to the east of the 1-3630EXC within footwall rocks for roughly 80 metres, where it was halted in barren quartz-eyes rhyolite of uncertain stratigraphic position. After drilling 10 horizontal diamond drillholes to the north of this heading into the mineralization, three crosscuts (1-3653EXC, the 1-3672EXC and the 1-3690EXC) were advanced along the line of drillholes 88-UG-3, 88-UG-5, and 88-UG-7 respectively. A series of upholes were also drilled to test the mineralization above the 600m level between the positions of the 1-3653EXC and the 1-3672EXC. Following indications of high grade mineralization by these crosscuts and diamond drillholes, two raises were driven up the ore : the 1-3661E RSE, collared in the 1-3653EXC and driven directly updip for 15 metres, and the 1-3675E RSE, collared in the 1-3672EXC and driven obliquely updip on the ore to the west for 25 metres.

3. Geological Mapping Programs

Special emphasis during geological mapping was placed on the recognition of discrete structural domains and faulting patterns, as well as careful visual appraisals of sulphide content and mineralization styles.

All advancing faces of the West Drift were mapped at a scale of 1:100. The back and ribs of the advancing round were also mapped up to 5 metres back from the face, to ensure at least a two metre overlap between mapped rounds for later ease of compilation.

The back and ribs of the East Drift and all crosscuts were mapped at a scale of 1:100 and 1:50 respectively, after the completion of their advance.

The ribs of all raises were mapped during raise advance at a scale of 1:50.

Composite maps of all new headings were then compiled from this mass of data to produce 1:100 scale geological level plans, and 1:50 scale level plans of crosscuts and sectional elevations of raises. Continuous sections of rib geology were constructed for the 1-3661E RSE and 1-3602E RSE, while continuous views of footwall geology only were compiled for the 1-3675E RSE and the 1-3577E RSES.

Occassional difficulties were encountered during the compilation of these maps due to a lack of standardization amongst the project geologists with regard to mapping techniques. However, these problems were largely overcome by the limited remapping of problem areas.

4. Underground Sampling Programs

Underground sampling of the Coronation Zone mineralization was carried out in four separate ways, discussed in detail below:

4.1 Muck Sampling : Random sampling of an entire round of advance was conducted to ascertain whether this method could be of use in obtaining a value for the accurate grade of a particular round. It was also intended that the results from this type of sampling would confirm those obtained by other sampling methods.

Due to the heterogeneity of the lithologies and mineralization being sampled, roughly 275 kg of fist-sized pieces of muck were randomly collected from each round. This large sample was subsequently reduced using a Jones splitter to roughly 35 kg, which was carefully dried and crushed to pea-gravel size. A final size reduction was conducted by Jones splitter to produce three 500 g splits, each split being assumed to be representative statistically of the entire round of advance. Comparison of the assay results returned for the three splits was then carried out to determine element repeatability. Random splits were also analysed for metallics to determine whether a coarse-gold problem is present.

Although every attempt was made to keep the selection of sample material random and thereby representative of the entire round, it was eventually recognized that only a low degree of confidence should be placed on the accuracy of results acheived from this sampling method due to :

(i) the observed propensity of the muck sampling crews to select finer sample material over the coarser fraction, possibly biasing the final result;

(ii) the recognition of a stockwork-like, cataclastic overprint on the primary sulphide facies, which introduces the existance of localized zones of Au-Ag enrichment and coarsely crystalline remobilized sulphides.

It is therefore unlikely that a 500 g sample would be truely representative of the muck from an entire round.

4.2 Testhole Sampling : Horizontal, jackleg-driven testholes, up to 8 metres long, were drilled into both ribs of the West Drift at 5 metre intervals, to gain a rough idea of the total extent and approximate grade of mineralization not exposed by the West Drift opening, and to check for the presence, within the range of the jackleg, of parallel zones of polymetallic mineralization within the footwall and hangingwall assemblages.

Sludge-water samples were collected from each testhole at four foot intervals, resulting in about 2 kg of sludge and 25 l of muddy water per sample. The samples were then allowed to settle for about 18 hours, at which time the clear water was decanted off. The final sample was then analysed as usual.

It should be borne in mind that although care was taken in the collection of these samples with regard to flushing out the holes between sample runs, etc., it was again later recognized that the results of this particular sampling method could only form a rough guide for sulphide contents and grade since :

(i) testhole sampling was usually not carried out under the direct supervision of the onsite geologist, and was therefore subject to occasional careless handling of the equipment and samples;

(ii) the horizontal directional bias of the jackleg testholes makes this sampling method ineffective in areas of low-angle thrusting.

4.3 Diamond Drilling : In addition to the surface and underground drilling used strictly to locate the position of mineralization boundaries, NQ drillholes were also cored along the intended line of advance of crosscuts 1-3653EXC (88-UG-3), 1-3672EXC (88-UG-5), and the 1-3690EXC (88-UG-7), as well as up the intended line of the east-trending 1-3577E RSE (88-UG-10). This pilot drilling allowed direct comparisons to be made between 'drilled grade' and 'mined grade' (drill-indicated results vs. a combination of muck and chip sampling results).

4.4 Chip-channel Sampling : Chip samples were collected from the face of each advancing round of the West Drift, from both ribs of the crosscuts, and from one rib of each raise (the rib being chosen as the one to be sampled if it was perpendicular to the strike of the mineralization).

A number of conditions peculiar to the Coronation Zone mineralization made accurate estimations of grade with simple, systematic, waist-height sampling inappropriate. These included:

(i) structural dislocation and rotation of fault-bounded blocks of rock with differing mineralization characters;

(ii) preferred orientations of high-grade sulphide pods due to primary banding or cataclastic fluxion textures;

(iii) folding and remobilization of primary sulphide bands within fault-bounded 'panels'.

To reduce the effects of these constraining factors, 'panel sampling' was adopted as the most suitable sampling technique. A single 20 cm-wide band of rock was carefully channeled across a sampling 'panel', defined either by structures or by noticeable changes in lithology of mineralization contents or character, resulting in a 3 to 5 kg sample. The 20 cm sampling channel was oriented perpendicular to any observed banding orientations seen within the panel, and care was taken to ensure that the sample collectedwas representative of the entire channel width (i.e. equal amounts of material from each section of the sampled band comprised the final sample). This sampling method operates under the assumption that assay result obtained from the analysis of material taken from the 20cm band is representative of the grade of the entire 'panel'.

Since the location and mineralization character of these chip samples were tightly controlled, important information could be discerned from the chip assay results with regard to grade vs. preferred host lithology, % visual sulphides, etc. It was also assumed that, in the absence of mill tests, chip sampling provided the best method available for grade estimation.

Only fair to moderate repeatability of assay results occurred when individual panels were resampled. This could be due to a number of reasons, which may include:

(i) careless sampling (a lack of standardization of sampling equipment, differing sample volumes, etc.);

(ii) inherent lithological or mineralogical heterogeneities in the panels being sampled (coarsely fragmental nature of the host rock, remobilization effects, cataclastic stockwork overprinting, etc.)

5.Lithological Overview

A detailed picture of the regional setting of the lithologies encountered underground may be found in Abermin's 1987 Final Report (Kapusta et al).

A lithologically variable sequence of felsic flows and tuffs of the Devonian McLaughlin Ridge Formation, Sicker Group, hosted the Coronation Zone polymetallic mineralization. Rock types encountered could be grouped into six catagories, as discussed below :

5.1 Footwall Assemblage : Rocks which formed the southerly footwall to the mineralized target horizon consisted of light grey to cream rhyolites, characterized by the presence of coarse-grained quartz-phyric and feldspar-phyric porphyries. The quartz-phyric porphyries were distinguished by their high degree of competency relative to the mineralized horizon or its hangingwall rocks, and by the presence of up to 30% elongate quartz-eyes. Feldspar porphyries were similar in competency and appearance to the quartz-pyhric units, containing up to 25% altered feldspar phenocrysts and usually less than 10% quartz-eyes.

The quartz and feldspar porphyries were generally massive, although in places (e.g. at the collar of the 1-3672EXC) there was evidence of tight folding with local ptygmatic folding of quartz-chlorite microveins within the otherwise massive-looking groundmass. Contacts between the quartz-phyric and feldspar-phyric units were difficult to recognise underground, with only broad textural and compositional differences allowing for their distinction.

The normally massive footwall sequence was discovered to contain a persistent bedded chert-sulphide horizon, up to 1.5 metres wide, visible roughly 5 to 6 metres south of the southern limit of the Coronation Zone mineralization, from the 1-3606EXC to the 1-3486EXC - a total strike length of at least 150 metres. The presence of this diastemic unit is highly significant, since it indicates that earlier extrusions of mineralizing fluids have taken place prior to the formation of the Coronation Zone (i.e. the possibilty exists for the presence of closely-stacked polymetallic horizons).

5.2 Coronation Zone Host Assemblage : The host rocks to the Coronation Zone consisted of a texturally variable sequence of crystal tuff, lithic tuff, and localized possible slump or debris-flow material.

The assemblage was structurally less competent than the footwall or hangingwall rocks, with most regional strains being expressed within the sequence in the form of complex microfaulting, open folding, and localized cataclastic brecciation zones and fluxion structures. The contact with the footwall assemblage was usually sharp, with poddy, impersistent grey gouge representing the marked competency contrast. Contacts with the hangingwall sequence were variably gradational (1-3606 EXC), to irregular (1-3653EXC) to extremely sharp, with the ubiquitous 'hangingwall fault swarm' appearing to drift back and forth across the gradational contacts.

The presence of irregularly distributed fragmental or volcanic-brecciate zones proved to be a complicating factor with regard to obtaining reliable representative chip samples from these sections. Angular blocks of coarse-grained, barren-looking rhyolite and lithic tuff were commonly enveloped by a disrupted-looking, banded and partially remobilized sulphide matrix, with no preferred orientation to the jumbled mass of fragments. These units probably comprised up to 15% of the total host rock assemblage.

5.3 Hangingwall Assemblage : The rocks which formed the immediate hangingwall to the Coronation Zone were a distinctive assemblage of fine-grained and well-foliated, crystal-ash tuff with small (less than 2mm) quartz-eyes comprising up to 15% of the total rockmass. Fine pyrite laminations and hairlike pyritic stockworks were common for up to 5 to 6 metres to the north of the northern polymetallic extremity (easily seen in the northern portions of the 1-3530EXC).

5.4 Sedimentary Units : These units comprised about 2 to 3% of the rocks observed underground. A 0.5 to 1 metre band of sediments was noted in the 1-3606EXC and 1-3578EXC roughly 4 metres south of the southern Coronation Zone limit, within the footwall assemblage. Here, thin argillite bands were closely intercalated with glassy, chert-sulphide bands; a weak polymetallic signature was obtained from this section. A similar exhalative horizon was noted in the footwall rocks from the 1-3552EXC to the 1-3486EXC, although it distinctly lacked argillaceous material.

5.5 Intrusive Rocks : The felsic volcanic package was cut by a number of mafic intrusions. The intrusions ranged in thickness from only a few cm to over 3 metres, commonly branching, anastomosing, and filling convenient voids and major structures. The majority of these intrusives were probably part of the feeder system of the Triassic Karmutsen Formation.

The rocks were generrally dark green, medium-grained, highly chloritized and carbonate-rich, with their original igneous fabrics being largely obscured by alteration and cataclasis.

5.6 'Tuff-dyke' Units : It is uncertain whether these rocks are of igneous or sedimentary affinity. The pale brown to buff-coloured, fine-grained and poddy unit was seen to be intimately associated with the stratigraphic position of the Coronation Zone horizon. In some areas, the rock displayed a fabric similar to a contorted metasediment; in other areas, igneous features were exhibited such as chill margins, relatively fresh appearance, remobilized quartz-carbonate sweats and sulphides along its contacts, and in the case of the 1-3442EXC, a seemingly discordant nature to the upper contact of the polymetallic mineralization.

The 'tuff-dyke' unit comprised roughly 3-5 % of the total rockmass observed.

6. Structural Overview

The felsic volcanic package has undergone at least six deformational events, dominated by a late Cretaceous age reverse-faulting event which thrust the Sicker volcanics to the south over later sedimentary formations. These events are outlined by Massey and Friday (1987), and are presented as Appendix 1.

The structural setting of the Coronation Zone rocks was dominated by an active history of cataclastic deformation and multidirectional faulting. These factors are discussed in detail below :

6.1 Cataclastic Effects : All units exhibited a strong penetrative tectonic fabric, which made the recognition of primary textures difficult, and allowed for the possibility of confusing the banding-like fluxion structures of cataclasis with primary laminar features. Most unitswere moderately to strongly foliated, with common boudinage features, rod-and-mullion and flaser textures, and minor tight or ptygmatic folding.

Regional cataclasis produced a range of fluxion structures and mylonitic fabrics in the felsic sequence, the relative degrees of matrix comminution and fragmentation probably reflecting the original grain sizes and textures of the parent rocks. The footwall assemblage commonly displayed a protomylonitic texture, with close-packed quartz-eyes supported in a finely comminuted siliceous matrix (the quartz eyes showing up to 6:1 elongations). The hangingwall sequence represents a more advanced stage of cohesive cataclasis as its quartz eyes are more widely spaced and finer in size.

The Coronation Zone mineralization and its host rock assemblage appeared to be relatively ductile compared to its more brittle footwall and hangingwall counterparts, in that most strains have been taken up by the less competent horizon. Sharp faulting and shattering was fairly minimal within the mineralized zone, with open folding and drag-features being more common.

6.2 Faulting Effects : Three main fault sets were encountered, and are as follows :

(a) Pre-Cretaceous high-angle faulting (parallel or subparallel to the Coronation Trend) : High-angle faults (65 to 85 degrees, SW-dipping) were observed within the mineralized horizon, especially on its 'contacts' with the footwall and hangingwall assemblages. This set appeared to be the oldest of the three sets identified, and was probably the result of competency contrasts between the massive, relatively homogeneous footwall and hangingwall rocks, and the heterogeneous, sulphide-rich horizon. Throws across these faults have not been determined, but are thought to be in the order of 1 to 2 metres (where they are not complicated by reactivation due to later thrusting episodes). These faults were usually devoid of gouge, and were very sharp.

(b) Late Cretaceous, low-angle reverse faulting (associated with the close proximity of the Fulford Fault) : Low-angle reverse or thrust faulting (5 to 50 degrees, SW dipping) largely dominated the structural picture from the terminus of the East Drift westward to the 1-3552EXC. The controlling effects of these faults on mineralization distribution were not fully realized from surface drilling; this resulted in difficulties in intercepting target areas with the underground workings - caused by erroneous up and down-section projections of drill intercepts, where thrusting had caused the subhorizontal 'shuffling' of the mineralized zones.

Knowing now how important the reverse faulting component is to the total structural picture of the Coronation Zone, new interpretations should be drawn up to solve previous problems when correlating mineralized intercepts on drillsections.

Sudden changes in the position or dip of the horizon on section has previously been variously interpreted as due to submarine palaeotopography, folding, lateral zonal thinning or slumping features; these features can be interpreted with equal confidence as continuous blocks of mineralization of uniform thickness, having been subjected to repeated episodes of low-angle faulting - which may have resulted in the final staircase-like configuration of mineralized blocks, with important implications for tonnage calculations and eventual stope design.

The thrusts tended to be sharp and branching, and were generally devoid of gouge. They proved tricky to identify in the footwall and hangingwall rocks due to the brittle nature of these sequences, the faults more resembling subhorizontal joints than major low-angle structures; in the less competent mineralized rocks, however, the faults are much more pronounced and easily recognized. The thrusts tended to follow paths of least resistance, joining the high-angle Coronation Trend fault planes for short distances whenever they were encountered. The amount of subhorizontal throw across these thrusts varied from 2 to over 15 metres.

(c) <u>Post-Cretaceous high-angle crossfaults</u> : These NE-striking faults were generally subvertical with downthrows to the west (Massey et al, 1987) and tended to cross the Coronation zone obliquely at an angle of 35 to 40 degrees.

The faults consistently exhibited a left-lateral sense of movement, and occurred in swarms. The amount of normal movement across these faults in unknown.

Cream-white, coarsely fragmental gouge was common, with numerous splays and zones of minor brecciation.

7. Mineralization Behavior and Modes of Occurance

The Coronation Zone mineralization was classed by Abermin as Kuroko-type massive sulphides, being volcanic-hosted, stratiform accumulations of polymetallic mineralization. The dominant mineralization style was not massive however, but consisted of a structurally complicated mixture of sulphide bands, laminae, stringers, and isolate massive pods in a siliceous, somewhat fragmental rhyolitic hostrock. The gross metal value of the deposit was contributed primarily by zinc and gold, with lesser silver, copper, and lead. Precious metal contents were difficult to accurately assess due to their erratic distributions. A detailed metallurgical discussion on actual mineral identities and habits is currently being prepared by Carson (1988 in press) of Noranda Exploration Co.

The differing mineralization modes within the polymetallic zone have been complexly shattered and juxtaposed by a combination of reverse and normal faulting. Sulphide banding, where visible, was rotated to varying degrees by these dislocations, resulting in many areas (e.g. the 1-3606EXC and the 1-3578EXC, as well as all East Drift crosscuts) in a mosaic of structurally dislocate blocks with varying mineral proportions and banding attitudes. The sizes of the 'blocks' observed ranged from 0.50 to over 10.0 m^3.

Sulphide banding in roughly 40% of occurances could be attributed to local cohesive cataclasis (fluxion structures, resulting in secondary compositional layering and colour laminating), whereby a seemingly massive sulphide pod would gradually change to resemble a well-banded unit within 30cm of a major structure. In the remaining 60% of banding occurances, the layering appeared to be primary.

Primary sulphide banding on a megascopic scale was difficult to discern when looking perpendicular to the strike of the mineralized horizon due to the high degree of stretching and flattening that has affeeted the assemblage. When a seemingly well-banded sequence viewed from this vantage point is examined in cross section, the banding sometimes appeared to actually consist of a coarse, anastomosing stockwork.

Remobilization of primary sulphides into new modes of occurance seemed to have played a significant part in determining the final morphology of the deposit. Cataclastic processes probably caused the limited mechanical remobilization and recrystallization of primary sulphides into crosscutting microvein swarms and breccia interstices; recrystallization and local sulphide enrichments also occured adjacent to and within intrusive units. Large quartz-carbonate-sulphide pods locally were seen (such as those in Trench 44 and at the collar of the 1-3530EXC) which contained coarsely-crystalline sulphides with high precious metal contents; however, these pods account for less than 1% of the mineralized rockmass.

Fine, hairlike stockworks of tetrahedrite-tennantite were observed in numerous locations which reported elevated, erratically reproduceable gold and silver assay results. It is probable that the cause of the erratic precious metal distributions within the ore-system could be a secondary, late cataclastic stockwork-like overprint on the primary laminated sulphides, due to hydrothermal activity being selectively concentrated in zones of intense shattering and structural disturbance.

The three main mineralization styles encountered underground - massive, semi-massive, and laminated-banded - were the same as those described by Kapusta et al in Abermin's 1987 Final Report. Detailed descriptions of each facies is given as Appendix 2.

8. General Geological Observations, 1988 Development Headings

Four major structural-mineralogical domains emerged from the 1988 underground exploration program, which differed from one another with respect to grade, structural setting, mineralization styles, and implications for future mine design. They are as follows :

(i) 'East Zone' : consisting of the section of the Coronation Zone between the east terminus of the East Drift and the major high-angle crossfault which intersects the junction of the 1-3630EXC and the West Drift;

(ii) 'Nearwest Thrust Complex' : including the mineralized section between the abovementioned high-angle crossfault, and a swarm of three high-angle crossfaults to the west, ath the 1-3552EXC position;

(iii) 'Midwest Zone' : comprising the mineralized zone between the 1-3552EXC and and an arbitrary point along the West Drift chosen where the zone begins to markedly thicken westwards, located at the position of the 1-3462EXC;

(iv) 'Farwest Zone' : includes the remainder of the mineralized section between the 1-3462EXC and the terminus of the West Drift.

Detailed descriptions of these domains are given below:

8.1 East Zone

Horizontal diamond drilling to the north of the East Drift revealed a much more continuous section of mineralization than had been previously interpreted from surface drilling by Abermin's geologists. A combination of crosscutting and raising within this bolck realized a structurally complex zone of medium-grade material with a high-grade massive sulphide core, which was fairly continuous updip and along strike. The zone was abruptly terminated to the west by a major high-angle crossfault which cuts the 1-3630EXC/West Drift junction (left-lateral displacement of the zone by roughly 25 metres) and to the east by a series of high-angle crossfaults - the easterly of which faults the zone completely off the 600m level.

Five areas of interest were discerned within the East Zone, and are discussed in detail below :

(a) East Coronation Zone terminus : The polymetallic mineralization was abruptly terminated by a group of six high-angle crossfaults between the 1-3690EXC and the terminus of the East Drift. The amount of downthrow on the west side of these faults (excluding the easternmost fault) was between 2 to 5 metres, estimated by the construction of block-faulting diagrams using the displacements of two distinctive thrust planes - which strike subparallel to the southern contact of the mineralized zone - as marker planes, to calculate the approximate position of the fault-bounded blocks. The calculated locations of the mineralized zone blocks was consistent with the results of underground drillholes 88-UG-9 and 88-UG-24, as well as Testhole S53.

The easternmost crossfault was actually a twin structure which displaced the mineralized zone off the 600m level. A small pod of thin, high-grade, black massive sulphide mineralization appeared in the 2 metre slice between these two faults, and was of uncertain origin; if these faults do indeed have significant downthrows on their west sides, then this isolate pod could represent a separate polymetallic horizon perched in the hangingwall assemblage.

(b) <u>1-3690EXC zonal overview</u> : The 1-3690EXC was driven to test the character of the drill-indicated mineralization of 88-UG-7, and to resolve discrepancies between the underground and surface drill-indicated mineralization in this locale.

The crosscut revealed a 5 metre-thick medium-grade mineralized section, including a 1.5 metre-thick, sharply truncated pod of extremely high-grade, black massive sulphide material similar to that exposed by Trench 43. The intersection was structurally very complex, being affected by a major high-angle crossfault swarm, and earlier low-angle thrust dislocations. The discontinuous, poddy nature of the high-grade mineralization was especially well exhibited in this crosscut.

The geological complexity of this intercept suggests that difficulties will be encountered when interpreting geology or calculating ore reserves, based on a widely-spaced drilling pattern.

(c) <u>1-3672EXC/1-3675E RSE zonal overview</u> : The 1-3672EXC confirmed the existance and grade of the mineralization indicated by surface drillhole 86-139 and underground drillhole 88-UG-5. The 1-3675E RSE was collared in the crosscut in high-grade material and driven at an angle of +49 degrees towards 296 Az., obliquely and to the west up the zone for 25 metres. It was hoped that this raise would prove the updip continuity of the high-grade massive mineralization.

The raise-crosscut geological mapping discovered that the drill-indicated, high-grade mineralization actually consisted of at least three lithologically distinct, structurally dislocate blocks of strong mineralization, separated by two low-angle thrusts; displacements across these faults is not more than 3 to 4 metres for the lower thrust, and is uncertain for the upper. A third low-angle fault forms the northern boundary of the mineralization in the vicinity of the raise terminus, with an overthrust in excess of 8 metres.

Massive mineralization in this section was of two distinct types, as follows :

(i) buff-coloured massive to semi-massive sulphide with cp-rich pods and lenses comprising up to 15% of the total mineralization facies (this type constitutes roughly 65% of all massive mineralization);

(ii) well banded, black massive sulphide with high sp-gl contents, similar to the massive sulphide pod encountered in the east rib of the 1-3690EXC.

Gold-silver enriched zones occur throughout the raise and crosscut, although tend to be erratically distributed and not associated with any particular lithology or mineralization style (secondary hydrothermal overprint?).

(d) <u>1-3653EXC/1-3662E RSE zonal overview</u> : The presence of a six metre-thick high-grade sulphide section in the 1-3653EXC was a surprise, as surface drillhole 86-131, which intersected the back of the crosscut exactly on the footwall contact of the mineralized zone, indicated the presence of a relatively thin, low to medium-grade intersection; the zone appeared to thicken again to roughly 5 metres, 8 metres updip as indicated by surface drillhole 86-132. To resolve the discrepancy between the drill-indicated mineralization pattern and that observed in the 1-3653EXC, the 1-3661E RSE was collared in the centre of the high-grade material and driven directly updip along the hangingwall contact for about 15 metres.

The raise intersected a major, low-angle thrust plane three metres above the back of the crosscut which offset the mineralization to the south by about 4 metres, creating a 'fault-window' through which the DH86-131 was evidently drilled. (DH86-131 also by chance drilled through a 'tuff-dyke' pod, barren of polymetallics, which diluted the drilled grade even more.) This offsetting thrust was not recognized in the 1-3653EXC as it was coincident at that level with the hangingwall fault plane.

The discovery here of updip continuity of the high-grade mineralization seen in the 1-3653EXC to the top of the 1-3661E RSE, with regard to grade and thickness, will have the effect increasing calculated tonnage on this section, since previous interpretations portrayed the mineralized zone to have an hourglass-like shape, thinning at the DH86-131 intersection.

(e) <u>1-3653EXC/1-3630EXC zonal overview</u> : This section was tested only by underground drilling, 88-UG-1 and 88-UG-2, to determine the western extent of the high-grade mineralization encountered in the 1-3653EXC.

The mineralized zone did indeed extend to the west as far as the major crossfault which intersects the 1-3630EXC/West Drift junction. Drillhole 88-UG-1 indicated a rapid thinning of the zone, but this is probably more a function of having drilled through a 'fault-window' similar to the case of DH86-131, since 88-UG-1 encountered a large gouge zone at the northern end of its intercept. This section may therefore host sizeable high-grade ore reserves which should be tested by future underground drilling, to assess the true tonnage figure for this block.

The 'blank hole' in this section on Abermin's Long Section between the positions of the 1-3653 and the 1-3606EXC, which was not assigned a value for potential ore reserves, is an invalid interpretation since the zone probably conatins sizeable reserves of high-grade ore.

The major crossfault which separated the East Zone from the adjacent Nearwest Thrust Complex displayed a left-lateral shift of the zone of approximately 25 metres, with a downthrow of uncertain magnitude. There appears to have been limited block rotation of the mineralized horizon across this fault, as the East Zone mineralization differs in strike from that of the Nearwest Thrust Complex by about 15 degrees. The fault itself contained large gouge pockets (up to 2 metres wide) and was associated with intense hangingwall (north) side parasitic faulting and shattering.

8.3 <u>Nearwest Thrust Complex</u>

The position of departure to the west of the West Drift from the 1-3630EXC was calculated from surface drilling to intersect the onstrike projection of the mineralized horizon from surface drillholes DH-85-18, DH85-15 and DH-84-12. The intention was to drift on the ore to ascertain mineralization styles and grades, and to assess ground conditions within the horizon.

The West Drift did not encounter the target minerailzation until 10 metres beyond the planned intersection with the DH-85-15 intercept. Several reasons for this miss have been advanced, the most plausible of which are as follows :

(a) the precise collar location and dip of the target drillholes was not known with accuracy due to a number of problems arising from Abermin's previous drill programs;

(b) the section of the Coronation Zone mineralization encountered in the 1-3606EXC and the 1-3578EXC was structurally complicated by a closely-spaced swarm of low-angle reverse-faults, whose strike parallelled that of the target mineralization. Consequently, the updip and downdip projections of drill-indicated intercepts to the 600m level was not valid, due to unkown amounts of horizontal displacement across these faults.

Four zones of interest were recognized within the section of mineralization between the 1-3630EXC/West Drift junction and the position of the 1-3552EXC. These are as follows :

(a) 1-3606EXC/1-3602E RSE zonal overview : The 1-3606EXC was positioned to expose the mineralization indicated from surface drillhole DH84-12. The crosscut intersected a complexly thrust-faulted package of semi-massive to massive sulphide material; individual blocks of rock with differing mineralization styles and lithologies were juxtaposed against one another, with banding attitudes within adjacent blocks varying widely.

The 1-3602E RSE was driven directly updip on the ore to test the continuity of the high-grade mineralization. The raise exposed a complicated zone of sheeted thrust swarms, separating relatively undisturbed blocks of contorted massive mineralization. The mineralization was cut off 12 metres up the raise by another SW-dipping thrust swarm, with a horizontal throw to the south of at least 8 metres. No gradational contacts were observed between the mineralized zone and barren hangingwall or footwall rocks. The thrusts locally steepened to 50 degrees, although generally dipped at 10 to 25 degrees.

High-grade mineralization was continuous within the intrathrustal blocks, without such a poddy nature as was observed in the East Zone sections. The massive sulphide facies was primarily buff-coloured py-sp-cp, with isolate pods and boudinaged bands of massive cp. Thin, black massive sulphide bands (less than 2 cm wide) rarely occured within the buff-coloured sections.

The indications in this area with regard to its gross structural picture is that the Coronation Zone mineralized horizon probably dips at a much steeper angle than was previously thought, and that Abermin's presumed average dip of 60 degrees is really a function of the zone having been 'laid back' or shallowed block-by-block to its present position due to reverse faulting.

The high angle crossfault which separates the East Zone from the Nearwest Thrust Complex was intersected near the terminus of the 1-3606EXC, and therefore indicates that the block between the 1-3630EXC and the 1-3606EXC, south of the West Drift, is of limited tonnage potential. Abutting on the west rib of the 1-3606EXC against the crossfault plane was a 1 metre thick fault wedge of chert-argillite-sulphide intercalations, which probably represents a different exhalative episode than that responsible for the formation of the Coronation Zone. This exhalite was positioned roughly 5 metres south of the southerly limit of the Coronation Zone, and was contained within massive-looking members of the footwall assemblage.

(b) <u>1-3578EXC/1-3552EXC sectional overview</u> : The 1-3578EXC and the section of the West Drift from the collar of the 1-3578EXC to the collar of the 1-3552EXC, encountered a medium to high-grade mineralized sequence structurally dominated by the same series of sheeted, low-angle reverse faults that dominated the 1-3606EXC/1-3602ERSE stratigraphy. At least six major thrust planes were discerned within the particular thrust swarm at the 1-3578EXC collar, which juxtaposed wedges of extremely high-grade black massive sulphide against other blocks of buff-coloured massive to laminated material. Exact displacements across these structures is not known with accuracy, but are probably of the order of 1 to 4 metres each - giving a sizeable cumulative displacement.

The observed structural complexity points to difficulties in trying to interpret geology and mineralization patterns from surface drilling information.

A more cherty version of the exhalite zone intersected in the 1-3606EXC terminus, was again intersected in the south end of the 1-3578 and 1-3552EXCS, where it attained a thickness in excess of 2.5 metres. Chip sampling across this zone revealed a weak polymetallic signature.

(c) <u>1-3577E RSES overview</u> : Two raises, called the 1-3577E Main Raise and the 1-3577E Finger Raise, were collared in buff-coloured massive sulphide, near the collar of the 1-3578EXC. Thier purpose was to assess the structural and mineralogical settings of the high-grade mineralization identified above the 600m level in this area by surface drilling. The raises were driven obliquely east and west updip on the mineralization at a +49 degree inclination, the 'main raise' to the east being driven along the line of underground drillhole 88-UG-10.

Two distinct thrust swarms were encountered in both raises, one occurring at the base of each raise, and the other occurring at the 24m mark in the east raise and the 20m mark in the west raise.

The intrathrustal sections in both raises were relatively structurally undisturbed, and consisted of low to medium grade, pyritic seimassive to finely laminated sulphides in a highly fragmental lithic tuff. Lithological variations within the block were small, bu mineralization styles appeared to be impersistent and rapidly changing laterally and vertically. Common intermixing of sulphide bands with differing sulphide proportions occurred, with massive py-cp lenses and bands being intercalated with buff-coloured and black massive sp-cp bands.

Precious metals were erratically distributed in both raises. The presence of a mafic dyke in the east raise with sulphide-enriched margins, together with an erratic cataclastic stockwork of tetrahedrite-tennantite microveins, made sampling for precious metals unreliable.

The east raise remained in low to medium grade pyritic material to its terminus despite the presence of the upper thrust swarm. The western raise, however, emerged into barren lithic tuff after passing through the same thrust series.

These two raises confirmed the presence of medium to high-grade reserves in the section between and above the 1-3606EXC to the 1-3552EXC. However, the mineralization was contained in large thrust-bounded blocks, separated from and faulted over over other blocks by a step-like series of anastomosing reverse faults, locally about 15 to 18 metres apart.

The Nearwest Thrust Complex was bounded to the west by three high-angle faults which passed through the 1-3552EXC. These faults brought the thrust-dominated zone aginst a totally different, structurally quieter domain with few disruptive structures.

8.3 Midwest Zone

The transition to this zone was dramatic, with a three-fault swarm marking the change from a complex, multidirectionally faulted, high-grade zone on the east to a thinner structurally simpler low to medium-grade section on the west. There was a sharp increase in the number of high-angle crossfaults which cut the mineralized section, intersecting the zone at between 35 to 50 degrees. Consistent left-lateral displacements across these faults of about 1 to 3 metres were common; the magnitude of downthrow was not discerned. Low-angle reverse faults were not as well represented in the Midwest Section as in the Nearwest Thrust Complex, but did occur to a much reduced extent, with isolated reverse faults showing 1 to 2 metre displacements.

The Coronation Zone mineralization was fairly uniform in thickness (2 to 3 metres) and still appeared to have taken up most regional strains - reflected in the presence of large amounts of intrazonal brecciation and the juxtaposition of blocks with differing mineralogical styles and contents.

The northern limit of the polymetallic mineralization took the form of a disinctive series of braided, chloritic splays, up to 10 cm in cumulative width. This contact could represent the remains of a thin, laterally-persistent sedimentary unit which signified a break in the extrusion of mineralizing fluids onto the seafloor, or could merely be the expression of shearing along the contact between two rock suites of differing structural competencies.

'Tuff-dyke' bodies and associated quartz-sulphide pods and sweats increased in frequency within the Midwest Zone, accounting for up to 10% of the total rockmass at the 1-3442EXC. Coarsely crystalline remobilized pyrite, chalcopyrite and sphalerite were commonly found along the dyke margins, together with rare, coarsely crystalline tetrahedrite.

Mineralization within this Midwest Zone consisted of a low to medium grade, mixed sequence of banded, to poddy semimassive material, containing impersistent boudinaged pods and bands of massive pyrite (and rarely sp-cp). Strikingly banded pyritic sections were noted at the south collars of the 1-3508EXC and 1-3486EXC, probably of primary origin.

The footwall exhalative horizon recorded in the south crosscut termini of the Nearwest Thrust Complex was again noted in the south ends of the 1-3530EXC, 1-3516EXC, 1-3508EXC, and the 1-3486EXC, becoming cherty and strongly pyritic to the west. The zone attained a thickness up to 2.5 metres, and was notably lacking argillaceous material - contrasting with the exhalite of the 1-3606EXC and the 1-3578EXC.

The well-foliated hangingwall lithic and crystal tuff assemblages contained significantly increased amounts of laminated and banded pyrite, locally up to 5%. The north section of the 1-3530EXC was particularly pyritic, resembling a stockwork-like texture. It is unclear whether the pyrite enrichment represents a primary stockwork, or is merely an effect of local or regional cataclasis.

8.4 Farwest Zone

The transition to this final section was arbitrary, with the zone steadily widening westwards from the 1-3462EXC to the West Drift terminus/1-3442EXC. The mineralized horizon became dilated in the 1-3442EXC by a series of intrusions, consisting of approximately 30% 'tuff-dyke' material in the upper sections of the zone, and a 3 metre-wide, greenish mafic dyke at the footwall contact.

Assay grades continued to increase westwards, with the mineralization in the terminal face of the West Drift approaching significant grades and width once more (cp-enrichment being particularly noted). Mineralization within the horizon consisted mainly of pyrite (85%) with locally enriched sp-cp banded and brecciated zones. Rare thin, poddy or boudinaged massive cp-sp bodies occurred, accounting for only about 3% of the observed mineralization. The entire zone was strongly sericitized and appeared shattered.

Close-spaced surface drilling ended with the position of the 1-3442EXC, with the next drill intercept being over 100 metres to the west. The gradual thickening and grade increases seen to have taken place westwards could indicate that a significant pod of medium to high grade mineralization has built up to the west of the West Drift terminus.

11. Certificate of Qualifications

I, Michael W. Harris, of the City of Victoria, British Columbia, Canada, do hereby certify the following to be true :

1. I am a geologist with temporary offices at Minnova Inc., Chemainus, B.C.

2. I received the degree of Bachelor of Science with Honours in Geology from the University of Durham, Durham City, England, in July, 1982.

3. I have practiced my profession since graduation in both British Columbia and NW U.S.A.

4. I have no direct, indirect, or contingent interests, nor do I expect to receive any such interest in the securities and properties of Minnova Inc., or Laramide Resources Ltd.

5. This report is based on mine examinations and sampling conducted by myself and geologistsT.J. Flynn and J.D. Kapusta during the months of May to September, 1988, and upon the evaluation of private data pertaining to this project.

6. The geological mapping and sampling was not carried out under my direct supervision; consequently, I take no responsibility for the ultimate accuracy of any work other than my own.

7. This report or any of its contents may not be used for any purpose without written permission from Minnova, Inc., or Laramide Resources Ltd.

Dated this 20th day of January, 1989, in the City of Victoria, B.C., Canada.

Michael W. Harris, B.Sc.
Mine Geologist

14. Appendix 1

Excerpt from Kapusta et al (1987) : 1987 Abermin Corporation Final Report

"Regional structure and tectonics of the Sicker Group, quoted from Massey and Friday, 1987."

2. Regional Structure and Tectonics

Tectonically, southern Vancouver Island has undergone at least six deformational events, commonly rejuvenating previous structures. The Horne Lake-Cowichan uplift area is dominated by the effects of Late Cretaceous thrusting. The six deformational events outlined by Massey and Friday (1987) are listed below.

Phase I: Late Devonian Syn-Sicker Group deformation produced large-scale open folds in the Nitinat and McLaughlin Ridge Formation volcanics. Subsequent to this event was a period of uplift and erosion. This event is reflected in an unconformity below the Cameron River Formation.

Phase II: Post-Lower Permian - Pre-Middle Triassic The second deformational event produced a series of west-northwest-trending, southwest verging, asymmetric folds with abundant parasitic minor folds. This event produced penetrative fabrics (schistosity in volcanics and cleavage in sediments) axial planar to the folds that are well developed. They have moderate to steep northeasterly dips. Intense flattening normal to the foliation is observed in volcanic rocks, whereas the Cameron River Formation seidments behaved more competently and lack flattening fabrics. Lineations due to bedding-foliation intersections and elongation of crystals and clasts are well developed. Plunges of the lineations are usually shallow, 5 to 15 degrees, and may be to the west-northwest or east-southeast. A crenulation cleavage normal or slightly oblique to the axial schistosity is developed in the more schistose volcanic rocks. This second foliation is well developed in structural depressions and culminations marked by change in azimuth of lineations.

Phase III: Late Triassic Extensive crustal dilation accompanied the emplacement of Karmutsen Formation lavas and intrusions.

Phase IV: Post-Middle Jurassic - Pre-Late Cretaceous Pre-Nanaimo Group deformation resulted in regional scale warping of Vancouver Island, producing the three major geanticlinal uplifts (Figure 2) with Sicker Group rocks in the cores. Faulting, often axial, accompanies the folding and is most prevalent in the Cowichan Lake area. Uplift and erosion followed this deformational phase.

Phase V: Late Cretaceous Large scale west-northwesterly trending thrusts cut the Cowichan uplift into several slices. Where exposed, these are high-angle reverse faults which dip between 45 and 90° to the north-northeast, paralleling the earlier axial folaition in Sicker Group rocks. Slip planes are relatively sharp and narrow, though wide schistose zones have developed in receptive lithologies. The thrusts generally place older rocks over younger and become listric at mid-crustal depths. The displacement along fault planes is not known but is considered to be in the order of 1 to 10 kilometres. Direction of the motion is also unknown but slickensides on fault planes indicate that the latest movement was horizontal and to the west. Minor imbricate faults are developed along most of the thrusts, especially where Nanaimo Group sediments occur in the footwall.

Phase VI: Tertiary? Several north-northeast cross faults offset the Late Cretaceous thrusts in the Lake Cowichan area. They are all subvertical with down throws to the west.

Regional tilting of all Vancouver Island has taken place since the Late Eocene.

Appendix 2

Excerpt from Kapusta et al (1987), "Abermin Corporation 1987 Final Report"

" Sulphide modes of occurrance, Lara property."

The massive sulphide facies, is a relatively coarse grained (1-2mm) massive intergrowth of sulphide minerals and gangue (predominantly calcite). Interbeds of rhyolite or sedimentary rock are rare, although small siliceous pods may be included in the sulphide mass. This facies occasionally exhibits a banded texture which is best represented by chalcopyrite-rich bands of 1 or 2 centimetres. Local accumulations of massive pyrite occur. These are commonly barren but may contain significant gold or zinc values. The massive sulphide facies is consistently high grade except for intersections of massive pyrite.

The predominant facies in the Coronation deposits is the banded and laminated facies which consists of sulphide laminae and bands up to a few centimetres thick in a siliceous host. The host rock varies from silicified rhyolite to a very fine grained siliceous mass with varying amounts of felsic tuffaceous debris. The mineralization is broadly conformable, however cross-cutting features are common within the conformable zones. Cross-cutting mineralization varies from occasional sulphide stringers to well developed breccia zones with sulphides in the matrix. Sulphides also occur disseminated in the rhyolite host. Primary textures are masked by a pronounced cataclastic overprint which is accentuated in this facies because of the competency contrast between thinly interbedded sulphide and volcanic units. Cataclasis may have caused mechanical remobilization of sulphides into breccia interstices. Although these features to some extent mask the primary depositional style, the overall stratiform character of the facies is demonstrated by the presence of sedimentary units which enclose and occur within the deposit, and which can be correlated over considerable distances (Figures 7 and 9).

The banded and laminated facies varies up to about 16 metres true thickness. Although not as high grade as the massive sulphide facies, the laminated and banded sulphides can attain significant grade. DDH 85-36 for example, intersected 4.18 metres grading 0.289 oz/t gold, 2.41 oz/t silver, 0.86% copper, 3.47% zinc and 0.50% lead. These intersections typically contain up to about 20% sulphide bands and laminae, and relative to the massive sulphide facies, contain a higher ratio of pyrite to total sulphides. Intersections usually contain from 3-5% pyrite, but concentrations of 10 to 15% pyrite are not uncommon locally.

The banded and laminated facies is finer grained than the massive sulphide facies; grain size generally averages less than 1 millimetre. The finer grain size is thought to be a primary feature, however, microscopic textures including disaggregation of mineral bands and grain rotation suggest that cataclasis may have been a contributing factor.

Although sulphides in the Coronation deposits are generally fine grained, chalcopyrite, galena and tetrahedrite are locally quite coarse (2-6mm). These coarse sulphide minerals are well developed in quartz veins, especially within the massive sulphide facies. Coarse sulphides also occur as irregular cross-cutting veinlets within finer grained sulphide masses. Coarse grained cross-cutting mineralization is thought to be due to recrystallization and remobilization during metamorphic or late tectonic events. Pyrite exhibits a bi-modal grain size distribution. Coarser (1-2mm) pyrite grains occur as well formed disseminated crystals which are interpreted as porphyroblasts.