F) Drill Hole Lithogeochemistry

Prior to the 1983 field programme, all available pulps or rejects from 1980-82 drill core were submitted for multi-element ICP analysis. The purpose was to determine if lithogeochemical haloes could be recognized to aid in selection of drill targets.

Elements analyzed for included Mo, Cu, Pb, Zn, Ag, Ni, Co, Mn, Fe, As, U, Au, Th, Sr, Cd, Sb, Bi, B, Ca, P, La, Cr, Mg, Ba, Ti, B, Al, Na, K, and W.

Based on their analytical variation the following elements were considered to be of potential use:

As, Mo, W, Ca, K, Na, Fe, Al.

Individual drill hole profiles were plotted for the 1980-82 drilling and the following points came to light from preliminary visual examination:

- anomalous As in many cases borders the mineralized zones, especially on the western margins. The bottom of drill hole 82-23, which ends in heterogeneous breccia with very high arsenic values, may be proximal to mineralization.
- volcanic rocks often show enrichment in K and Al adjacent to mineralized breccia.
- high W is commonly closely associated with high Au. Because of this close spatial association, W has limited use as a 'pathfinder'.
- the early molybdenum system associated with the

quartz porphyry appears to have a weak lead-zinc silver halo.

- West Zone is not associated with any obvious lithogeochemical halo. Within the zone, high Au, Cu, Ag, As and W show positive correlation.
- lamprophyre dykes represent spurious anomalies in Ca, K, Al, Fe and Na.

Now that I.C.P. analysis has also been completed on 1983 drill core, the lithogeochemistry of all drilling to date is currently being investigated. In an attempt to quantify any subtle lithogeochemical haloes which may exist to mineralization, the data will be computer-manipulated to determine features such as correlation coefficients between the various elements. It is hoped that results of this work will influence selection of 1984 drill sites.

B) Revisions to Property Geology

Brian Marten of BP Minerals Limited spent three and one half days examining drill core and one day examining outcrop on the property during the period July 25-30, 1983. His aim was to clarify come of the structural relationships evident on the property. Five specimens of drill core were selected for thin-sectioning.

Conclusions:

No new significant observations were made on the breakdown of lithologic units and their age relationships. However, it is believed that all map units except the late lamprophyres have been subjected to a regional biotite grade metamorphic event associated with weak zonal tectonic flattening. The sulphide mineralization and at least some of the associated alteration has been deformed and metamorphosed. Consequently, the mineral assemblages need to be critically re-examined in order to separate primary alteration from metamorphic overprint. Only then can the origin of the mineralization be fairly discussed.

Structural Relationships

A widespread weak to moderate tectonic flattening is zonally developed in the intrusive breccia. An associated weak to moderate foliation defined by brown biotite lies in the plane of flattening. The foliation is also present in the other lithologies, and in the augite porphyry is seen as

localized zones of amphibole-biotite schistosity. These features are best seen in drill core but were also noted in outcrop near the Willa adits, where local foliation strikes 55-58^{o} and dips 65^{o}E to subvertical.

Sulphide stringers, lenses and blebs are streaked and drawn out in the plane of foliation where this is well developed, indicating that they and the Au-Cu mineralization pre-date the foliation. Pre-foliation diopside-microcline-sulphide stringers are seen in one thin section (drill hole 83-25 at 25.0 metres), suggesting that at least some of the green silicate alteration is also early.

Subsequent syntectonic recrystallization involved growth of biotite, tremolite-actinolite and hornblende with a weak to strong preferred orientation that defines the foliation. Metamorphic mineral growth continued after deformation ceased so that late randomly oriented biotite and amphiboles overprint the foliation.

The few thin sections for this study were selected to clarify structural and metamorphic relationships, but do not help much in elucidating the alteration stages related to the mineralization. It is clear however that the mineral assemblages seen must be critically re-examined to take into account modifications to the primary mineralogy that must have been induced by the metamorphic event. This would require careful textural observations on a large number of selected thin sections.

The breccia pipe appears to have suffered little bulk strain as a result of the weak northeast-trending zonal deformation. The northerly trend of the mineralization appears to be a primary pre-tectonic feature.

The character of some of the more schistose zones suggests that they reflect shear zone style deformation, but as noted in earlier Riocanex reports the "Willa Shear" does not appear to exist as such. A 30cm wide zone of biotite schistosity (strike 55^0 dip 65^oSE) with lensed clasts is exposed 5 metres north of the Willa #2 adit, and can be traced to the portal. This is a strictly localized feature and moreover cannot have the straight outcrop of the Willa Shear indicated on existing maps. Also, critical examination of outcrops near drill hole 81-15 shows that the lamprophyre dykes are sinuous and irregular and the indicated offset of them by the Willa Shear is not substantiated. It is recommended that, in order to avoid confusion, the Willa zone should not be shown as a shear zone or fault on maps or sections.

The only other suggested revision to property geology is elimination of unit 4a Biotitic Breccia as a distinct rock type. Since it appears that this early brecciation and accompanying biotization are related to emplacement of the heterogeneous breccia, as evidenced by its occurrence in all pre-heterogeneous breccia rock types (though it is most prominently developed in feldspar porphyry) it should be considered as an alteration effect and noted as such. Development of this brecciation/biotization along the base of the feldspar

porphyry inlier and along the footwall contact of the east-west radial dyke suggests that this alteration effect was related to ascending fluids (assuming no significant tilting of the system has occurred).