PROGRESS REPORT: SEPTEMBER, 1989

SAMATOSUM DEPOSIT: STRUCTURAL MAPPING PROJECT

During my last visit to Sam (September 15 to 21) I concentrated largely on mapping and interpretation of core from diamond drill holes on sections 96 + 80 W, 97 + 00 W, and 97 +20 W; only a brief visit to the open pit was made in order to update myself on new bench exposures.

In all, eleven drill holes from these sections (RG 67, RG 70, RG 85, RG 86, RG 112, RG 115, RG 118, RG 119, RG 122, RG 123, and RG 124) were layed out side-by-side in order to facilitate lithological comparisons and an attempt was made to establish stratigraphic tie-lines between holes. Time did not permit completion of other holes on these sections, but a rough log of RG 220 and RG297 was made.

Inconsistencies in the placement of the mafic/sediment contact were found in previous logging of these holes, particularly on section 97 +20 W, where the upper limit of sericitized mafics was often taken as the contact. Relogging of these holes resulted in the mafic/sediment contact becoming far less irregular and relocation of the cross fault on section 97 + 20W. Significantly, the modified section shows that the thickest zone of sericitized mafic volcanics occurs above the ore zone. This spatial association indicates that no significant post-ore displacement has occurred along the mafic/sediment contact, despite the common occurrence of fault gouge and brecciation at this contact.

No definitive stratigraphic tie-lines within the sediments were found between holes, although the position of quartz wacke interbeds in RG 67 and RG 70, together with core angles to bedding, indicate that these units are parallel to the contact with the overlying mafics. Furthermore, grading in the wackes and primary sedimentary truncations of underlying laminae within argillite-siltstone interbeds demonstrate that this part of the section is upright. These sediments are sericitized in RG 67, but not in RG 70, thus reflecting the cross-cutting (and therefore epigenetic) nature of the sericitization. This is supported in all the holes examined to date by comparison of the textures, compositional variability, and bedding styles in sericitic lithologies with the same features in their unaltered sedimentary protoliths. Furthermore, boundined quartz veins commonly occur in the former but not in the latter. This same spatial relationship was documented for the open pit (Progress Report: June 1989).

Similarly, "muddy tuff", as defined by the presence of silver-grey sericite, was found to occur within every lithology from cherty argillite to quartz wacke. It occurs in the hanging wall and foot wall of the mineralization in the downdip holes on Section 97 +20 W. Here, its pyrite content is highest close to the mineralized intersections, decreasing away from the mineralization and toward a gradational contact of muddy tuff with sericitic schist, or, particularly on the foot wall side, with unaltered sediments. This overall geometry is reflected along the margins of individual veins. Therefore, "muddy tuff" is most simply explained as the product of proximal wall rock alteration in the deeper levels of an epigenetic mineralizing system. Here, the mineralization and the outer margins of the muddy tuff dip at about 55 degrees toward the northeast, in contrast to the shallower 40 degree dip of the mafic/sediment contact. This is thought to reflect their cross-cutting nature. If this is the case, then the banded massive to semi-massive sulphides that occur in RG 85 and RG 86 are epigenetic and not, as previously supposed, syngenetic. The above relationships are schematically represented in Figure 1.

Lively discussions with Kerry, Al, and Bob have helped to crystallize the following model for the genesis of Sam:

1. Lead dates from Sam indicate a Devonian age for the mineralization, whereas regional mapping indicates a Lower Cambrian age for the host rocks. This supports an epigenetic model for the deposit.

2. Kerry's thesis documents biotite (petrographically) and K-spar (XRD) within "muddy tuff" but neither were found in "sericitic tuff". These minerals are diagnostic of the potassic zone of alteration which occurs within the deeper, more proximal parts of a porphyry mineralizing system. The "sericitic tuff" is interpreted as the phyllic zone. The outer shell of propylitic alteration (chlorite, epidote and carbonate) may be represented by the mineral assemblage ferroan dolomite plus chlorite, which occurs marginal to the sericite zone within the mafics and in the deeper parts of some holes (e.g., RG 85 and RG 86). These alteration assemlages are overprinted by sub-greenschist facies regional metamorphism, which occurred at the same time as penetrative deformation.

3. The silver zone, which represents most of the Sam deposit as an economic entity, occurs mostly within discrete quartz veins approximately where these veins cross the contact from the potassic zone (muddy tuff) to the phyllic zone (sericitic tuff). This part of the zone is parallel with and close to the overlying mafic/sediment contact. Hence, it is likely that the hanging wall mafics provided an impermeable cap, below which the mineralization was channelled parallel to the bedding.

4. In contrast, cross-cutting zones of banded massive to semi-massive sulphides, high in base metals but low in silver, and the peripheral finely disseminated zones of pyrite mineralization within the muddy tuff, represent the deeper parts of the system. Here, much (but not all) of the cherty lithologies probably represent zones of pervasive silicification. Similarly, the "chert knobs" which occur close to the deposit on surface may represent local hydrothermal centres.

5. The alteration zones are asymmetric in some parts of the ore body - the phyllic zone (sericitic tuff) is not generally developed in the foot wall of the potassic zone (muddy tuff), and is generally thickest in the hanging wall.
   This may be simply a reflection of the initial orientation of the conduit(s), such that upward perculation of the hydrothermal fluids caused more extensive penetration of the hanging wall rocks than the footwall rocks.

6. This overall geometry requires that the deposit is upright, a conclusion that is supported by structural and stratigraphic facing directions, at least in the upper part of the sedimentary sequence.

EXPLORATION GUIDES

The above model has important implications for exploration with respect to Sam-type mineralization:

1. "MUT/SERT" CONTACT: This contact falls within the zone of highest grade silver mineralization. It may be cross-cutting or stratabound, uniform or irregular. The degree of sericitization within any given protolith can be used as a

vector toward this contact. Consequently, a good case can be made for deepening holes that were stopped in muddy tuff or sericitic tuff unless this vector has been clearly established.

2. MAFIC/SEDIMENT CONTACT: Zones of extensively sericitized or carbonatized mafics close to this contact offer the best collar locations.

3. "CHERT KNOBS": These may be local centres of silicification that record conduits of maximum hydrothermal activity - has the area around the tailings pond, in the vicinity of the chert knob and mafic contact, been adequately tested?

RELATIONSHIP OF SAM TO REA

I think that the above model should cause us to re-evaluate the data upon which the syngenetic model for Rea is based. Certainly, the association of "muddy tuff" and "sericitic tuff" with the ore zones at both Sam and Rea raises serious questions, despite the fact that the muddy tuff and ore zone are stratabound at Rea (most of the Sam deposit is stratabound).

In the surface trenches at Rea the barite zone in the structural foot wall of the ore comprises massive barite. Here, at least, it looks more like vein material than a bedded exhalite.

Bedding-cleavage relationships observed in the Rea trenches indicate that the sequence is upright, whereas the syngenetic model for Rea indicates that the ore sequence is overturned. If this is the case, it represents the only area where structural and stratigraphic tops contradict each other. This suggests that a structural event caused the overturning of the ore sequence at Rea prior to the development of S1 -an event for which there is no evidence elsewhere - the foot wall sediments at Rea, below the footwall fault, are structurally and stratigraphically overturned.

An alternative model for the Rea deposit is tentatively proposed involving Rea as the distal stratabound (but epigenetic) expression of the same Devonian mineralizing event that produced the Sam deposit. This model requires that the Rea Mafics and the Sam Mafics are stratigraphically equivalent and that both deposits are upright. Repetition of the mineralized sequence may have been caused by a thrust fault or (less likely) an anticline-syncline pair. If this is correct, Sam and Rea were once part of a continuous mineralizing system. The link between these two ore bodies has subsequently been severed by the thrust fault, but must still exist somewhere at depth along the Rea horizon in the footwall of the hanging wall mafics. In view of the limited number of holes between Sam and Rea that have penetrated the horizon to date, I think that this area still offers an excellent exploration opportunity.

Respectfully submitted,

J.K. Glover

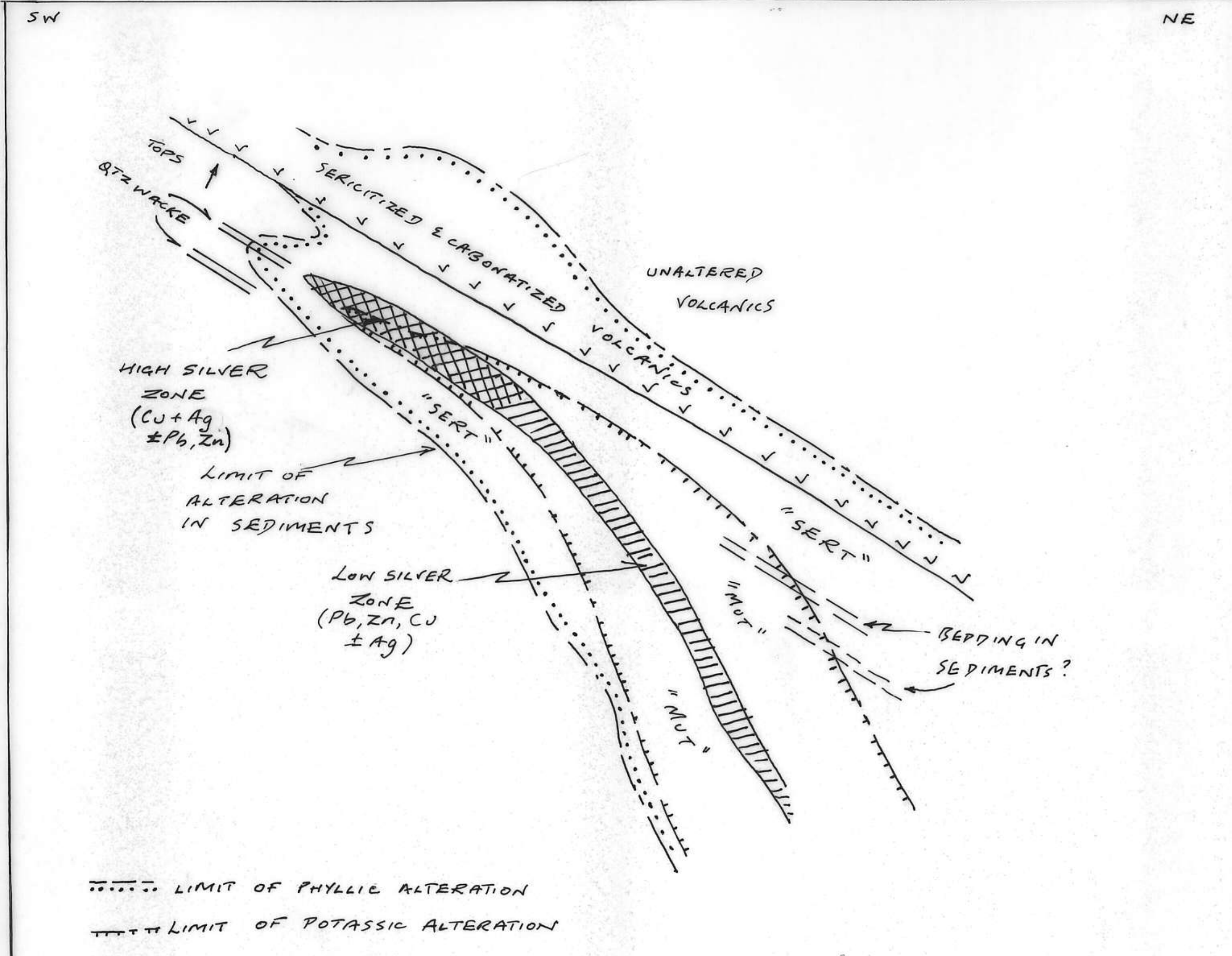

FIGURE 1: SCHEMATIC CROSS-SECTION SAMATOSUM DEPOSIT

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