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GEOLOGICAL RE-EVALUATION OF THE SAMATOSUM DEPOSIT

PROGRESS REPORT: JANUARY 1990

TO: A. Davidson

COPIES TO: I. Pirie, A. Hill, D. Heberlein, R. Friezen, I. Piwek

FROM: K. Glover

DATE: January 29. 1990

Since the meeting on January 18th during which Al gave his update on the relogging of D.D.H. core from Sam, Al and I have made a two day trip to Sam (January 25 and 26). The purpose of this trip was primarily to relook at some of the critical holes on sections 96+80 W and 97+20 W that display evidence for late brittle faulting and to evaluate its importance with respect to the genesis of the high silver, tetrahedrite-rich zone (i.e., the ore body). In addition, we visited the pit where the ore body is presently exposed along the 1297.5 metre bench.

Although I agree with the main descriptive points outlined in Al's memo of December 8, 1989, I still have problems with his preliminary conclusions regarding the importance of late, fault-controlled ferroan dolomite-rich solutions in precipitating the tetrahedrite within the ore body.

All the evidence that I have seen to date indicates that most, if not all the tetrahedrite in the high silver zone was deposited prior to the penetrative foliation in the wall rocks and the tight asymmetric folding of the quartz veins that host the majority of the ore body. There is also a pre-penetrative deformational phase of ferroan dolomite that occurs within these veins and is intimately associated with the sulphides. It is possible to confuse this phase of ferroan dolomite with later ferroan dolomitization (possibly localized along and peripheral to late brittle faults).

I think that it is important to emphasise that not all brittle structures within the ore are late: During penetrative deformation of the wall rock, most of the minerals within the veins (tetrahedrite, sphalerite, pyrite and for that matter quartz) deformed in a brittle manner; in contrast, galena (and possibly chalcopyrite) responded in a ductile to semi-brittle manner, as shown by deformation lamellae that are parallel with the margins of all the above minerals. This is strikingly displayed in the case of boudined sphalerite layers within a matrix of deformed and dislocated galena crystals, the fabric within which conforms to the boundaries of the sphalerite.

Some cross-cutting quartz-carbonate veins that contain base metals do occur within the mafics and may represent remobilization of the ore-bearing minerals by SiO_2 and CO_2 rich hydrothermal solutions that followed late brittle fault zones. I do not think, however, that these veins contributed to the ore body itself.

I agree with Al that the relationship between the ore and the grey sericite-yellow sericite contact is not always clear, but several factors have probably conspired to make this so:

1. Multiple feeder zones would produce complex overlapping alteration patterns - if these operated at different intensities through time, then the development of the overall alteration pattern may have been complicated by lower temperature fluids overprinting (and therefore retrograding) earlier formed higher temperature assemblages, e.g. grey silver sericite converted to yellow sericite.

2. Variable porosity (and possibly chemistry) of initial host rocks, for example lithic wacke versus argillite, probably resulted in a feathery and irregular geometry to the grey sericite 'front'.

3. Subsequent penetrative deformation of these host rocks was accompanied by at least small-scale thrusts which, certainly on the scale of the pit, imbricate the ore body, the enclosing alteration zones and unaltered sediments.

Therefore, the complexity of the alteration pattern does not necessarily invalidate the apical zone of the grey sericite/yellow sericite contact as the principal control of ore deposition. Moreover, this complexity may provide exploration opportunities for other ore zones. I believe that thrust-related repititions of the ore body in the structural footwall are a very real possibility - abrupt changes from grey silver sericite to unaltered sediments in the footwall and duplication of the alteration zones in the western part of the ore body, evident on several sections, may be telling us this already.

This memo is not intended to categorically refute Al's ideas about the relationship between the late brittle structures and the ore zone, but simply represents my structural bias (and probably a certain amount of attachment to the original epigenetic alteration story!) In fact, I agree with Ian, we cant afford to ignore any features that might lead us to more ore.

In summary, I think it would be premature to terminate the relogging program at this time. The game plan to continue with two or three more sections and then re-evaluate is extremely prudent, especially as the preliminary results from the fluid inclusion study should be available by that time (see below).

FLUID INCLUSION STUDY

In the course of this visit we also collected eight samples of diamond drill core and six samples from the pit for the fluid inclusion study. This study is to be done by Jim Reynolds, a consultant based out of Colorado who is apparently one of the leaders in the field and gives courses on fluid inclusions all over the world - he was recommended by Andrei Pantaleyev of the B.C.G.S.B. Providing we get the samples to him in the next two weeks, we should have the results from this first phase of the study back within the next month, at a cost of $1,000 maximum. If any more work is warranted, he would be prepared to make a visit to Sam and collect additional samples himself. He assured me that this second phase would cost $3,000 at the most, but does not believe that follow-up work is always justified, because often sufficient information is obtained from the first pass.

In selecting the samples, we tried to get a good cross-section through the mineralized system (see attached sheet):

- from the deeper parts of the feeder zone (the so-called sulphide seam), to the high silver zone and its updip extent;
- the samples from the pit extend from the footwall, through the ore zone, to the hanging wall on the 1297.5 metre bench;
- in addition, two base metal mineralized veins in the mafics (one from the pit, on the 1390 metre bench and another from DDH RG 124).

The samples collected included all the different types of quartz, ferroan dolomite of different generations, and sphalerite.

I have written a summary of the main geological features of Sam and included an idealised cross-section of the deposit, showing the sample locations, to be included with the package for Jim Reynolds. Please look it over and make any changes that you think necessary. His address is:

T.J. Reynolds, Fluid Inc.
c/o E. Licht Co.
3255 South Acoma
Inglwood
Colorado
Zip 80110

OTHER STUDIES

I think that a study of the textural relationships of the ore and gangue minerals would be a useful adjunct to the fluid inclusion data. The polished sections of the ore that were used for the metallurgical study would provide a good starting point. Apparently, Craig Leitch at U.B.C.is a good ore microscopist. I gave him a call last week and he would be available to do the work on a contract basis -the price he quoted was $60.00 per section.

I phoned Doug Archibald at Queen's and he would be prepared to take a look at samples of the alteration with a view to dating the sericite (K-Ar and Ar40/39), but he was not that encouraging about the potential to see through the regional metamorphism. I thought the samples were on their way, but unfortunately, the message never got to Al! Anyway, Al's going to send some to him in the near future.

Respectfully submitted:

Keith

J. Keith Glover

Geological Consultant