CORBETT GEOLOGICAL SERVICES Pty. Ltd.
A.C.N. 002 694 760
6 Oakville Road, Willoughby, N.S.W. 2068, Australia
Phone (+61) (0) 409 306063
E-mail: greg@corbettgeology.com Web: www.corbettgeology.com

COMMENTS ON

RECENT DRILL TESTS OF THE

ULTRAMAFIC CONTACT LODE,

STAVELY, AUSTRALIA

Greg Corbett
January 2020

SUMMARY

High grade Cu with associated Au-Ag, and nearby Ni-Co, are hosted within the Sulphide Lode which is localised by the Ultramafic Contact Fault (UCF), developed as a WNW trending dilatant flexure in the regional scale NNW trending Stavely Structure. Ore formation is interpreted to have been triggered by a transient event of sinistral strike-slip deformation on the Stavely Structure to form the dilatant UCF recognised as a west dipping normal fault contact between obducted ultramafic rocks to the east and sediments, volcanics and intrusions of the Cambrian Stavely Arc to the west. Stavely Minerals has also suggested the UCF and Sulphide Lode might lie in the northern graben fault of a pull-apart basin, which provides potential for a mirror structure on the southern margin.

The UCF Sulphide Lode displays progressive inward deposition of additional minerals as replacement of ultramafic rocks in the footwall of the UCF against competent Stavely Arc rocks in the hanging wall, which may have facilitated dilation and fluid flow. Many drill intersects of the UCF Sulphide Lode display the same paragenetic sequence of mineral deposition as:

- Initial pyrite $\pm$ quartz deposition, typical of porphyry style D veins, defines the outer lode margins, with minor magnetite and haematite within ultramafic hosted lodes.
- Chalcopyrite progressively overprints and replaces pyrite.
- Bornite, which hosts Au, becomes dominant over chalcopyrite.
- Chalcocite overprints bornite in the high-grade Cu intercepts, with the development of vughy silica alteration, as an indication of the progression to a very low pH ore fluid responsible for the deposition of high sulphidation state minerals.
- Covellite is not recognised in the UCF Sulphide Lode inspected here but noted in other lodes at Thursdays Gossan and elsewhere occurs late in the paragenetic sequence.
- Enargite is recorded in petrology but was not recognised in hand specimen as the highest sulphidation state mineral deposited at the final stage of fluid evolution to a lower pH.

This paragenetic sequence of mineral deposition mirrors the evolution of a rising depressurised and cooling magmatic ore fluid from a near neutral state (pyrite-chalcopyrite deposition) as it exsolves mainly increased quantities of SO_2 volatiles which in turn disproportionate to progressively form a hot very acidic (low pH) fluid and so deposit the sequence of minerals as: bornite -> chalcocite -> covellite ->enargite. Although this sequence of events occur with time throughout the UCF Sulphide Lode, portions of the lode where the bornite zone is best developed are regarded as most favourable. Here, high grade good metallurgy Cu is expected to be associated with Au and some Ag. A recent drill intercept (DDH070) 650 metres north of the initial DDH050 intercept of the sulphide lode intercepted pale sphalerite within the Sulphide Lode, typical of low temperature epithermal mineralisation. This is consistent with the Stavely Geological Model which places the main Cu mineralisation to the south and DDH070 lies on the northern margin of the hydrothermal system.

Continued exploration should with a priority A:

- Define the limits of the Sulphide Lode paying particular attention to identification of the controls to mineralisation as the dilatant flexure in the UCF and possibly outlined by the metal grade x vein width, with an allowance for vein dilution by the post-mineral dacite. Limited host rock competency for dilatant fracture formation is provided by the hanging wall sedimentary, volcanic and intrusive rocks.
- All other left-stepping perturbations in the Stavely Structure should be identified, prioritised and then prospected as potential dilatant sites for additional ore systems.
- Continued exploration should seek to identify porphyry Cu-Au mineralisation either as traditional intrusion-hosted stockwork veins or wall rock hosted wallrock porphyry such as at Cadia East.

INTRODUCTION

In January 2020, 3 days were spent for Stavely Minerals at the Stavely porphyry Cu-Au project in an examination of recent drill core from tests of the Sulphide Lode developed predominantly within the Ultramafic Contact Fault. Two days were devoted to drill core inspection and another day to group discussions with Stavely geological staff, and Scott Hayley as well as Paul Ashley by telephone. The assistance in this work is gratefully acknowledged of Stavely geological staff Chris Cairns, Jennifer Murphy, Hamish Forgan, Stephen Johnson, Michael Agnew, and consultants Scott Halley and Paul Ashley.

Priority

Exploration projects are rated with priorities to proceed with the planned work program to take them to the next decision point. Any such a grading might include a number of projects at widely differing stages of evaluation, some with substantial data bases, while others might be unexplored, but may display considerable untested potential. Priorities are based upon the data to hand at the time of inspection, and are subject to change as increased exploration provides improved and additional data. Projects are categorised as:

A – Of highest interest such that the proposed exploration program should be carried out immediately. However, early stage projects with untested potential might be rapidly down graded from this stage by completion of the planned work program.

B – Of some interest and should be subject to further work if funds are available, often with smaller components of continued exploration expenditure than higher priority targets.

C – Of only little interest and subject to further work at a low priority if funds are available, but not to be relinquished at this stage.

D – Of no further interest and can be offered for joint venture or relinquished.

GEOLOGICAL SETTING

The Sulphide Lode under consideration here is closely associated with the Ultramafic Contact Fault (UCF) which represents a portion, extending SE from Thursdays Gossan, of the Stavely Structure (in Corbett, 2019b) developed as the contact between ultramafic rocks to the east and Stavely Vocalics to the west. The Stavely Volcanics lie within Stavely Arc (Cairns, et al., 2019) which comprises volcanic and sedimentary rocks into which polyphasal porphyry intrusions have been emplaced, in what Bailey et al. (2018) describe as an Andean subduction complex constrained between a passive Gondwana Continent to the west and obducted oceanic crust to the east. The Cambrian age ascribed to the Stavely Volcanics, grading from 511 m.y. for the earliest intrusions, to 499-496 m.y. for the Thurdsays Gossan Quartz Diorite Porphyry (QDP) (Cairns et al., 2019b and referenced therein), places Stavely arc development as part of Delamerian Orogeny. The QDP represents the second in a series of overprinting events currently interpreted at Thursdays Gossan by Stavely Minerals (Corbett, 2019b) as:

- Victor porphyry represents the 4 km long composite intrusion system responsible for the alteration system described by Spence (1996).
- QDP intrusion accounts for the development of wall rock hosted modestly mineralised banded quartz-magnetite (M) veins.
- A significant intrusion must account for the wide distribution of pyrite D veins which characterise the Stavely district and transect the QDP M veins.
- A magma source is interpreted to account for the emplacement of Cu sulphides with some Au, into the earlier D veins in order to form features such as the Sulphide Lode.

STRUCTURE

The UCF (as part of the Stavely Fault in Corbett, 2019b) dips steeply to the W-SW as a (west block down) normal fault, probably with a growth fault character, which created the depression into which the Stavely volcanic rocks were deposited, and a dilatant environment for the emplacement of the polyphasal porphyry intrusions. It has been more accurately defined south of Thursdays Gossan in the vicinity of the UCF Sulphide Lode where the UCF represents a deviation of the regional Stavely Structure from the average NNW trend (337° average in Corbett, 2019b), to about 300°. Other sulphide lodes are hosted by the North Fault and associated structures. The development of a mineralised lode within such a dilatant WNW splay would have been facilitated by a component of (? transient) sinistral strike-slip movement on the Stavely Fault System, which represents the most prominent structural element in the district. Similar transient events of sinistral strike-slip movement are recognised triggers for ore formation within the generally EW compressional Macquarie Arc of NSW, most discernible at the Cowal Gold deposit, as well as other arcs such as in northern Chile (Corbett, 2017).

In the flexure model (above), the degree of dilation to provide wider and higher precious metal veins is expected to increase as the flexure progressively rotates anticlockwise from NNW to WNW and closer to EW, during continued sinistral strike-slip movement on the regional scale Stavely Structure (figure 1). The degree of down drop-on the graben fault is expected to increase with dilation, especially if the dip increases to steeper angles. In these settings best ore commonly occurs within ore shoots (Corbett 2012, 2017), characterised by wider with higher metal grade vein segments, which display orientations governed by the interaction of fault movement as: dip-slip to produce flat-pitching ore shoots in steep-dipping normal faults portions, and strike-slip to produce steep-pitching ore shoots localised in dilatant sites in the host fault, such as flexures or jogs. At Stavely the combination of sinistral strike-slip and dip-slip fault movement is expected to provide north-pitching ore shoots.

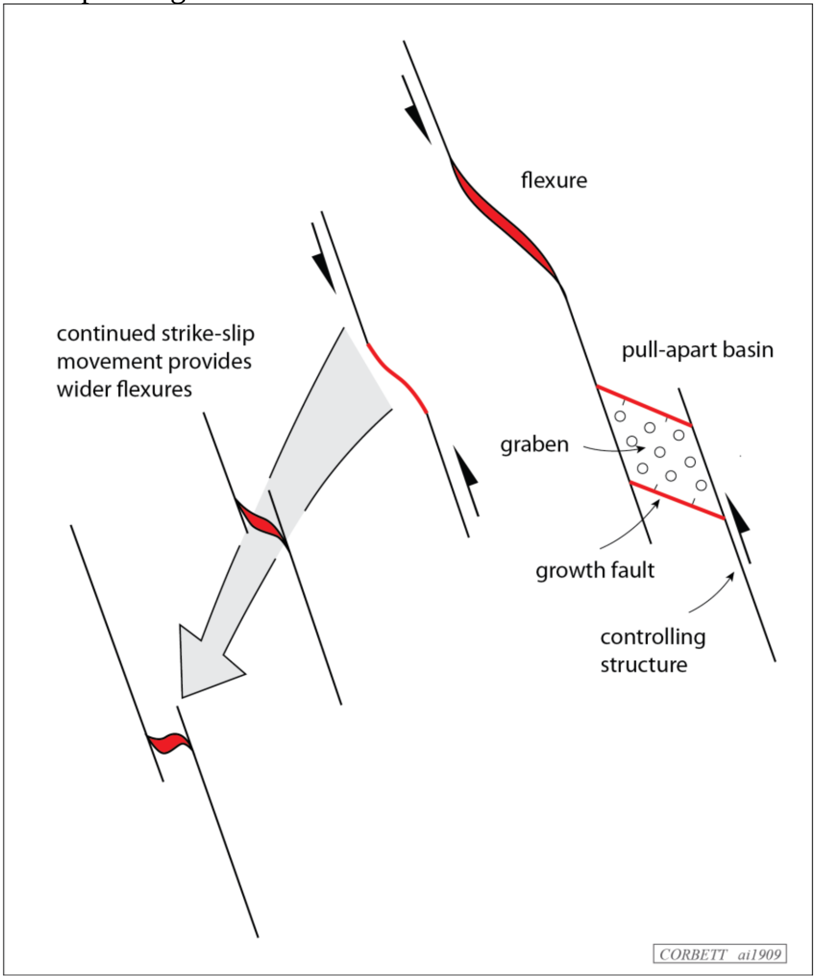

Figure 1. Distinction between a flexure and pull-apart basin and showing the development of wider veins during the progressive rotation which results from the continued movement on the strike-slip structures.

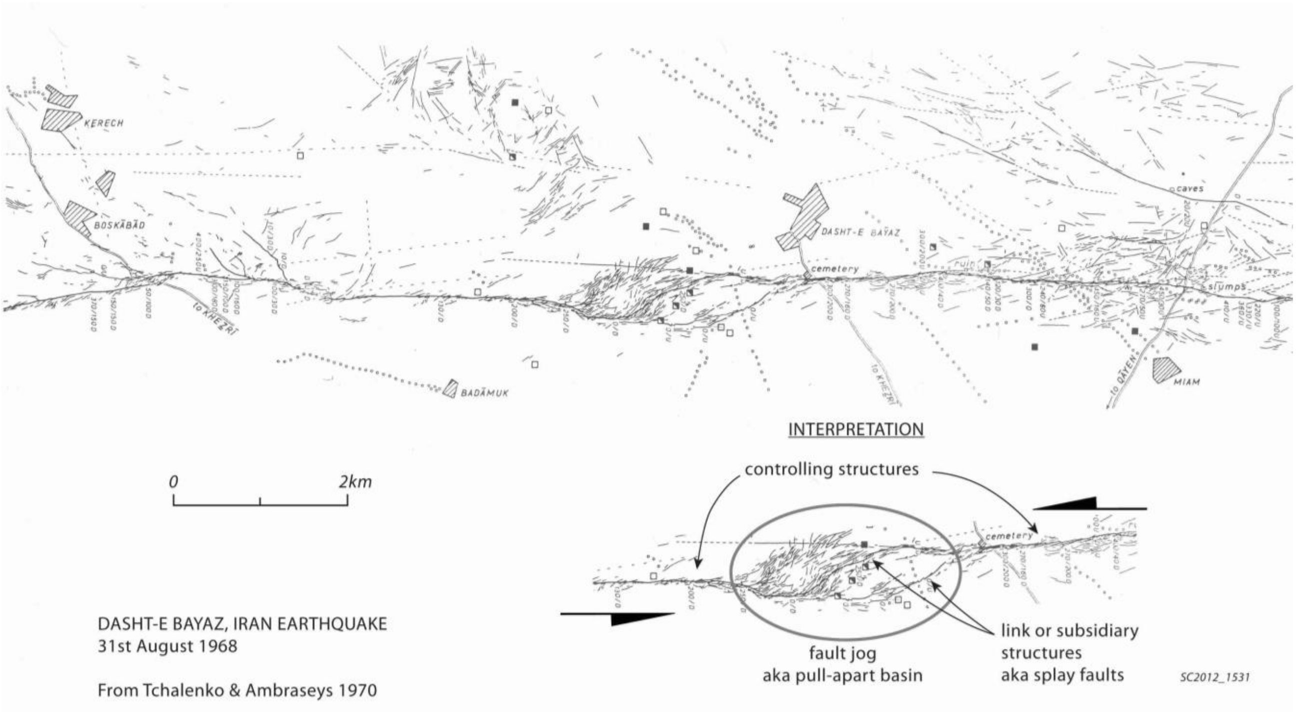

Figure 2. Modern analogy of pull-apart basin showing dilatant link structures between the strike-slip structures.

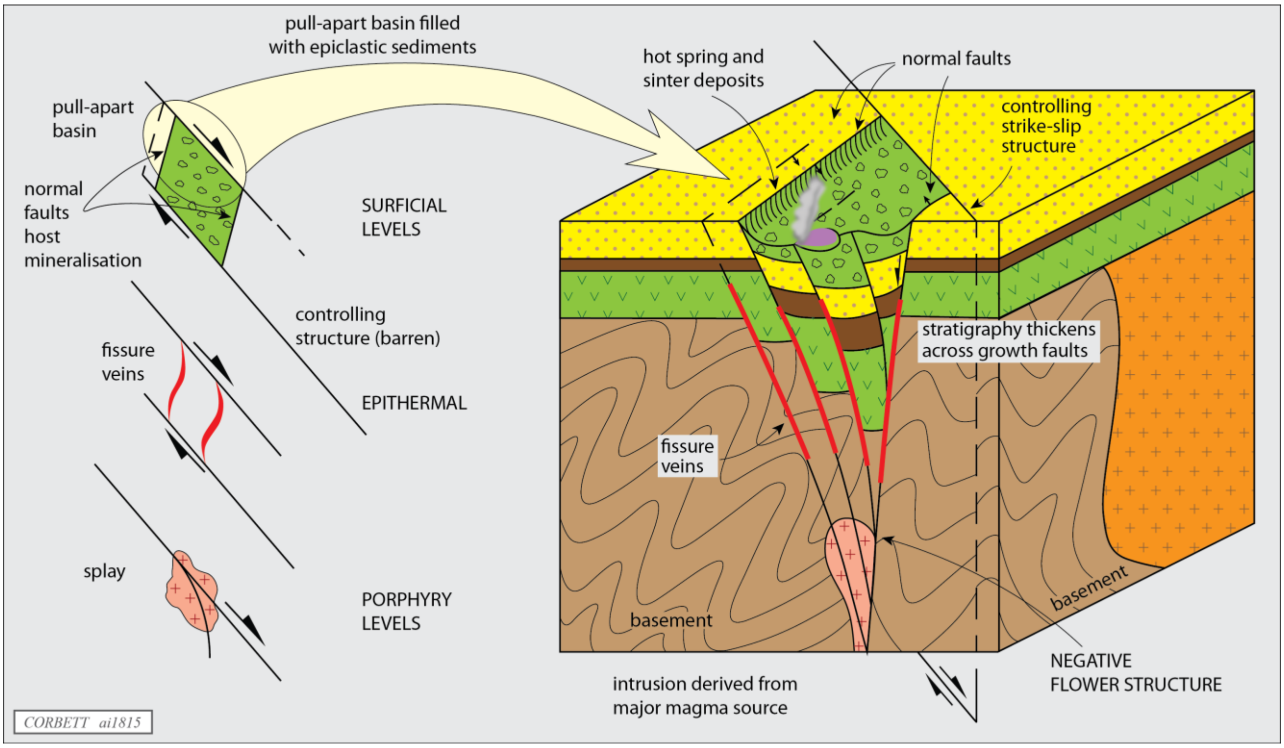

Figure 3 Model for a pull-apart basin developed within a negative flower structure showing down-drop on graben-bounding and link structures which at depth represent the dilatant structures which host veins and at depth may host porphyry deposits localised within splay faults, from Corbett and Leach (1998) and Corbett, 2017).

In some instances (Goonumbla, Eastern Australia) relaxation of orthogonal subduction-arc compression may act as a trigger for porphyry emplacement and vein formation. Additional configurations for the structural setting of the Sulphide lode under consideration by Stavely Minerals include a pull-apart basin model and a reverse flower structure, which may include participation of the North Fault. Flexures are defined as simple deviations in a throughgoing structure in which the progressive rotation of the dilatant portion accounts for increases in vein width in response to continued strike-strike movement on the controlling structures (figures 1 - 3; Corbett and Leach, 1998; Corbett, 2017). Pull-apart basins develop as dilatant link structures take up the dilation between two strike-slip structures and by down-drop facilitate pull-apart basin formation.

The UCF in the vicinity of Thursdays Gossan is transected by a low angle reverse fault (LAS) which commonly hosts the 409-406 m.y. Lalkaldarno porphyry dyke, and so is regarded as post-mineral Devonian structural with intrusive activity. Although reverse offsets in the order of 200 m are recognised, the extent of strike-slip displacement of the UCF remains unknown.

Whether flexures of pull-apart basins, the presence of mineralisation within one left-stepping segment of the regional Stavely Structure indicates that any other similar perturbations should be prospected as dilatant sites for ore formation.

UCF SULPHIDE LODE

The many drill intercepts of the Sulphide Lode examined in this inspection all display a similar paragenetic sequence of development which is also related to that recognised in the SMD044 drill intercept of lode sulphide mineralisation associated with the North Fault. (Corbett, 2019a). The Ultramafic Contact Fault represents the main controlling structure, for lodes with up to 10 m down hole drill intercepts, although many subsidiary fractures also host mineralisation, typically of a lesser calibre down to only metre scale. Post-ore fault activation id often apparent within the drill intercepts and wall rock selvage alteration is described below.

There may be a rock type competency influence to ore shoot development (Corbett, 2013; 2017), as the brittle volcanosedimentary rocks and porphyry intrusions in the hanging wall fracture better than the footwall altered ultramafic rocks, and so drill intercepts wholly within the ultramafic may be of a poorer quality. In the drill holes examined, which bore from SW to NE, and therefore from volcanosedimentary rocks and intrusions towards the ultramafic rocks, the UCF is easily discernible in intensely altered (sulphide flooded) rocks, as a sharp rise in Ni and Co contents, generally at the upper contact of the Sulphide Lode which also contains relict chromite. There is also a zone of remobilised and supergene enriched Ni mineralisation within the ultramafic rocks in DDH SMD050 below the Sulphide Lode. Consequently, the Sulphide Lode displays a strong replacement character (of the ultramafic) rather than progressive fill of an open space dilatant structure within competent host rocks, as is typical of epithermal veins developed at shallower crustal levels than these lodes are expected to have formed. Nevertheless, the Sulphide Lode displays inward vein growth with time from the margins of a progressively opening structure, typical of epithermal veins.

A consistent paragenetic sequence of mineral deposition recognised in the drill intercepts of the UCF Sulphide Lode grades from the outer lode margins to the inner portion (photos 1 & 2) as:

- Coarse grained euhedral pyrite or quartz-pyrite typical of the abundant D veins at Stavely, represents the main portion of each lode and is cut by cores of later Cu sulphide mineralisation (photos 3 & 4). Some lodes hosted wholly within ultramafic rocks are dominated by early minor magnetite and later red haematite or specularite.
- Chalcopyrite, with low Au contents, overprints pyrite which it rims, cuts as veinlets or replaces (photos 5 & 6).
- Bornite, with elevated Au, progressively overprints chalcopyrite (photo 6) and, as it hosts higher Cu-Au contents than chalcopyrite, accounts for higher metal contents (photo 7) as it becomes the dominant sulphide. On exposed surfaces bornite displays a tarnish to blue supergene covellite (photo 7).
- Chalcocite overprints bornite as a significant increase in Cu sulphide content in the vein centres to produce the highest Cu grade drill intercepts (photos 9 & 10). Vughy silica

alteration, typical of high sulphidation epithermal Au mineralisation, has developed in association with the transition from bornite to chalcocite deposition, as an indication of the dramatically lower pH ore fluid that evolved at this later stage (below) in order to deposit higher sulphidation state ore minerals (photo 9-11).

- Covellite is recognised in many of the deeper lode intercepts in the vicinity of the North Fault (photo 8), but not specifically within the Sulphide Lode paragenetic sequence. Dick et al. (1994) place covellite as the last Cu sulphide phase deposited in the Collahuasi district, Northern Chile, which is consistent with sulphide mineral zonation described by Meyer and Hemley (1967).
- Enargite deposited from the lowest pH fluid last in the paragenetic sequence is recorded in petrology of the Sulphide Lode (Ashley, unpubl. reports), but was not recognised in this hand specimen inspection. It is locally well developed as a late stage overprint in the deep level sulphide lodes at Thursdays Gossan. Limited shallow level drill intercepts of high sulphidation epithermal Au-Cu mineralisation and associated advanced argillic alteration intersected by drilling in the Stavely district represent the completion of this fluid evolution process (below).
- A post mineral dacite locally cuts the lode and may stope out mineralisation.
- Supergene chalcocite accounts for elevated Cu contents where faults transect the lodes and have facilitated the downward movement of Cu-bearing ground waters.
- High grade supergene Ag is recognised with supergene chalcocite such as at SMD050 where a fracture face which yielded a hand held XRF analysis of 2% Ag with 44% Cu (photo 12), and no doubt contributes towards the 500 g/t Ag content over two 1 m assay intervals in that drill intercept of the Sulphide Lode.
- Low temperature silica (opal), which fills open space such as in the vughy silica in the vein centres, may have been deposited by late post-mineral warm meteoric waters during progressive uplift and erosion.
- Supergene covellite is recognised as a patina on exposed bornite surfaces developed since the drill core has been cut (above, photo 7).

Following this field inspection, drill hole DDH073, collared some 750m north of the original Sulphide Lode intercept in DDH050, identified significant pale low-Fe low temperature sphalerite in the position of the Sulphide Lode, at the faulted contact between Stavely Volcanics and Serpentinite. The most common metal zonation marginal to porphyry deposits results from progressive temperature decline away from the magmatic source from Cu, locally to marginal Mo, and then typically to Pb-Zn and then more distal As-Sb. Temporal zonation in Cu species with the change in sulphidation state, by declining pH of the ore fluid, is described herein. The metal zonation at the Magma Vein described by Hammer and Peterson (1968) grades within an initial pyrite vein, herein likened to the D veins at Stavely, to distal sphalerite over about 1.2 km (figure 4). Copper species display later stage zonation at Magma and Stavely. At Stavely, the gossan boulders at Thursdays Gossan are interpreted to have been derived from the weathering of D veins which are well developed in the recent drill holes and also as the initial stage of the Sulphide Lode (above). Consequently, the sphalerite identified in DDH073 is consistent with the existing geological model which suggests DDH073 is located on the northern margin of the batholitic source for mineralisation and exploration for Cu mineralisation should be focused further south. The pale low temperature sphalerite is indicative of epithermal style low temperature conditions which would be expected to have been deposited in some distance from the magmatic source. Localised high sulphidation epithermal Cu-Au occurrences are also located in this setting

This paragenetic sequence of mineral deposition events (above) is one of time, as later stage minerals are deposited towards the centre of each dilated lode overprinting earlier minerals which remain at the margins as the lodes expanded from the centre. Elsewhere in major lodes such as the Magma vein, Superior District, Arizona, and also recognised at Thursdays Gossan, the deposition of later higher sulphidation state minerals results in overprints of covellite or enargite upon pyrite, chalcopyrite and bornite in deep level lodes (Corbett, 2019b and references therein). The model for derivation of these fluids (Corbett, 2019a; Corbett, 2020 and references therein) suggests that rising depressurised and cooling magmatic fluids exsolve SO_2-rich volatiles. Below 400°C, particularly in the epithermal temperature range of 150-300°C, this concentrated SO_2 disproportionates to H_2SO_4 and H_2S gas, and so the once over-pressurised, deep level, near neutral, magmatic fluid, progresses to exhibit a low pH as it rises and evolves. It is then expected to deposit high sulphidation state minerals (enargite) which overprint earlier lower sulphidation state minerals. Consequently, enargite-bearing high sulphidation epithermal Au deposits develop at epithermal crustal levels from the reaction with wall rocks of the rapidly rising strongly acidic (low pH) magmatic fluid, and some epithermal veins are recognised at Stavely. This hot, very acidic (pH 1-2) fluid may then be progressively cooled and neutralised by reaction the wall rocks and entrainment of ground waters to deposit lower sulphidation ore minerals with bonanza precious metal grades and superior metallurgy to the enargite ores, as recognised at Butte, Montana; El Indio, Chile and Mt Carlton, Australia. In this scenario, an ore fluid has evolved from near neutral at depth, where it deposited low sulphidation minerals such as chalcopyrite within potassic alteration, to very acidic (pH 1-2) at epithermal crustal settings where it deposited high sulphidation ore minerals such as chalcocite with associated advanced argillic alteration, and then in turn evolves to deposit an intrusion-related low sulphidation epithermal ore assemblage such as sphalerite-galena-rhodochrosite with high Au-Ag grades and characterised by good metallurgy (Butte, Montana; Appendix I Corbett, 2019b).

Bornite ores are preferred at Stavely for the high Cu and Au contents with favourable metallurgical response which is expected to decline in the higher crustal level enargite ores, while Cu-Au values may decline in the deeper level chalcopyrite ores. Thus, if the system is vertically zoned the overall crustal level of formation will be important.

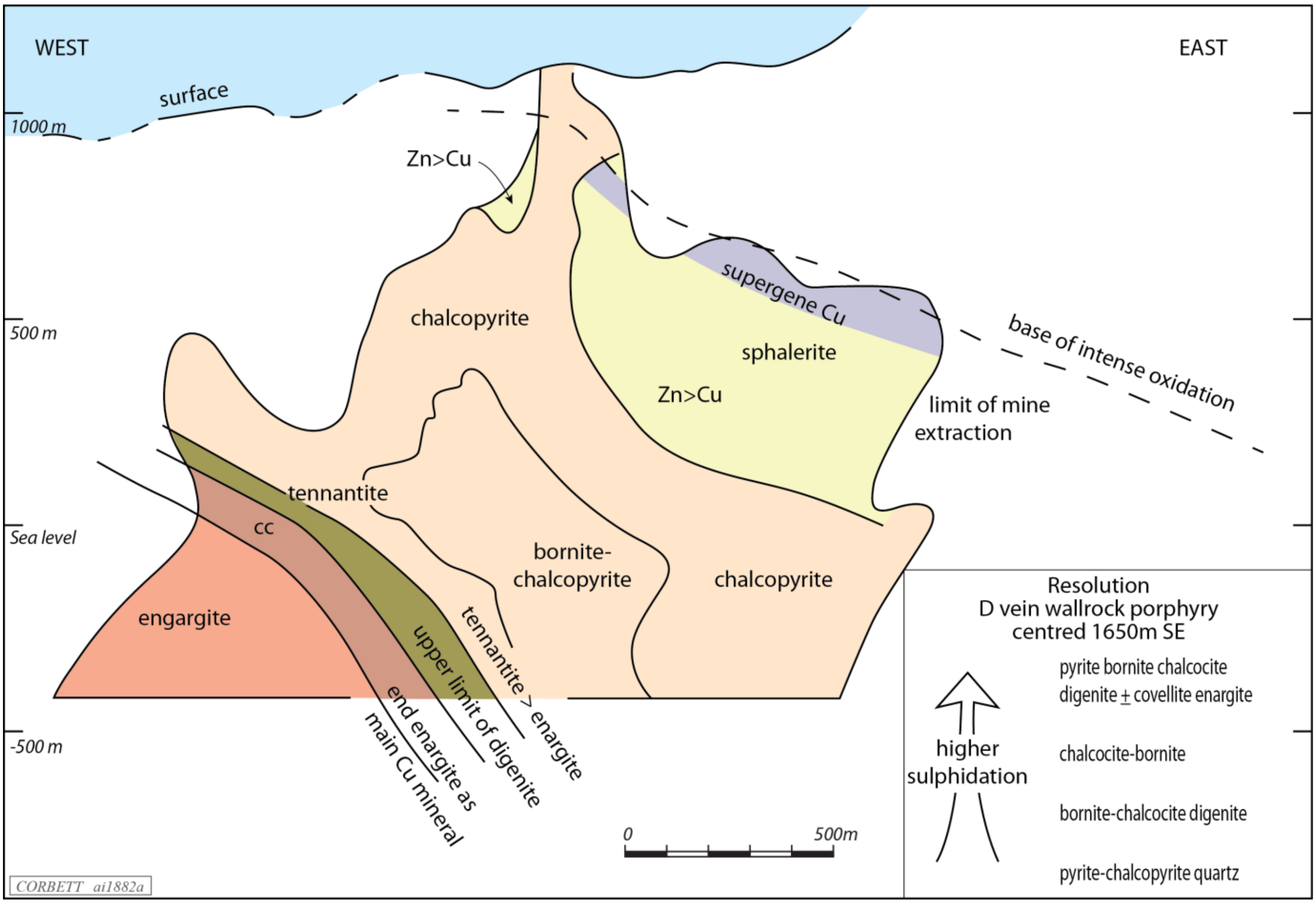

Figure 4 Metal zonation in the Magma Vein Superior district from west to east as left to right. The initial pyrite throughout has then been progressively overprinted by copper minerals.

HYDROTHERMAL ALTERATION

The early D vein phase of the Sulphide Lode displays typical sericite alteration selvages. However, in hand specimen much of that selvage alteration appeared more like lower temperature less ordered illite, than the higher temperature more platy sericite. The illite crystallinity should be verified by spectral studies as other aspects of the Sulphide Lodes (Paul Ashley, pers comm) are consistent with low temperatures of formation.

Advanced argillic alteration is expected in the wall rock marginal to the veins as the alteration passes though bornite, with dominantly sericite and local pyrophyllite-dickite alteration, to covellite with increased pyrophyllite-dickite alteration, and then chalcocite with associated vughy silica in the ore zone. Theoretically, the lode should be rimed by alunite wall rock alteration. However, the chalcocite-vughy silica ore lies at the centre of D vein pyrite which might protect the wall rocks from the effects of the cooling low pH fluids. It is difficult to distinguish the more marginal pyrophyllite from talc in the ultramafic rocks in hand specimen, and so spectral investigations are required here also.

CONCLUSIONS

The UCF Sulphide Lode at Stavely appears to host best ore within ore shoots which may display similar controls to epithermal deposits (Corbett 2012, 2013) as:

- Structure as the sulphide lode has developed in the UCF dilated as a left-stepping dilatant flexure in the regional Stavely Structure by a transient component of sinistral strike-slip movement. A pull-apart basin environment would place a mirror dilatant fracture south of the UCF. The orientation of any ore shoot will be controlled by the interaction of sinistral strike-slip and SW block down dip-slip movement to provide a possible northern pitch in the plane.
- Host rock competency may be important as the best mineralisation lies within the UCF which features competent sediments and intrusion in the hanging wall, whereas the footwall ultramafics are incompetent and host only poor veins. The Sulphide Lode has developed as a replacement of the ultramafic rocks, rather than simply fill or open space.
- Style of mineralisation as the evolving ore fluid described herein deposits best Cu-Au grades and metallurgy in the bornite ore which transitions to include overprinting chalcocite.
- The mechanism of Cu-Au deposition as cooling of the ore fluid.

The Sulphide Lode displays similarities with other lodes developed in porphyry districts such as Magma, Arizona and Butte Montana as they display a paragenetic sequence as: pyrite -> chalcopyrite -> bornite -> chalcocite -> covellite -> enargite deposited from an evolving ore fluid which passes in time from a near neutral to very low pH supported by the presence of vughy silica with the chalcocite at Stavely. Here, the change in mineralogy with time is discernible as veins grow inwards. The evolution in time is also discernible at the Magma Vein, Arizona where enargite overprints other veins at depth, although the same evolution is present in space at Butte, Montana where enargite is recognised in the upper portion of the hydrothermal system, and low pH fluid then evolves to deposit lower sulphidation ore minerals laterally within a dilatant structural setting (above; Appendix 1, Corbett 2019b).

RECOMMENDATIONS

Regional prospecting should continue with a priority A. All the left-stepping perturbations in the regional scale Stavely Structure should be numbered or named and then prioritised for field investigation. Remote techniques might aid in the evaluation of cover prior to simple lines of soil augre samples as an ideal regional prospecting tool. Flexures rotated more from NNW to WNW and towards EW are likely to be more dilatant and better mineralised.

The controls to the development of ore shoots should be evaluated with a priority A, as a prospecting tool. As suggested above the combination of the Sulphide Lode/UCF shape and metal grade x width plots should help to provide the ore shoot shape, although any effects of the post-mineral dacite intrusion will need to be taken into account.

Although the Sulphide Lode remains highly prospective with a priority A, the ultimate exploration target remains a porphyry Cu-Au which should be given the same priority. The setting of the Sulphide Lode within a graben bounding fault is analogous to the Magma vein at the Superior District, Arizona, where the Resolution porphyry, described as a series of D veins (Hehnke et al., 2012) and hence a wallrock porphyry as per the terminology used in Australia, may overlie and apophysis in the buried magma source. Exploration should continue to seek a porphyry Cu-Au deposit, whether intimately associated with an intrusion or a wallrock porphyry. A plot of Mo might be useful as it commonly forms a halo around porphyry systems.

REFERENCES CITED

Bailey, A., Bastrakov, E., Cairns, C., Cayley, R., Duncan, R, Huston, R., Lewis, C, McAlpine, S., Schofield, A., Skladzien, P., Taylor, D., and Thomas, M., 1 2018, Regional geology and mineral systems of the Stavely Arc, western Victoria, A. Schofield, Ed. Geoscience Australia, Record 2018/02, 220 p.

Corbett, G.J., 2012, Structural controls to, and exploration for, epithermal Au-Ag deposits: Australian Institute of Geoscientists Bulletin 56, pp 43-47.

Corbett, G.J., 2013, Pacific rim Epithermal Au-Ag: World Gold Conference Brisbane, Proceedings, Australasian Institute of Mining and Metallurgy, Publication Series 9/2013, p. 5-13.

Corbett, G.J., 2017, Epithermal Au-Ag and porphyry Cu-Au exploration – Short Course Manual: unpubl., www.corbettgeology.com

Corbett, G.J., 2020, Epithermal Au-Ag and porphyry Cu-Au exploration – Short Course Manual: unpubl., www.corbettgeology.com

Corbett, G., August 2019a, Comments on the significance of diamond drill hole SMD044 at the Stavely porphyry Cu-Au project, Western Victoria, Australia: Unpublished report to Stavely Minerals

Corbett, G., August 2019b, Comments arising from a July 2019 review of the Stavely Cu-Au Porphyry Exploration Project, Western Victoria, Australia: Unpublished report to Stavely Minerals.

Corbett, G.J., and Leach, T.M., 1998, Southwest Pacific gold-copper systems: Structure, alteration and mineralization: Society of Economic Geologists Special Publication 6, 238 p.

Cairns., C., Forgan, H., Agnew, M., Johnson, S., Murphy J., and Corbett, G., 2019, Unravelling the gordian knot at Thursday's Gossan: Mines and Wines Conference, 2019, Australian Institute of Geoscientists.

Dick, L.A., Chavez, W.X., Gonzales, A., and Bisso, C., 1994, Geological setting and mineralogy of the Cu-Ag-(As) Rosario Vein System, Collahuasi District, Chile: Society of Economic Geologists Newsletter No 19.

Hammer D.F. and Peterson D.W., 1968, Geology of the Magma Mine area, Arizona *in* Ore Deposits of the United States, 1933-1967, Americian Institute of Mining, Metallurgical and Petroleum Engineers, New York, p 1282-1301.

Hehnke, C., Ballantyne, G., Martin, H., Hart, W., Schwarz, A., and Stein, H., 2012, Geology and exploration progress at the resolution Cu-Mo deposit, Arizona: Economic Geology, Special Publication, 16, p. 147-166.

Hehnke, C., Ballantyne, G., Martin, H., Hart, W., Schwarz, A., and Stein, H., 2012, Geology and exploration progress at the resolution Cu-Mo deposit, Arizona: Economic Geology, Special Publication, 16, p. 147-166.

Spencer, A.A.S., 1996, Geology, mineralisation and hydrothermal alteration of the Thursdays Gossan Porphyry system, Stavely, Western Victoria: Unpublished honours thesis, La Trobe University.

Photo 1 View of the Sulphide Lode in DDH SMD51, 144-153 m grading from outer D vein pyrite (photo 3) to inner Cu sulphides and vughy silica (photo 9 where the pencil sits).

Photo 2 View of the Sulphide Lode in DDH SMD53 200-210 m grading from outer D vein pyrite to central Cu sulphides (photo 10).

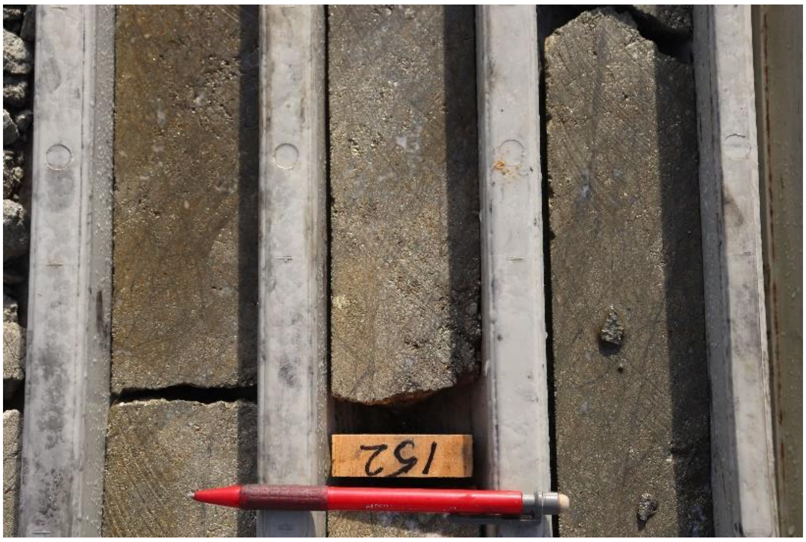

Photo 3 Pyrite D vein pyrite on the margin of the Sulphide lode shown in photo 1, DDH SMD51-152 0.04% Cu & 0.06 g/t Au.

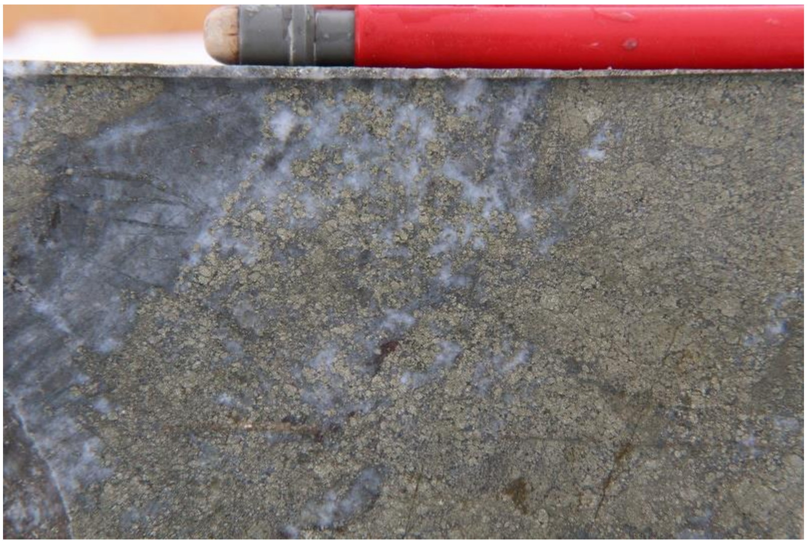

Photo 4 Quartz-pyrite D vein, DDH SMD54, 90m, 0.23% Cu & 0.05 g/t Au.

Photo 5 Chalcopyrite overgrows pyrite, DDH SMD50, 89.9m, 1.28% Cu & 0.64 g/t Au.

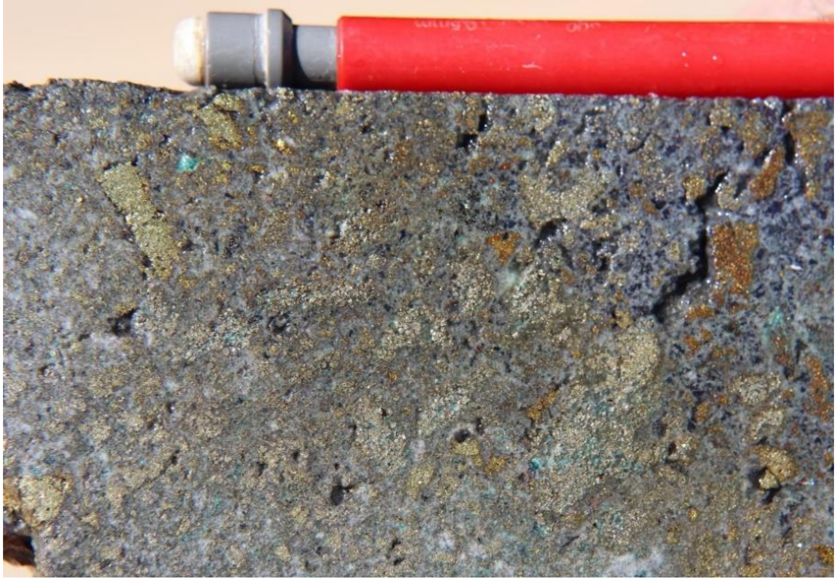

Photo 6 Chalcopyrite grading to bornite and minor chalcocite overgrows and cuts pyrite, DDH SMD50, 82.9m, 21.6% Cu & 3.8 g/t.

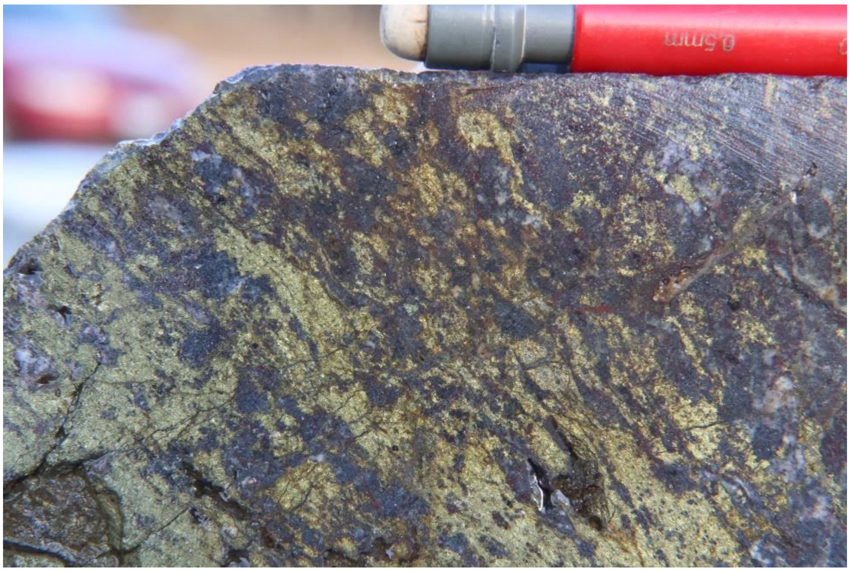

Photo 7 Pyrite-chalcopyrite-bornite lode with a blue supergene covellite tarnish on the bornite, DDH SMD53, 202.1m, 8.25% Cu & 0.41 g/t Au.

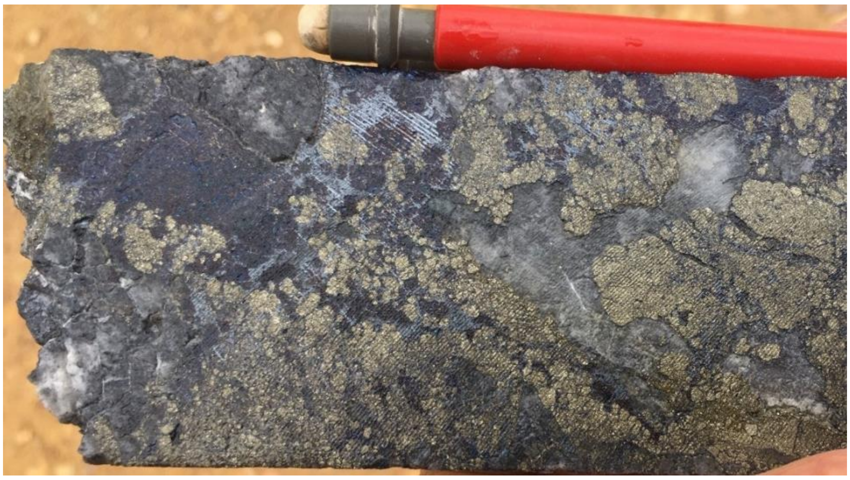

Photo 8 D vein pyrite overprinted by bornite, then chalcocite and later anhydrite, DDH SMD44 W1, 858.6m.

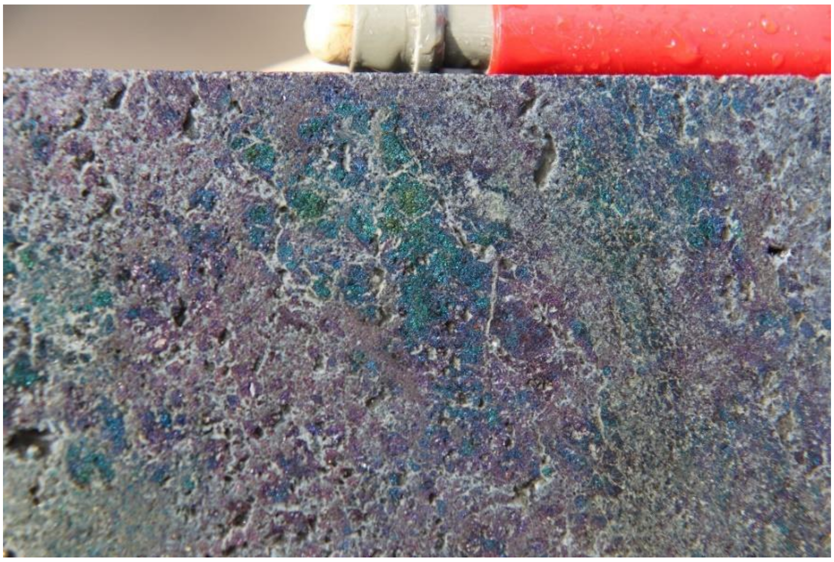
Photo 9 Massive bornite with later chalcocite DDH SMD50, 82.7m, 21.6% Cu & 3.8g/t Au.


Photo 10 Bornite overgrown by chalcocite with vughy silica texture, DDH SMD50, 85.5m, 40.3% Cu & 2.35 g/t Au.

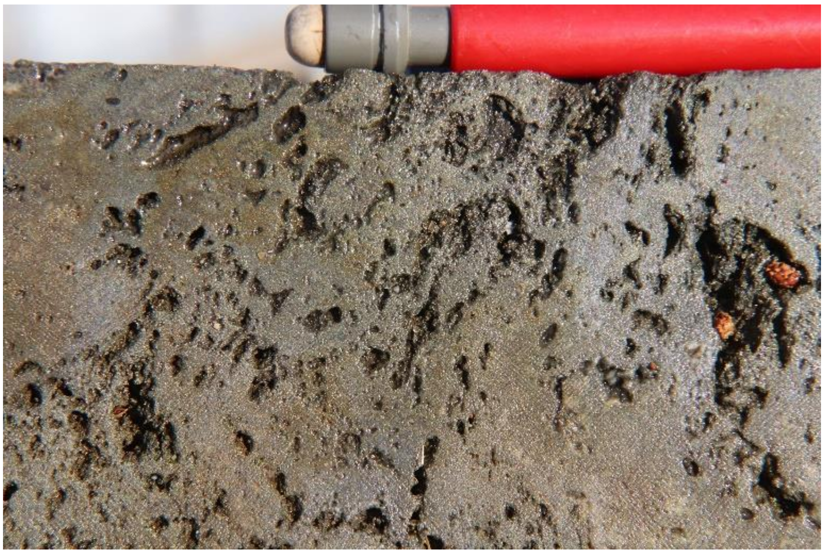
Photo 11 Pyrite, bornite, chalcocite with vughy silica, DDH SMD51, 149.2, 12.2% Cu & 3.33 g/t Au.

Photo 12 Fracture with supergene chalcocite which yielded a hand held XRF assay of 55% Cu & 0.5% Ag, SMD50, 65.5m.