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McCartheys Hill Diamond Core Logging

Two diamond drill holes drilled in the McCarthey's Hill area of the Pine Creek Orogen were geologically logged. The following briefly describes the lithology, structure, mineralisation and alteration observed in the core.

The core had been orientated using the Reflex system and a bottom of core line was marked. Stereoplots of bedding data show that the orientation marks were of reasonably high quality. The holes were said to have been drilled inclined at -60^{o} towards 040^{o}; in the absence of down-hole survey data the holes are assumed to have been drilled straight for the purpose of this report. No collar coordinate data were provided.

Both diamond holes intersected highly sulphidic metasediments assigned to the Koolpin Formation. Base-metal sulphides were intersected in both holes, although Fe-sulphides dominate.

DH2 Lithology

DH2 has intersected a sequence of interbedded carbonaceous meta-pelites (shale and siltstone) and cherts assigned to the upper Koolpin Formation. The sequence is hornfelsed within the contact metamorphic aureole of a biotite-hornblende granite (McCarthys Granite), some of which was intersected in the last few metres of the hole. Pyrrhotite is abundant (0.5-20%) in most of the lithologies intersected, but is especially concentrated in cherty horizons. Galena and sphalerite were observed only in a small quartz stock-work vein zone. Chalcopyrite is extremely rare but can be seen as occasional inclusions in vein hosted pyrrhotite. Definite identification of chalcopyrite from pyrite was difficult, as the core had been allowed to tarnish.

Lithologies intersected comprise:

Hornfelsed carbonaceous shale-siltstone.

These meta-pelites are very fine grained dark grey to black siliceous rocks. While the fine grain size makes visual identification of the minerals difficult, they appear to be composed of quartz, biotite, k-par and graphitic carbon. Pyrrhotite is abundant, from 0.5-20% mostly along bedding plane laminations, but also disseminated, as pyrrhotite dominant bands and as rare crosscutting tension veinlets. Porphyroblasts of andalusite are frequently prominent, especially in the more carbonaceous, less siliceous zones.

Chert

Numerous chert horizons are present. Cherts are sometimes massive bands of grey silica-quartz to 30cm thickness, but more frequently beds of slightly flattened silica nodules of 0.05-2m width set in either a bedded carbonaceous meta-pelite or a recrystallised banded siltstone matrix. Pyrrhotite is concentrated in the chert horizons, frequently as rims around chert nodules, disseminated, as bedding plane laminations and as coarse fracture fillings in chert bands. Chert often has a sugary, recrystallised appearance. The "siltstone" matrix often contains green amphibole.

Meta-siltstones

Banded grey-brown rocks comprising fine to medium grained quartz-biotite-sericite, occasionally quartz-amphibole-and rare garnet, sometimes gneissic in appearance are interpreted as recrystallised meta-siltstones. They are distinguished from the carbonaceous shales mainly by absence of obvious carbon and much coarser grainsize. Sulphides are much less common in these rocks, except adjacent to chert bands.

Granite

The hole terminated in a fine to medium grained biotite-hornblende granite. The contact is intrusive, with a narrow but distinct almost aphanitic chilled margin up to a few centimetres from the contact. The granite has a rather disorganised appearance, with randomly oriented patches of varying grainsizes; this may be the result of absorption of country rock and possibly still the effect of a chilled margin. The hole terminated a few metres into the granite, so it is unknown if it is a dyke or part of a larger body.

DH2 Structure:

The sequence is well bedded with little apparent change in bedding orientation down the hole despite the presence of a number of small order folds. Overall the sequence dips at 69 degrees to 215 (Figure 1). Rough measurement of minor fold orientations suggests a dominant moderate westerly fold plunge of about 40 degrees to 280 (Figure 2).

A few very minor faults are present in the core; they consist of a narrow graphitic fault-plane, sometimes with narrow laminated quartz emplaced. Quartz crackle fracturing extends for a few tens of centimetres from the fault-plane. Faults appear to be mostly sub-parallel to the bedding.

Quartz veining is very scarce. Apart from the above mentioned crackle veining, veining is limited to a few rare hairline fractures, a small quartz base-metal ladder vein and rare quartz-feldspar-muscovite segregations.

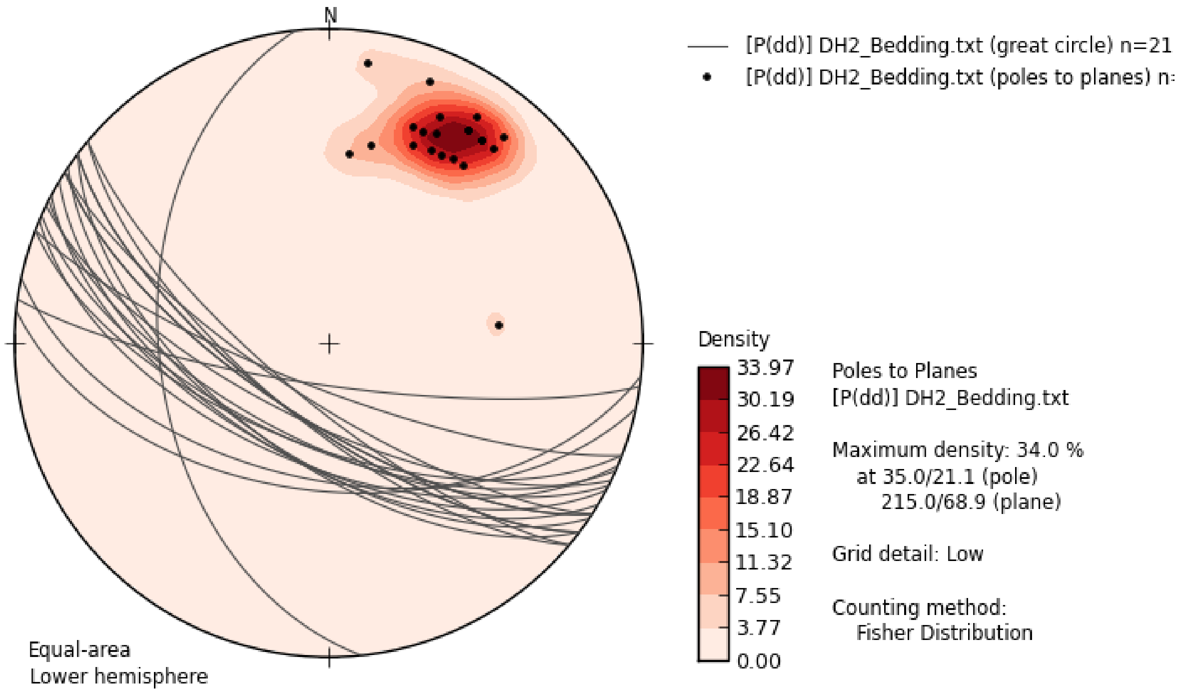

Figure 1 Stereoplot of bedding measurements, DH2, potted using OpenStereo software

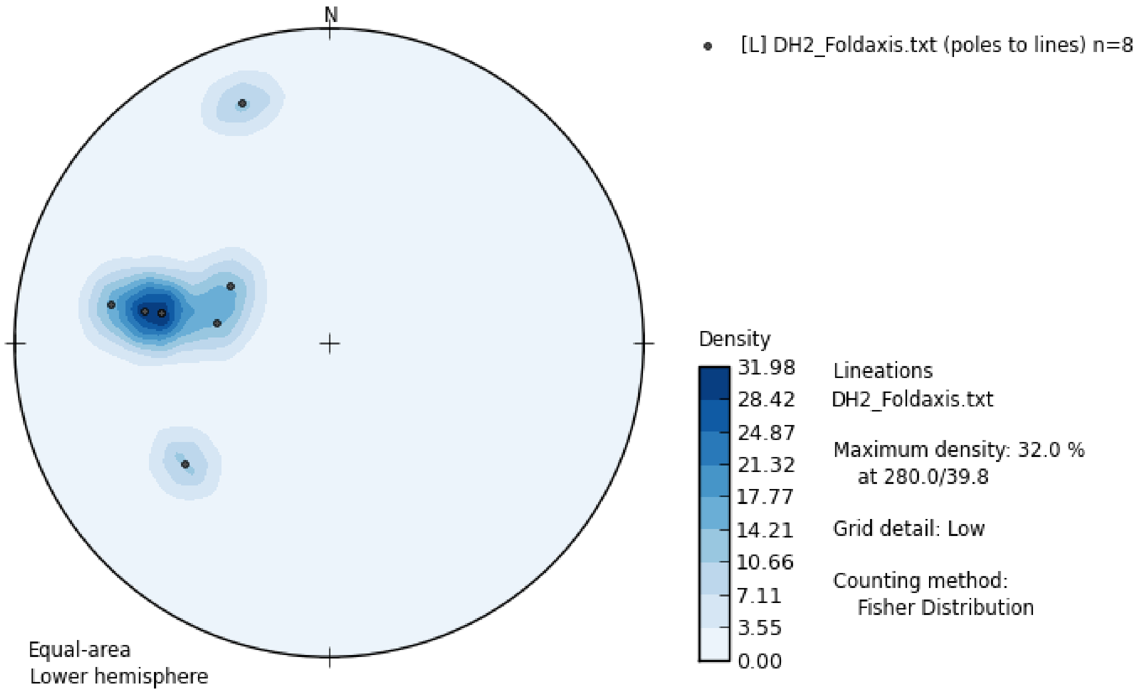

Figure 2 Stereoplot of fold-axis measurements DH2

DH2 Mineralisation and alteration:

While pyrrhotite is prominent throughout the core, it is most likely that this is formed from the conversion of diagenetic pyrite in the contact metamorphic aureole of the granite, and not as a result of hydrothermal fluids passing through the rock.

There is very little sign of hydrothermal alteration in the core; most mineral assemblages are consistent with thermal contact metamorphic effects without the addition of hydrothermal fluids. Very rare chlorite alteration and sericite alteration is present in a zone of recrystallised meta-siltstones.

Galena and sphalerite are present in a small quartz ladder-vein/stock-work at 239m.

Trace arsenopyrite is present sparsely disseminated in a massive chert band at 244.6m. This is the only area where arsenopyrite was observed.

Chalcopyrite is very rarely found as segregations in more massive pyrrhotite veins, never in the more abundant lamellar pyrrhotite.

Pyrite or marcasite is present in low quantities in some coarser pyrrhotite veins and as coatings on rare late fractures.

DH2 Conclusion:

Abundant pyrrhotite explains the aeromagnetic anomaly targeted by this hole. With the exception of a few veins, the pyrrhotite is not of hydrothermal origin and is thus not prospective for gold or base-metals mineralisation.

The simple structure suggests the hole was drilled in limb position away from the structurally more favourable hinge zone; the orientation of minor fold axis suggests a moderate westerly plunge to the main fold hinge.

The lack of significant veining or alteration suggests little hydrothermal activity in the vicinity of this hole. It appears that nearby granite emplacement has been by melting and absorption of the country rock with little fracturing of the hornfelsed carapace, and for hence little opportunity for hydrothermal fluids to migrate through the rock.

The base-metal stock-work at 239m is of interest as it implies the possibility of a hydrothermal base-metal mineralising event in the area at least, even if the occurrence in this hole is of no economic significance. The main vein in the stock-work was measured at dipping 20^{o} towards 210^{o}; however this is too little evidence on which to try and obtain a vector to mineralisation.

Sparse disseminated arsenopyrite in chert at 244.6m is an anomaly; it may imply that this particular chert is actually a quartz vein although its appearance doesn’t support that.

DH2 Recommendations

For completeness sake the base-metal veining and the chert-arsenopyrite zone should be sampled, not because they are likely to give economic results, but because they would provide comparisons with any other holes and could indicate if gold mineralisation is present in the area.

DH1

DH1 has, like DH2 intersected the same hornfelsed, sulphidic carbonaceous shales and nodular chert of the Koolpin Formation. Unlike DH2, intense deformation in fault/shear zones in parts of DH1 is accompanied by quartz veining, chlorite alteration and remobilisation of sulphides, predominantly pyrrhotite-pyrite, but also occasionally significant sphalerite.

DH1 Lithologies

Lithologies in DH1 are essentially the same as for DH2.

DH1 Structure

The sequence is well bedded, with only minor fluctuations in orientation. Overall bedding dips at -82^{o} towards 206^{o} (Figure 3). Measurements of faults, shears, veins and foliation show predominantly similar orientations (Figure 4-5), implying that these are all sub-parallel to bedding. Some shearing/faulting is normal to bedding, implying a conjugate set. Measurement of lineations on fault/shear surfaces show two main populations, one with a moderate, one with a shallow SE plunge (Figure 6).

Major zones of irregular brecciation, faulting-shearing, quartz veining and sulphide remobilisation are present in what is predominantly carbonaceous shale between 140-189m and 252-276m. While most of the quartz-sulphide network vein fill is highly irregular or disorganised, the overall controlling structure appears parallel to bedding.

Insufficient consistent bedding-cleavage and fold axis data was collected to make a meaningful interpretation of the orientation or presence of folding in the core. However, a remarkable symmetry exists in the core where a wide chert unit is followed by the quartz veined breccia zone, a less brecciated “core”, followed by quartz veined breccia zone and wide chert unit; this may imply drilling through the core of a larger fold.

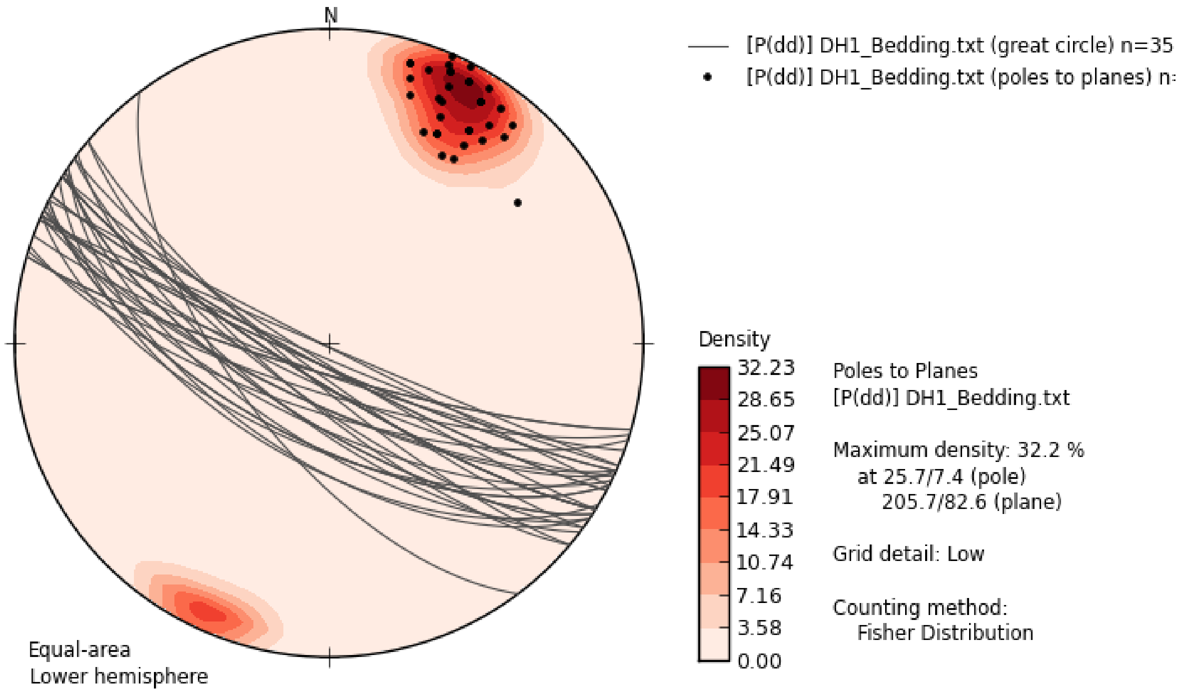

Figure 3 Stereoplot of bedding measurements DH1

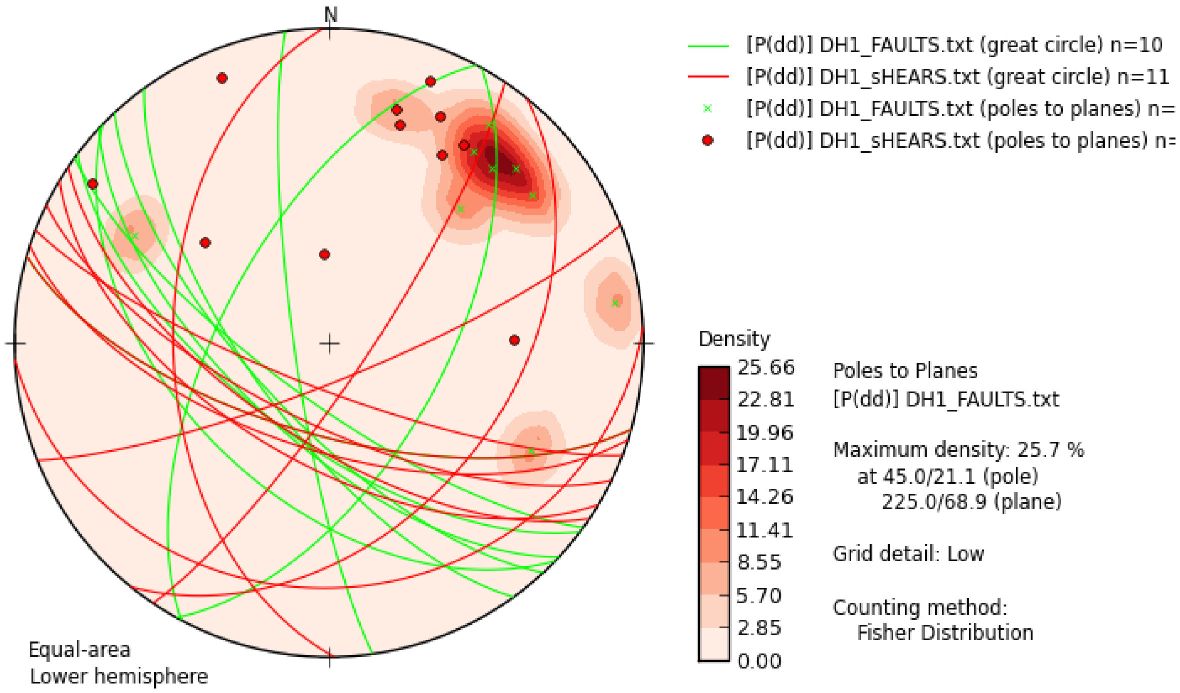

Figure 4 Stereoplot of faults/shears DH1

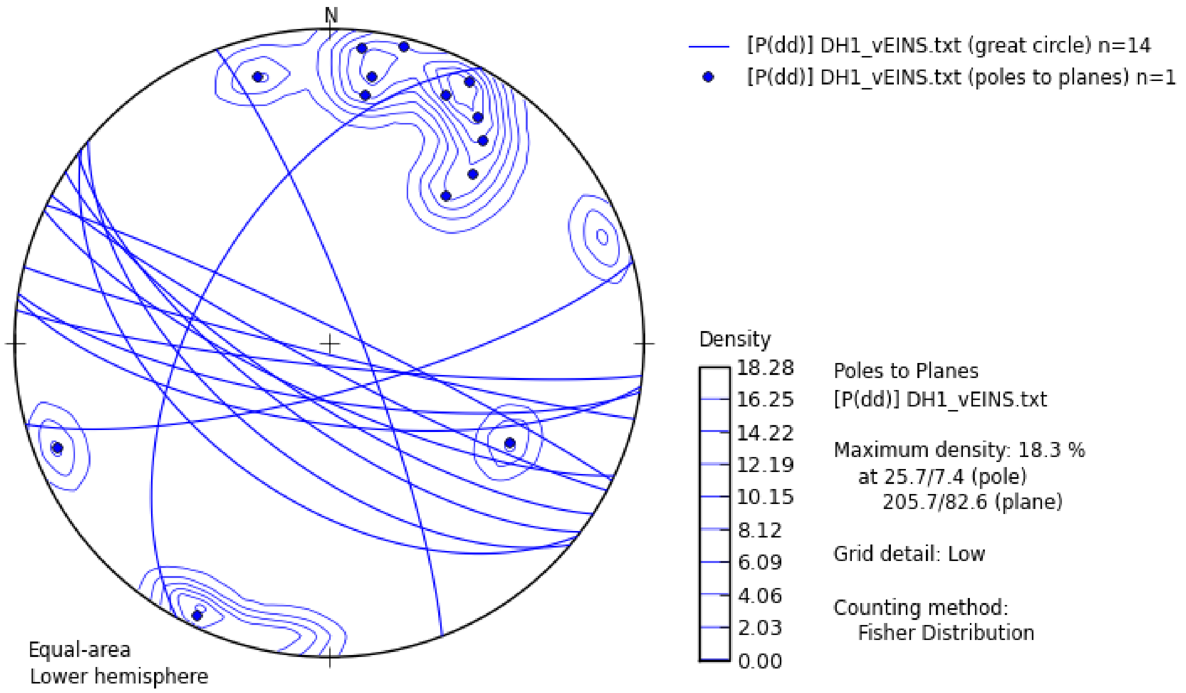

Figure 5 Stereoplot of vein measurements DH1

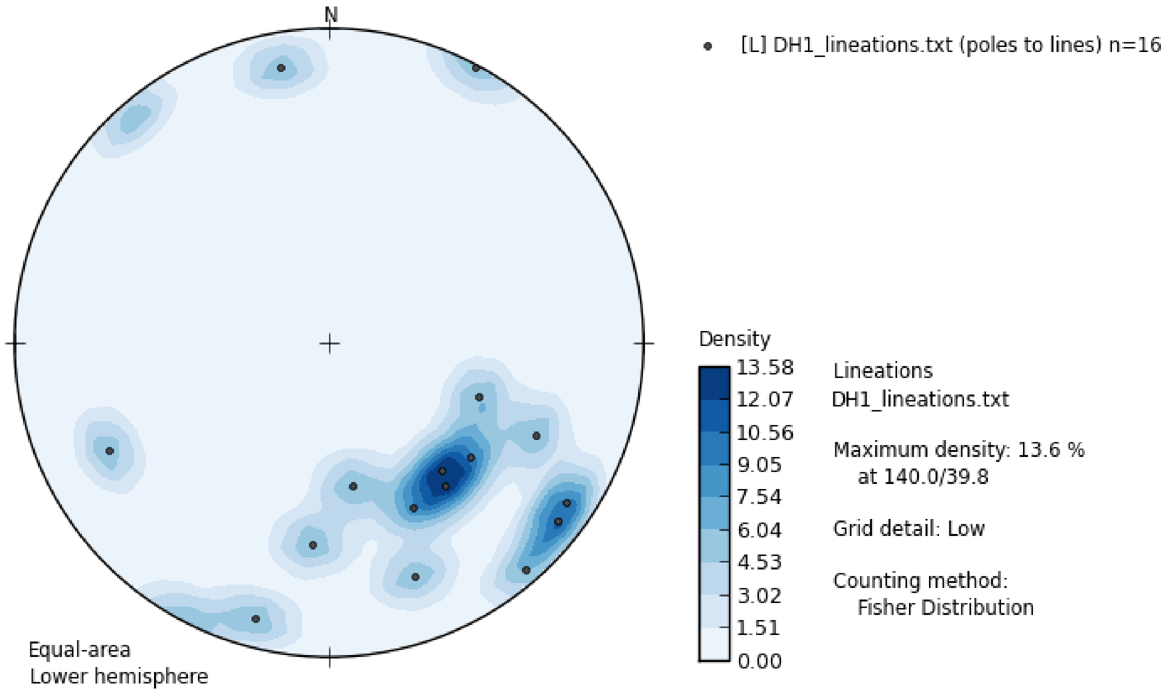

Figure 6 Stereoplot of lineation measurements (fault/shears) DH1

DH1 Alteration

Most of the lithologies intersected have been hornfelsed in the contact metamorphic aureole of a granite intrusion, resulting in the same compositions as described for DH2. Overprinting this is a chloritic alteration event, which is associated mostly with the margin of chloritised faults and shears and which also appears as a distinctly spotty chloritisation of crystals (possibly formerly dolomite?) in carbonaceous pelites.

Quartz veining/silicification/sulphidation is present in the more intense deformation zones. Both quartz and sulphide appear to have been mainly redistributed rather than introduced.

DH1 Mineralisation

Pyrrhotite-pyrite is present throughout DH1 which largely represents primary sedimentary sulphide. It has however been significantly remobilised in zones of deformation and quartz veining; it is possibly that remobilisation has concentrated or introduced other elements to the sulphide mix, such as Au, Ag and Zn, although no direct evidence of precious metals mineralisation was observed.

Zinc mineralisation is present as 1-2% sphalerite over the interval 166-170.5m, as brittle vein fillings associated with pyrrhotite-pyrites-quartz stringers. Traces of sphalerite are present in other sections of the core. As sphalerite is one of the less obvious sulphides when it is fine grained, more may be present than has been observed.

DH1 Conclusion

Potentially significant if sub-economic Zinc mineralisation was intersected in DH1 associated with a major structure and chloritic alteration event. Abundant pyrrhotite-pyrite explains any EM and magnetic anomalism in this area.

It should be cautioned that Koolpin Formation shales frequently have elevated background levels of base-metals; it is plausible that the apparently hydrothermal Zinc mineralisation observed has been remobilised and concentrated with the pyrrhotite-pyrite.

DH1 Recommendations

Sampling of a broader interval of Fe-sulphides in DH1 outside the obvious Zn mineralised zone is warranted to test for Au, Ag, Zn or Pb anomalism. Further work to define the extent of base-metal anomalism in the area of DH1 is recommended. Soil sampling may be appropriate.

Harold Mees *BEng (Hons) MAIG*

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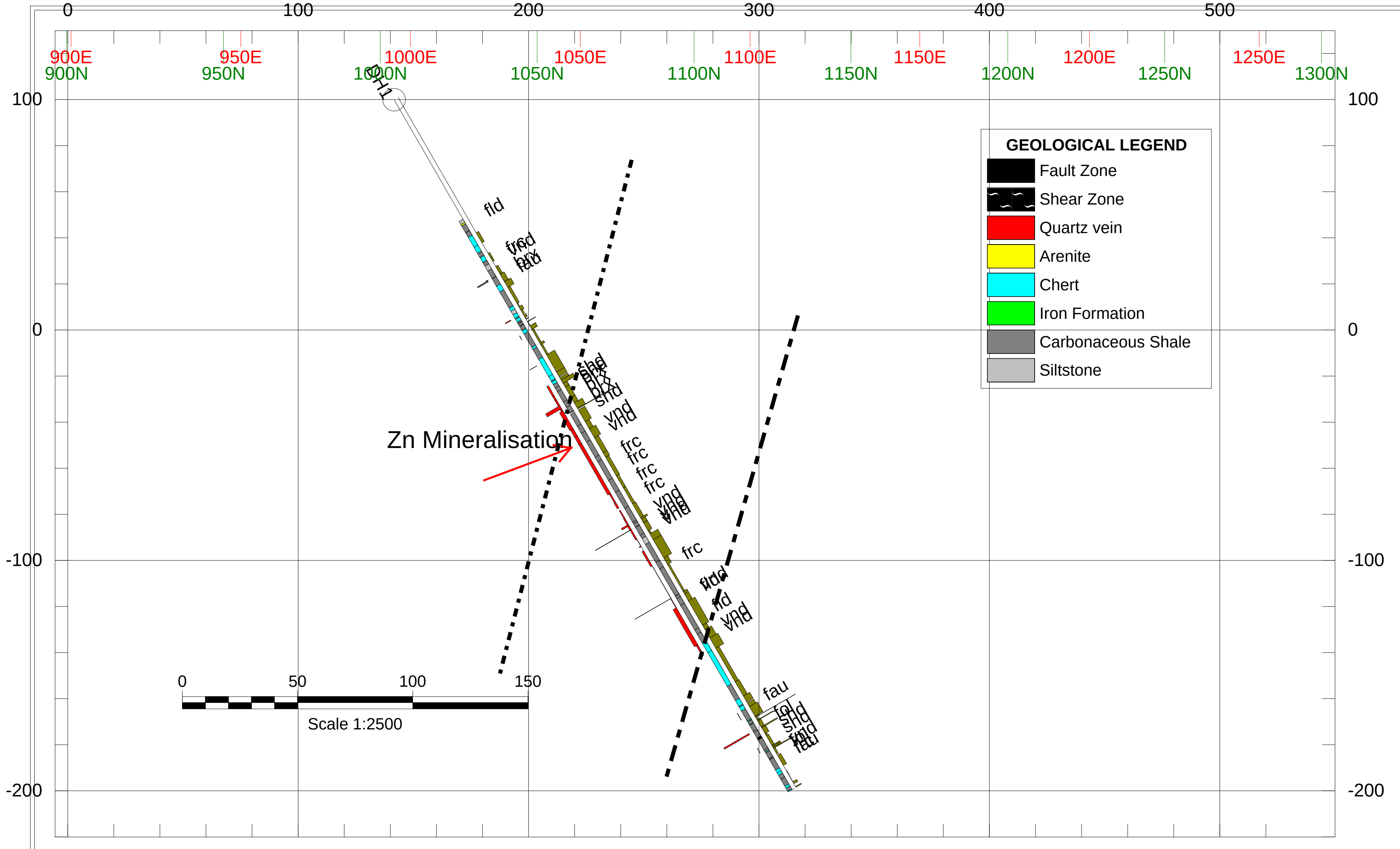

LHS Bar Plot

Vein1_pct
Scale = 137.50/cm
Lower Cut = .5
Upper Cut = 100
0 200
< 100

RHS Bar Plot

Su1_Pct
Scale = 62.50/cm
Lower Cut = 0
Upper Cut = 50
0 100
< 50.0

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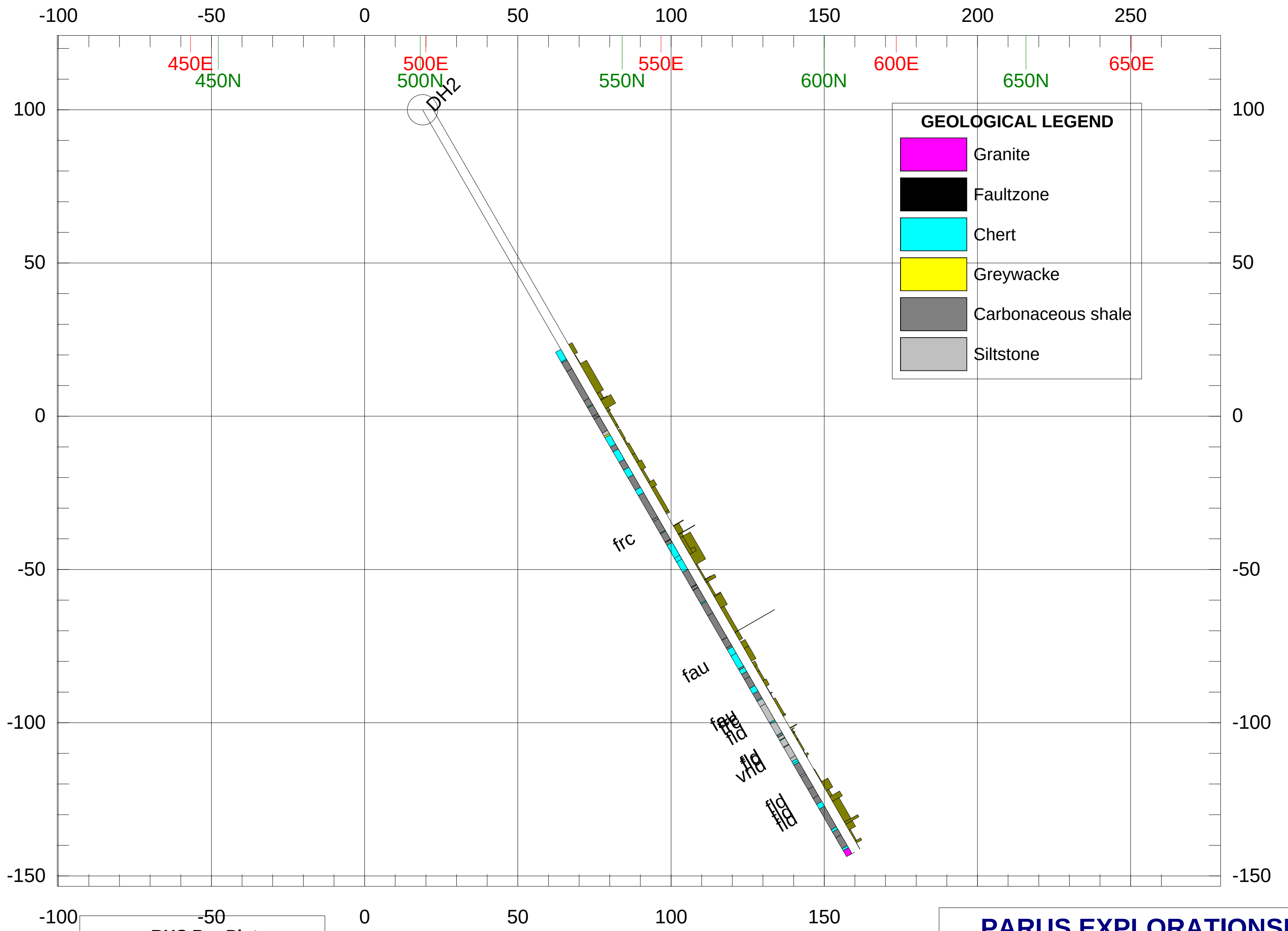
McCarthys Hill Area Diamond Drilling
Section through DH1

GEO:H.Mees	Scale 1:2500	REPORT:
DRAWN:H.Mees	Date :2014/04/14	PLAN:



RHS Bar Plot

Su1_Pct
Scale = 80.00/cm
Lower Cut = 0
Upper Cut = 60
0 100

< 50.0

0 40 80 120

Scale 1:2000

INTERDEX

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McCarthys Hill Diamond Drilling
Section through DH2

GEO:H.Mees	Scale 1:2000	REPORT:
DRAWN:H.Mees	Date :2014/04/15	PLAN: