

**PETROGRAPHIC REPORT ON TWO DIAMOND DRILL
CORE SAMPLES FROM THE FARRELL GROUP, WESTERN
TASMANIA**

For

Pertzel Tahan and Associates

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SUMMARY

Two samples of diamond drill core from the Farrell Group in western Tasmania were submitted for petrographic preparation, description and interpretation. The samples were labelled 134029 and 134030 and were from drill holes FDD06 349 m and FDD07 377.85 m respectively. Polished thin sections were prepared from each sample and they were subsequently examined in transmitted and reflected light. Magnetic susceptibility was measured on each sample and carbonate speciation was tested on the section offcuts using dilute HCl.

Summary descriptions of each sample are listed below:

134029 FDD06 349m PTS

Summary: Brecciated fine grained graphitic sericitic phyllite, with early veining and replacement by fine to medium grained quartz, plus minor carbonate and pyrite, followed by later breccia infilling and veining by medium to coarse grained carbonate (dolomite) and quartz. It is interpreted that the protolith for the phyllite was a carbonaceous pelite that was metamorphosed to low grade and strongly deformed. A strong sericite-defined foliation has been locally folded and crenulated, before or during the early veining and replacement event. The brecciation may have been tectonically induced and the breccia mostly incorporates phyllite fragments, along with a few vein quartz fragments. The altered phyllite fragments and early veining and replacement contain disseminated pyrite, with tiny traces of galena, sphalerite and chalcopyrite being hosted in pyrite.

134030 FDD07 377.85m PTS

Summary: Hydrothermal breccia with abundant variably altered fragments of foliated, fine grained phyllite, as well as fragments of carbonate and quartz, probably representing vein material. Phyllite fragments in the breccia are commonly sericite-rich, but may have considerable quartz, as well as minor graphite and pyrite. They represent former carbonaceous pelitic material. There is no evidence that the breccia has a volcanic origin and it contains no recognisable volcanic material. The breccia fragments are enclosed in a matrix of smaller fragments and hydrothermal quartz, with minor carbonate, pyrite and a little sphalerite, arsenopyrite and trace chalcopyrite and biotite/chlorite. Weak deformation effects occur in the breccia matrix (shearing, fracturing of pyrite) and the rock has been cut by a few later irregular aggregates and veins containing medium to coarse grained carbonate and local quartz.

The two drill core samples show a considerable resemblance to one another in that they are interpreted to be breccias. There is no textural (or compositional) evidence to suggest that the breccias are of volcanic origin, or that there is any volcanic component within the samples. Both display abundant fragments of fine grained foliated graphitic phyllite as the main clast type. Both also have fragments of vein quartz and in 134030, there are also fragments of what is interpreted to be vein carbonate. The phyllite fragments in the breccias are considered to be of fine grained sedimentary origin, e.g. former carbonaceous shale. This initial sedimentary rock had under low grade metamorphism, foliation development and subsequent folding (crenulation), as well as hydrothermal alteration prior to being fragmented and incorporated into a breccia. The cause of the brecciation is speculated to have been tectonic

and/or hydrothermal processes. Both samples show early hydrothermal alteration and breccia infill by fine to medium grained quartz, with minor carbonate and pyrite, with a little sphalerite, arsenopyrite and biotite/chlorite also occurring at this stage in 134030. Following brecciation, there may have been further weak penetrative deformation with formation of minor shear fabrics and fracturing of pyrite. Traces of later stage chalcopyrite and galena occur in fractures in pyrite. The latest event to have affected both samples is the emplacement of scattered irregular aggregates and veins of medium to coarse grained carbonate and minor quartz.

In the samples, carbonate may be dominated by dolomite, although the pale brown carbonate in 134030 might be ankeritic. In the latter sample, there is a close association between carbonate aggregates and small amounts of Fe-poor sphalerite. It is speculated that carbonate might contain some Zn in solid solution, so consideration of electron microprobe analyses might be worthwhile.

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Handspecimen: The drill core sample is composed of a type of breccia, perhaps partly of tectonic origin, but subsequently invaded by masses of hydrothermal carbonate \pm quartz to form a hydrothermal breccia. The host rock is a dark grey, fine grained, foliated sericitic pelitic rock (phyllite), with dark carbonaceous (graphitic) pigmentation and a little disseminated pyrite. It has been strongly fragmented, with angular to sub-rounded fragments being up to 1-2 cm across. The initial breccia has been invaded by irregular masses and veins up to a few centimetres across of pale creamy carbonate and minor quartz. Testing of the section offcut with dilute HCl gave only minor reaction, indicating that the carbonate is probably dolomite. The sample is very weakly magnetic, with susceptibility up to 30×10^{-5} SI units.

Petrographic Section:

a) Primary mineralogy and textures: In the section, the rock is strongly brecciated and veined. Fragments in the breccia commonly include fine grained, strongly foliated, sericite-rich phyllite, in places showing dark graphitic pigmentation and a little fine grained disseminated pyrite. Although no relict texture is preserved in the phyllite, the bulk composition of this type of fragment implies that the phyllite had a carbonaceous pelitic protolith (i.e. organic-bearing shale). There is no textural evidence that any of the fragments in the sample are of volcanic origin, or that the breccia has been formed by volcanic processes.

b) Alteration and structure: It is interpreted that the original sedimentary rock underwent low grade metamorphism and strong deformation such that it recrystallised into a fine grained, strongly foliated phyllite rich in muscovite, with subordinate quartz, minor chlorite, a little graphite, pyrite and trace rutile. Foliation is defined by preferred orientation of sericite flakes. Subsequently, the foliation has been folded and shows a few small crenulations. During the ductile deformation, the phyllite developed scattered thin stylolitic masses containing graphite and pyrite and it was invaded by a network of thin (generally $< 1\text{mm}$ wide) fine to medium grained veins and replacement aggregates rich in quartz, but with local carbonate and pyrite. The rock was later brecciated, perhaps by tectonic action, with development of detached and rotated fragments up to 1 cm across. The breccia ranges from matrix- to clast-supported. Most fragments are composed of phyllite, but there are a few composed of fine to medium grained vein quartz. The breccia matrix is composed of smaller fragments, but infilled and partly replaced by irregular to veinlike masses of medium to coarse grained carbonate (dolomite) and minor quartz.

c) Mineralogy and paragenesis: The sample contains minor, irregularly distributed pyrite within the phyllite and in the early quartz-rich veins and replacement aggregates. There is little or no pyrite associated with the later carbonate-rich veining and breccia infill. Pyrite grains range up to 0.9 mm across and are anhedral to subhedral. Larger grains commonly show zoning and tiny traces of fine grained galena, sphalerite and chalcopyrite are hosted in pyrite.

Mineral Mode: Approximate modal proportions are: carbonate (dolomite) 40%, sericite and quartz each 25% chlorite and pyrite each 4%, graphite 1% and traces of rutile, sphalerite, chalcopyrite and galena.

Interpretation and Comments: It is interpreted that the sample is a brecciated fine grained graphitic sericitic phyllite, with early veining and replacement by fine to medium grained quartz, plus minor carbonate and pyrite, followed by later breccia infilling and veining by medium to coarse grained carbonate (dolomite) and quartz. It is interpreted that the protolith for the phyllite was a carbonaceous pelite that was metamorphosed to low grade and strongly deformed. A strong sericite-defined foliation has been locally folded and crenulated, before or during the early veining and replacement event. The brecciation may have been tectonically induced and the breccia mostly incorporates phyllite fragments, along with a few vein quartz fragments. The altered phyllite fragments and early veining and replacement contain disseminated pyrite, with tiny traces of galena, sphalerite and chalcopyrite being hosted in pyrite.

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Handspecimen: The drill core sample is composed of a mineralised breccia, with abundant small angular to sub-rounded fragments up to 8 mm across, cemented by carbonate and quartz, and containing considerable disseminated pyrite, in places as aggregates up to 3 mm across. The rock is dark grey in colour mostly, due to the presence of fine grained carbonaceous (graphitic) phyllite fragments. There are also some fragments of coarse grained milky vein quartz. The breccia displays a few pale brown carbonate aggregates and veins and testing of the section offcut with dilute HCl gave little reaction, indicating that the carbonate is probably dolomite or ankerite. The sample is essentially non-magnetic, with susceptibility of $<20 \times 10^{-5}$ SI units.

Petrographic Section:

a) Primary mineralogy and textures: In the section, it is evident that the rock is a breccia. It contains abundant angular fragments up to 8 mm across of variably altered fine grained foliated phyllite as well as probably fragments of medium to coarse grained vein material that includes polycrystalline and single grains of quartz and of carbonate. The phyllite fragments have little preservation of relict textures, except for traces of fine grained framboidal pyrite, but their bulk mineralogical composition of sericite and quartz, with minor graphite, pyrite and trace rutile implies a pelitic protolith (e.g. carbonaceous shale). There is no textural evidence that any of the fragments in the sample are of volcanic origin, or that the breccia has been formed by volcanic processes.

b) Alteration and structure: It is interpreted that the original fine grained carbonaceous shale was metamorphosed to low grade and deformed so as to form a foliated phyllite with an assemblage of sericite + quartz, with minor graphite, pyrite and trace rutile. The phyllite may have been veined by medium to coarse grained quartz and by carbonate. Subsequently, strong brecciation occurred, perhaps caused by tectonic and/or hydrothermal processes, with the formation of rather tightly packed angular fragments up to 8 mm across. Breccia texture ranges from clast- to matrix-supported. Hydrothermal alteration occurred, with variable replacement of phyllite fragments by fine grained quartz \pm carbonate and sulphides. There was flooding of the breccia matrix (smaller fragments) by fine to medium grained quartz, with local aggregates of carbonate, pyrite, a little sphalerite, arsenopyrite, fine grained brownish biotite (maybe interlayered with chlorite) and trace chalcopyrite. Later, there was minor deformation of the rock, leading to formation of some shearing in the matrix and local development of thin graphitic and pyritic stylolites, and to fracturing of pyrite aggregates. The deformation may have been followed by the emplacement of scattered irregular to veinlike aggregates of medium grained quartz and larger, medium to coarse masses of carbonate up to several millimetres across. There are little or no sulphide minerals associated with the late carbonate and quartz.

c) Mineragraphy and paragenesis: The sample contains considerable disseminated pyrite and a little sphalerite, arsenopyrite and traces of chalcopyrite and galena. Pyrite mostly occurs as disseminated grains and aggregates up to 3 mm across scattered as a hydrothermal product in the breccia matrix. However, fine grained pyrite of sedimentary/diagenetic origin also

occurs in the phyllite fragments (e.g. framboidal pyrite). The breccia matrix locally hosts small acicular grains of arsenopyrite up to 0.4 mm long, as well as sphalerite and chalcopyrite, but most sphalerite occurs with carbonate aggregates in the matrix, or within carbonate fragments. Sphalerite is pale orange-brown in colour, implying a low Fe content. Fractured pyrite aggregates locally have traces of chalcopyrite and galena invading along fractures.

Mineral Mode: Approximate modal proportions are: quartz 40%, carbonate (dolomite/ankerite) 35%, sericite 15%, pyrite 6%, graphite, sphalerite and arsenopyrite each 1% and traces of chlorite/biotite, rutile, chalcopyrite and galena.

Interpretation and Comments: It is interpreted that the sample is a hydrothermal breccia with abundant variably altered fragments of foliated, fine grained phyllite, as well as fragments of carbonate and quartz, probably representing vein material. Phyllite fragments in the breccia are commonly sericite-rich, but may have considerable quartz, as well as minor graphite and pyrite. They represent former carbonaceous pelitic material. There is no evidence that the breccia has a volcanic origin and it contains no recognisable volcanic material. The breccia fragments are enclosed in a matrix of smaller fragments and hydrothermal quartz, with minor carbonate, pyrite and a little sphalerite, arsenopyrite and trace chalcopyrite and biotite/chlorite. Weak deformation effects occur in the breccia matrix (shearing, fracturing of pyrite) and the rock has been cut by a few later irregular aggregates and veins containing medium to coarse grained carbonate and local quartz.