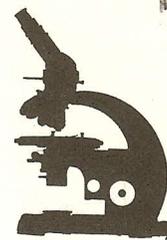


David Cowan & Associates Pty. Ltd.

MAC 24



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24th August, 1989.

REPORT DCA 89/7/4.

YOUR REFERENCE: Letters dated 27/6/89 and
4/8/89.

DATES RECEIVED: 28/7/89 and 9/8/89.

SAMPLE NO'S: 515670-515679 incl. and
515676A-515678A incl.

SUBMITTED BY: A. W. McNeill.

WORK REQUESTED: Petrology.

DAVID COWAN. M.Aus.I.M.M.

COPY TO:
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REPORT DCA 89/7/4.

A total of thirteen samples of drill core from DDH/MAC-24 was received in two submissions (of ten, and subsequently three samples) for routine, petrological examination. All thirteen samples are incorporated into this report at the request of A.W. McNeill.

As the second group of three samples duplicated previously received sample numbers these samples were arbitrarily assigned the suffix-A to avoid confusion. As requested two representative thin sections were prepared from each sample. Sections are not strictly identical being prepared from separate offcuts, and the attached tabulated descriptions, summarising microscopic data, are, in a few cases, composites of the two sections examined.

SUMMARY.

As drilled and sampled the MAC-14 sequence comprises an altered felsic intermediate acid igneous "unit" (samples 515670, 515671) overlying a sequence of similarly altered sediments.

The "upper" unit exhibits leuco-andesitic/trend dacitic relict compositional characteristics and semi-chilled textural features. This unit is "amygdaloidal". Altered cavity fillings in sample 515670 were primarily quartzofeldspathic with textural features consistent with late magmatic/deuteric infilling of miarolytic vugs. On this basis, and generally homogeneous textures this unit is interpreted as a minor intrusive.

The underlying sediments comprise a sequence of mainly altered tuffaceous, or distal-ashy, pelitic to psammopelitic rocks with intercalated coarser grained clastic sediments. Compositional detail is partly obscured by alteration and mild shearing effects but pelitic rocks typically exhibit relict "vitroclastic" microtextures. Coarser grained units are generally polymict but variably acid volcanic-derived (similarly the pelites) and include a distinctly conglomeratic unit (sample 515674) in addition to mass flow or turbiditic-textured units.

Sediments in general exhibit "intrabasinally" reworked carbonaceous-pelitic material and coarser grained units may include basement-derived clasts of low grade regional metasediment. The latter clastic assemblage is then similar to that of polymict units representing "breaks" in the dominantly volcanic QHV. However, these rocks appear devoid of basic-intermediate volcanic debris and, more specifically, clastic (or detrital) chromite.

On these bases this sequence is considered as relatively "basal" and probably trending towards or flanked by a "rhyolitic" volcanic sequence.

The sequence, as a whole, is rather uniformly altered with a sericite/Fe-carbonate assemblage locally accompanied by chlorite and/or quartz and disseminations of pyrite.

Fe-carbonate is replacive in part, presumably after a Ca-carbonate (?dolomite) as clasts and diagenetic concentrations within the sediments.

A few rocks exhibit late, partly fracture-controlled, development of kaolin as a partial replacement of sericite.

DAVID COWAN. M.AUS.I.M.M.

SAMPLE NO.:

515670.

(Section No. DCA 0093).

70-45m

CLASSIFICATION:

Amygdaloidal Felsite.

COMPOSITION:

Frequent variably Fe-carbonate-stained sericite pseudomorphs (mean 500mu) after phenocrystal feldspar, minor similarly altered but leucoxenised opaque-stained phenocrystal ferromags. Disseminated amygdales (to 2mm) of quartz, sericite and cloudy microcrystalline sideritic carbonate. Altered groundmass of sericite and variably sericite-stained anhedral quartz (mean 100mu) with included sericitised feldspar microlites.

FABRIC:

Strongly porphyritic, amygdaloidal, with evenly disseminated phenocrysts and amygdales in a felsitic ("snowflake-textured") groundmass.

ACCESSORIES:

Conspicuous very fine, minor coarser leuco-xenised opaques, traces of extremely fine acicular apatite. Rare spherulitic-textured carbonate-stained sericite aggregates. Rare very fine pyrite.

COMMENTS:

Amygdales are strictly altered quartzofeldspathic and on this basis reasonably interpreted as strictly miarolytic vugs and this rock as a semi-chilled minor intrusive. Apparent primary composition was leuco-andesitic/dacitic with detail obscured by pervasive sericite-quartz-carbonate alteration. This rock is essentially unstressed.

SAMPLE NO.:

515671.

(Section No. DCA 0094). 158.7m

CLASSIFICATION:

Amygdaloidal "Leuco-Andesite".

COMPOSITION:

Disseminated sericite (-carbonate) pseudomorphed feldspar phenocrysts (mean 350mu, to 1mm). Subordinate leucoxene-stained quartz-carbonate-sericite pseudomorphs (mean 250 to 500mu) after lathic phenocrystal ?amphibole. Sporadic/minor quartz-carbonate micro-amygdales (mean 250mu). Altered groundmass of sericite and sericite-stained microcrystalline quartz (30mu) with pervasive clots of cloudy carbonate and minor sericite-quartz pseudomorphed feldspar micro-laths (20mu).

FABRIC:

Similar to 515670. Relatively porphyritic, weakly amygdaloidal and finer grained with a felsitic/incipiently snowflake-textured groundmass.

ACCESSORIES:

Semi-conspicuous more or less evenly disseminated leucoxenised opaques, rare very fine apatite. Thinly disseminated fine to ultra-fine pyrite partly concentrated in the altered ferromag. phenocrysts. Minor late discontinuous kaolin veinlets.

COMMENTS:

Close compositional affinities with 515670 and similarly altered but relatively pyritic. In comparison this rock is finer grained and relatively lava-like but may represent a relatively chilled minor intrusive. Exhibits relatively abundant altered phenocrystal amphibole consistent with leuco-andesitic rather than strictly dacitic primary composition.

SAMPLE NO.:

515672.

(Section No. DCA 0095). 171.0m

CLASSIFICATION:

Carbonaceous "Dolomitic" Pelite.

COMPOSITION:

Semi-sericitic and abundant fine silt sized relict detrital muscovite with subordinate to minor silt-sized splintery to subangular detrital quartz. Semi-pervasive carbonaceous matter. More or less pervasive fine grained and coarser semi-lustre-mottled patches of Fe-carbonate, concentrated in sporadic (quartzose, micaceous) silty, semi-massive interbeds (mesoscopically pale grey).

FABRIC:

Intricately banded on a micro- to submillimetric scale with laminated micaceous silty shale units, sporadic relatively carbonaceous shaly and silty "dolomitic" partings/interbeds. Some relatively quartzose silty shale units are weakly graded, as are similarly the silty "dolomite" units. Very incipient concordant slaty cleavage with minor microscale high angle discordant carbonaceous microfractures.

ACCESSORIES:

Rare recrystallised simple radiolaria and ?sponge spicules. Semi-conspicuous very fine clastic leucoxenic semi-opaques, rare zircons and apatite. Minor traces of ultrafine "syngenetic" pyrite.

COMMENTS:

A finely banded micaceous, quartzose silty shale with silty "dolomitic" interbeds. Strongly carbonaceous, very weakly pyritic and incipiently microfossiliferous. The carbonate is a ferroan ("sideritic") variety and is interpreted as replacement, presumably after dolomite. No tangible volcanically-derived or tuffaceous features.

SAMPLE NO.: 515673. (Section No. DCA 0096). 186.0m

CLASSIFICATION: Polymict Breccia.

COMPOSITION: Clastic framework (50%) of sericitised/variably sideritic carbonate-impregnated, poorly determinate lithic clasts, splintery angular to subangular/minor rounded quartz grains and minor composites; frequent clastic muscovite flakes and aggregates of sideritic carbonate/altered dolomite(?) rock. Matrix of silt to fine sand sized muscovite flakes, sericitised shard fragments, minor quartz and carbonate grains. Microcrystalline sericite-stained kaolinitic cement.

FABRIC: Randomly sorted, weakly bedded gritty fine to coarse sandy clastic; silt-supported and clay-cemented.

ACCESSORIES: Carbonaceous pelite and low grade regional metapelitic clasts, minor metaquartzite clasts. Clastic leucoxene, minor zircons. Minor quartz-carbonate veinlets. Thinly disseminated pyrite.

COMMENTS: Exhibit slump- or "mass flow debris" sedimentary breccia characteristics. Strongly polymict with a variety of intrabasinal sedimentary and basement-derived metasedimentary components and a partly reworked tuffaceous (fragmented-shardy in part) clastic matrix. Finer detail obscured by marked clay-carbonate alteration but no definite primary pyroclastic components.

SAMPLE NO.:

515674.

(Section No. DCA 0097). 200.25m

CLASSIFICATION:

Polymict Breccia.

COMPOSITION:

Framework (75-80%) of quartz-sericite altered and variably carbonate-impregnated felsitic-devitrified acid (dacitic-rhyolitic) lava clasts, subordinate clasts of chert/impure (sericitic, sideritised-dolomitic(?) chert; minor quartz grains and carbonaceous pelite clasts. Cement of semi-sericitic white mica with a little sericite stained quartz and sporadic clots of sideritic carbonate.

FABRIC:

Essentially lithoclastic grit/coarse sand-matrixed/sericite-cemented conglomeratic. Subangular to subround poorly sorted pebbly framework dominated by acid lava clasts.

ACCESSORIES:

Altered lithoclast-hosted leucoxenised opaques. Thinly/semi-pervasively disseminated fine to ultrafine pyrite. Minor chlorite-selvedged quartz-carbonate veinlets. Rare coarse detrital muscovite.

COMMENTS:

A dominantly acid volcanomict but strictly polymict sedimentary breccia, distinctly conglomeratic in comparison with 515673, relatively sericite-quartz altered, carbonate-deficient and relatively pyritic. Additionally apart from very minor coarse detrital muscovite flakes this rock is devoid of metasedimentary components.

SAMPLE NO.:

515675.

(Section No. DCA 0098). 123.45m

CLASSIFICATION:

Altered Dolomitic Tuffaceous(?) Siltstone.

COMPOSITION:

Aggregates of semi- to sericitic white mica with subordinate/variable proportions of silt sized splintery to subangular quartz and disseminated to conspicuous silt sized relict detrital muscovite flakes. Semi-pervasive spongy clots (mean 100mu) of cloudy sideritic carbonate, concentrated in relatively quartzose-micaceous silty bands (to 5mm wide). Semi-pervasive carbonaceous matter, partly as clastic silt-sized aggregates.

FABRIC:

Planar- to lenticularly banded on a sub- to millimetric scale with minor incipient grading, scour and fill, and flaser microtextures. Essentially unshered. Vaguely pseudomorphous sericite aggregates apparently replacive after splintery to subangular felsic (?feldspathic) debris. Rare late calcite veinlets.

ACCESSORIES:

Semi-conspicuous fine silt sized clastic leuc-oxenic semi-opaques, rare zircons. Minor traces of pyrite.

COMMENTS:

Primarily a semi-labile siltstone with clastic quartz and muscovite subordinate to feldspathic and/or ashy debris now obscured by sericitic alteration. Sideritic carbonate interpreted as secondary after dolomite. This rock is tentatively considered as primarily a composite of distal ashy, detrital, and reworked "intra-basinal" carbonaceous pelitic components.

SAMPLE NO.: 515676. (Section No. DCA 0099). 205.8m

CLASSIFICATION: Altered Tuffaceous(?) Siltstone.

COMPOSITION: Aggregates of semi- to sericitic white mica with thinly/pervasively disseminated silt-sized relict detrital muscovite flakes, carbonaceous pelite clasts and splintery to subangular quartz grains. More or less pervasively disseminated spongy clots (mean 200mu) of cloudy Fe-carbonate. Irregular networks of variably continuous carbonate veinlets. Semi-pervasive late displacive carbonaceous microfractures.

FABRIC: Essentially similar to 515675; similarly but relatively flaser-microtextured and relatively massive/poorly banded. Mildly displacive carbonate veinlets, variably crenulated to mildly segmented by late carbonaceous microfractures.

ACCESSORIES: Conspicuous fine silt sized clastic leucoxenic semi-opaques, minor zircons, rare apatite. Rare spongy clots of pyrite in Fe-carbonate veinlets. Rare recrystallised radiolaria(?).

COMMENTS: Close affinities with 515675 and similarly interpreted as sericite-carbonate altered tuffaceous on microtextural grounds. Vague relict distal vitroclastic ashy type microstructures largely obscured by sericitisation and mild heterogeneous shearing/deformational effects.

SAMPLE NO.:

515677.

(Section No. DCA 0100). 217.45m

CLASSIFICATION:

Altered Tuffaceous Pelite.

COMPOSITION:

Aggregates of semi- to sericitic white mica weakly stained with ultrafine leucoxenic material partly concentrated into lensoid clots (mean 200mu diameter). Thinly disseminated silt sized clastic muscovite flakes, relatively minor quartz grains and carbonaceous pelite clasts. Sporadic spongy impregnations of sideritic carbonate (to 750mu diameter).

FABRIC:

Massive to weakly banded and incipiently medium angle discordantly sheared. Exhibits essentially pervasive vague but diagnostic sericitic "ghosts" of fine silt sized vitroclastic debris.

ACCESSORIES:

Fine silt sized clastic leucoxenic semi-opaques, rare zircons. Rare discontinuous microscale carbonate veinlets with minor traces of ultrafine grained galena(?).

COMMENTS:

Affinities with 515675 and 515676. In comparison this rock is finer grained and exhibits relatively marked distal vitroclastic ashy characteristics. Essentially an impure pelitic ash with clastic/non-tuffaceous mica flakes and carbonaceous pelitic intraclasts. Pervasive sericitic alteration, with relatively minor associated Fe-carbonate, enhanced by incipient shearing effects.

SAMPLE NO.:

515678.

(Section No. DCA 0101). 263.45m

CLASSIFICATION:

Altered Tuffaceous Pelite.

COMPOSITION:

Aggregates of semi- to sericitic white mica with pervasively disseminated silt sized splintery to subangular quartz grains, subordinate carbonate pelite clasts and muscovite flakes. Semi-pervasive spongy clots/impregnations of sideritic carbonate with sporadic associated irregular discontinuous veinlets and minor intergrown chlorite.

FABRIC:

Essentially massive (unbanded) silty clastic with sporadic carbonate (-chlorite-sericite) altered/poorly determinate sand sized lithoclasts. The sericitic matrix exhibits vague relict vitroclastic microtextures. Very incipiently sheared.

ACCESSORIES:

Clastic leucoxenic semi-opaques, rare zircons and sericitised biotite flakes. Late displacive veinlets of ankeritic carbonate with disseminated blebs of chalcopyrite. Rare disseminated very fine pyrite.

COMMENTS:

A sericite-carbonate (-chlorite) altered, vitroclastic ashy, slightly sandy-lithoclastic siltstone with close affinities to 515675, 515676 and 515677. "Sideritised" lithoclasts were probably initially limey (?dolomitic) in part at least, with minor selectively sericitised "volcanic" types. Carbonaceous matter virtually entirely clastic in silt-sized aggregates as in the associated (altered) ashy pelites.

SAMPLE NO.:

515679.

(Section No. DCA 0102).

286.95m

CLASSIFICATION:

Altered Dolomitic Tuffaceous Psammopelite.

COMPOSITION:

Framework (50%) of splintery to subangular silt to fine/minor medium sand-sized quartz grains and ankeritic carbonate lithoclasts with subordinate fine muscovite flakes and thinly disseminated clasts of carbonaceous shale. Microcrystalline sericite-stained kaolinitic matrix/cement with minor crypto- to microcrystalline quartz.

FABRIC:

Poorly sorted weakly bedded silty to medium sandy clastic with a very vaguely relict vitroclastic-microtextured argillised matrix. Very incipiently sheared.

ACCESSORIES:

Conspicuous fine clastic leucoxenic semi-opaques, minor zircons, traces of apatite. Minor discontinuous ankeritic carbonate veinlets. Minor late relatively continuous veinlets of microcrystalline kaolin and quartz.

COMMENTS:

This rock exhibits certain turbiditic characteristics partly obscured by argillic alteration with kaolin apparently developing as a late partial replacement of sericite. Similarities with 515675 etc. but distinctly quartzose, micaceous and (altered) dolomitic-lithoclastic in comparison. In contrast to the broadly compositionally similar 515673 there are no definite basement (i.e. metasediment) -derived components. The vaguely tuffaceous matrix is supplemented by minor sericitised volcanic lithoclasts and embayed/fragmented volcanic quartz grains.

S15135

SAMPLE NO.:

515676A.

(Section No. DCA 0120).

397.9m

CLASSIFICATION:

"Cherty Argillite".

COMPOSITION:

Aggregates of semi- to sericitic white mica and crypto- to microcrystalline sericite-stained quartz with conspicuous fine silt sized clastic white mica flakes. Pervasive microscopic films and lensoid clots of carbonaceous matter. Thinly disseminated rhombs (mean 25mu) of Fe- and minor relics of dolomitic carbonate.

FABRIC:

Silty clastic and flaser-textured on a microscale with an incipient concordant slaty cleavage and sporadic late high angle discordant carbonaceous microfractures.

ACCESSORIES:

Thinly disseminated silt to fine sand sized clastic quartz grains. Conspicuous fine silt sized clastic leucoxenic semi-opaques. Minor traces of ultrafine pyrite.

COMMENTS:

Similarities with 515676 etc. and possibly similarly strictly a distal ashy silty pelite. Finer detail obscured by relatively fine grain-sizing and the poorly optically determinate sericitic quartz which may be primary, or alternatively, replacive.

515136

SAMPLE NO.:

515677A.

(Section No. DCA 0121).

426.5m

CLASSIFICATION:

Altered Ashy Pelite.

COMPOSITION:

Aggregates of semi- to sericitic white mica with thinly/pervasively disseminated silt-sized clastic quartz grains and muscovite flakes. More or less pervasively disseminated clots (mean 250mu) of sideritic carbonate, locally concentrated into lensoid semi-massive aggregates with minor associated discontinuous (Fe-) carbonate veinlets. Subordinate/variable proportions of cryptocrystalline quartz intergrown with sericite.

FABRIC:

Weakly planar to lenticularly laminated with interspersed lenses of relatively massive carbonate. Incipiently concordantly sheared. More or less pervasively silty clastic/vaguely relict vitroclastic.

ACCESSORIES:

Disseminated silt-sized clasts of carbonaceous matter/carbonaceous pelite. Fine silt sized clastic leucoxenic semi-opaques, extremely rare zircons. Rare very fine to ultrafine pyrite

COMMENTS:

Close affinities with the overlying distal ashy dolomitic, carbonaceous, pelitic sediments and similarly altered with a replacive Fe-carbonate /sericite assemblage. Relatively distinctly altered ashy-vitroclastic in comparison with 515676A although much finer detail is obscured by alteration and mild but penetrative shearing effects.

515137

SAMPLE NO.:

515678A.

(Section No. DCA 0122). 462.5m

CLASSIFICATION:

Altered Reworked Rhyolitic "Xenotuff".

COMPOSITION:

Aggregates of sericite and crypto- to micro-crystalline quartz with semi-pervasive clots and rhombs of sideritic carbonate. Minor clots of chlorite. Pervasively disseminated splintery to subangular/minor subround silt to fine-medium sand sized quartz grains. Minor sericite-stained clastic feldspar (oligoclase-albite) grains. Disseminated carbonaceous shale clasts.

FABRIC:

Poorly sorted silty fine to medium sandy clastic with "furbiditic" bedding structures. Strongly lithoclastic with sericite-carbonate altered/poorly determinate felsic lava and eutaxite-like clasts. Incipiently sheared.

ACCESSORIES:

Minor clasts of chert/impure chert and low grade regional metapelite. Clastic muscovite flakes, conspicuous clastic leucoxenic semi-opaques, rare zircons, extremely rare apatite.

COMMENTS:

A thoroughly altered turbidite-like sandy clastic facies dominated by altered rhyolitic debris which may be a composite of primary tuffaceous and reworked components. Xenolithic in carbonaceous pelitic, low grade regional metapelitic, chert clasts, and mica flakes. Affinities with for example 515679 but relatively tuffaceous; similarly altered.