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REPORT DCA 89/5/2.

YOUR REFERENCE:	Letter, S. Richardson 12.5.89.
DATE RECEIVED:	24th May, 1989.
SAMPLE NO'S:	515610-515622 incl.
SUBMITTED BY:	S. Richardson.
WORK REQUESTED:	Petrology.

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REPORT DCA 89/5/2.

A suite of thirteen drill core samples from DDH/MAC-21 drilled 700m west of the Que R. mine was received for routine petrological examination. Representative thin sections were prepared, examined in transmitted light and together with respective offcuts in oblique incident light with feldspar - and carbonate stain tests performed as warranted.

Attached tabulated descriptions summarise the microscopic data and include interpretative comments. Individual descriptions detail the relevant alteration assemblages.

SUMMARY.

As sampled the MAC-21 sequence comprises an upper polymict breccia unit (samples 515610, 515611) overlying dacitic and underlying andesitic volcanics with a "basal" prehnite-pumpellyite facies altered basaltic unit.

Both major contacts (i.e. dacite/andesite and andesite/basalt) are partly defined by zones of "hybrid" clastic volanics, either tuffs (dacite/andesite contact) or lava breccia (andesite/basalt).

There is an apparent repetition towards the base of the drill hole. Sample 515618 represents a prehnite-pumpellyite altered basaltic tuff with over- and underlying andesitic volcanics exhibiting sericite-chlorite-carbonate-quartz assemblages. A similar (prehnite-pumpellyite facies) assemblage is also characteristic of the 515621 basalt with both rocks exhibiting essentially unaltered relics of clinopyroxene.

This repetition is presumably fault-related. The andesites overlying the basalts (i.e. samples 515617, 515620) exhibit relatively marked development of epidote indicating a local trend to development of "prehnite pumpellyite facies characteristics into basal andesitic volcanics.

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SAMPLE NO.: 515610 113.3m (Section No. DCA 0011).

CLASSIFICATION: "Breccia".

COMPOSITION: Framework of randomly sorted angular to sub-angular quartz-sericite altered variably quartz-amygdaloidal leuco-andesitic/dacitic and quartz-sericite-chlorite altered andesitic lava clasts, minor relatively chloritic basic ("basaltic") lava clasts. Minor calcite impregnations in lithoclasts. Matrix/cement of sericite and microcrystalline quartz with interspersed vuggs and minor loosely clustered rhombs of calcite, locally fringed with Fe-carbonate and chlorite.

FABRIC: Randomly sorted psammitic to agglomerate grade angular lithoclastic with an interclastic cavity-filling hydrothermal cement and a weak phyllitic overprint.

ACCESSORIES: Leucoxenised lithoclast-hosted and minor clastic opaques. Minor clasts of sericite-quartz altered felsic semi-flattened (flow-structured) pumice.

COMMENTS: A volcanomict poorly sorted sedimentary breccia, polymict in the sense that acid, intermediate and minor basic lava clasts are represented although there are no tangible non-volcanically-derived components. Thoroughly sericite-quartz-chlorite-carbonate altered and mildly sheared. Devoid of sulphides.

mu : microns

SAMPLE NO.: 515611 133.5 m (Section No. DCA 0012).

CLASSIFICATION: Chert-cemented Breccia.

COMPOSITION: Framework of quartz-sericite altered/variably chlorite-stained and ankeritic carbonate-impregnated intermediate (Andesitic) and intermediate-acid (leuco-andesitic/dacitic) lava clasts supplemented by minor sand-sized sericite-pseudomorphed feldspar grains. Matrix/cement of crypto- to microcrystalline clay-stained cherty quartz aggregates weakly stained with microscopic rhombs of dolomite-ankerite and with disseminated to locally conspicuous sericitised microshard fragments.

FABRIC: Poorly sorted lapilli to agglomerate grade angular lithoclastic with a prominent impure chert cement. Relatively sericitic altered clasts exhibit a weak phyllitic fabric.

ACCESSORIES: Leucoxenised opaques. Rare ultrafine pyrite in altered lava clasts. Fine silt-sized clastic white mica flakes.

COMMENTS: Affinities with 515610. In comparison this rock exhibits relatively prominent andesitic debris and is impure chert-cemented. In detail the chert cement grades into a pelitic ash and may be more tuffaceous than is now apparent.

mu : microns

SAMPLE NO.: 515612. 207.5m (DCA 0013).

CLASSIFICATION: Amygdaloidal Dacite.

COMPOSITION: Disseminated albitised/variably carbonate-sericite stained to more or less completely sericite-pseudomorphed feldspar phenocrysts (mean 400mu) / minor clusters (to 2mm), subordinate chlorite-cloudy microcrystalline Fe-carbonate-pseudomorphed ferromag phenocrysts (amphibole in part). Minor quartz-sericite amygdales in an altered groundmass of sericite-stained felsitic/anhedral quartz and minor clear quartz.

FABRIC: Porphyritic/weakly glomeroporphyritic and weakly amygdaloidal with an altered felsitic (devitrified) groundmass. A weak but semi-pervasive perlitic devitrification structure is defined by networks of microscale films of sericite. These features reflect incipient shearing.

ACCESSORIES: Leucoxenised opaques. Minor secondary leucoxenic, crudely stylolitic microfractures.

COMMENTS: A typical devitrified and sericte-quartz-chlorite-carbonate altered dacitic pitchstone or porphyritic glassy lava. Weakly flow structured and banded and weakly amygdaloidal. Incipient shearing effects essentially restricted to perlitic networks of sericite films.

mu : microns

SAMPLE NO.: 515613. 217.7m (DCA 0014).

CLASSIFICATION: "Dacitic Tuff".

COMPOSITION: Aggregates of sericite and microcrystalline quartz with disseminated albitised/chlorite-carbonate-stained to -pseudomorphed feldspar phenocrysts and subordinate clusters, frequent similarly carbonate-chlorite pseudomorphed ferromag. phenocrysts and selectively chloritised microphenocrysts, frequent chlorite micro-amygdalas. Semi-pervasive microscale leucoxenic stainings defining sub- to fine millimetric scale fiamme-like lithoclasts.

FABRIC: Variable. Generally strongly porphyritic and finely microamygdaloidal with a microfelsitic-textured groundmass. Exhibits randomly orientated fiamme-like/collapsed-pumiceous lithoclasts in irregular centimetric scale zones. Vague "ghosts" of similar features are evident elsewhere. Very incipiently sheared.

ACCESSORIES: Disseminated leucoxenised opaques. Rare corroded phenocrystal quartz grains.

COMMENTS: A problematical rock, primarily a relatively ferromag. silicate-rich felsic pitchstone and strongly micro-amygdaloidal. Exhibits conspicuous fiamme-like lithoclasts defined by leucoxenic stainings or elsewhere vaguely ghosted in quartz-sericite aggregates. Poorly diagnostic as to alternative pumiceous flow-breccia or welded tuffaceous modes of origin with finer detail obscured by devitrification and pervasive sericite-quartz-carbonate-chlorite alteration. Possibly strictly leuco-andesitic or a hybrid of dacitic and andesitic components.

mu : microns

SAMPLE NO.: 515614. 2397m (DCA 0015).

CLASSIFICATION: Andesiric "Breccia".

COMPOSITION: Loose framework of sericite-quartz-chlorite altered and variably cloudy Fe-carbonate impregnated lava clasts with disseminated albitised/carbonate stained feldspar- quartz-pseudomorphed pyroxene- and carbonate-pseudomorphed amphibole phenocrysts; sporadic quartz-carbonate amygdales and veinlets. Matrix of fine grained quartz with subordinate/variable proportions of sericite and disseminated clots of carbonate.

FABRIC: Poorly sorted angular psammite to agglomerate grade lithoclastic with an interclastic cavity-filling/marginally corrosive and replacive hydrothermal cement. Some evidence of in-situ brecciation.

ACCESSORIES: Leucoxenised opaques, minor traces of chlorite, rare apatite.

COMMENTS: Finer textural detail obscured by thorough and pervasive sericite-quartz-carbonate-chlorite alteration and the marginally corrosive quartz-sericite-carbonate matrix. Tentatively interpreted as a brecciated lava but possibly an agglomeratic lithic tuff. Andesitic relict compositional and textural features.

mu : microns

SAMPLE NO.: 515615. 251.3m (DCA 0016).

CLASSIFICATION: Andesitic Breccia.

COMPOSITION: Clasts and megaclasts of sericite-quartz altered lava with carbonate (calcite) and chlorite-carbonate (impure, Fe-calcite) - pseudomorphed feldspar and ferromag. phenocrysts, subordinate selectively silicified pyroxene phenocrysts and similarly-derived quartz-sericite-calcite-chlorite composite aggregates. Subordinate semi-selectively quartz-sericite altered relatively felsic ("leuco-andesitic") lava clasts. Minor interclastic patches of sericite-carbonate-quartz cement.

FABRIC: Coarsely lithoclastic with a phyllitic overprint and thus poorly resolved on thin section scale although essentially moulded-lithoclastic. "Megaclasts" include tuff lava-textured types consistent with a flow breccia mode of origin.

ACCESSORIES: Rare corroded quartz phenocrysts. Leucoxenised opaques, minor traces of chromite and apatite as relict micro-inclusions in pyroxene-pseudomorphous quartz.

COMMENTS: Detail obscured by the agglomerate grade coarse lithoclastic fabric pervasive alteration and shearing effects. However this rock exhibits composite or hybrid lava flow breccia-type characteristics with andesitic and leuco-andesitic/dacitic components represented as clasts. The alteration pattern is similar to that in 515614 and particularly 515613.

mu : microns

SAMPLE NO.: 515616. 272.4m (DCA 0017).

CLASSIFICATION: Andesitic Tuff.

COMPOSITION: Framework of sericite-quartz-calcite-chlorite altered intermediate lava clasts with albitised/carbonate-stained to calcite-pseudomorphed feldspar and subordinate quartz-calcite-chlorite pseudomorphed ferromag. phenocrysts; subordinate similarly altered crystal fragments.
Matrix/cement of microcrystalline quartz aggregates with minor semi-sericitic white mica, a little chlorite and disseminated clots and crude rhombs of carbonate. Sporadic crosscutting zones (to 3mm wide) of chlorite-matrixed breccia. Late irregular networks of calcite veinlets.

FABRIC: Poorly sorted/crudely bedded psammitic to lapilli grade lithic-crystal fragmental, impure chert-cemented with subsequent zones of chloritic granulation/semi-mylonitic fractures and late weakly displacive networks of carbonate veinlets.

ACCESSORIES: Leucoxenised opaques. Semi-pervasive fine to ultrafine grained pyrite disseminations in altered lithoclasts. Minor granulated vuggs of hydrothermal quartz.

COMMENTS: Primrarily an impure chert-cemented andesitic lithic-crystal tuff. Thoroughly sericite-quartz-carbonate-chlorite altered and weakly pyritised. Subsequently partly granulated/semi-mylonitised with chloritic fracture development and semi-contemporaneous to cross-cutting calcite veinlets.

mu : microns

SAMPLE NO.: 515617. 284.0m (DCA 0018).

CLASSIFICATION: Brecciated, Albitised Leuco-Andesite.

COMPOSITION: Framework of angular lava clasts with albitised/weakly sericitic and variably cloudy microcrystalline epidote-impregnated plagioclase phenocrysts and phenocrystal clusters, relatively quite minor chlorite-albite-epidote pseudomorphed phenocrystal ferromags (amphibole in part) and an altered groundmass of microlitic and fine anhedral albite with a little quartz and more or less pervasive cloudy cryptocrystalline epidote and chlorite stainings. Matrix of crypto- to microcrystalline albite aggregates with minor clots of chlorite. Semi-pervasive networks of quartz-calcite-albite veinlets.

FABRIC: Porphyritic/trend glomeroporphyritic with a microfelsitic/snowflake-microtextured groundmass. Reflects in-situ "crackle-style" brecciation with a corrosive-replacive cement of irregular networks of albite films and veinlets. Late straight walled crosscutting quartz-calcite-albite veinlets.

ACCESSORIES: Leucoxenised opaques. Traces of pyrite, minor traces of chalcopyrite in altered clasts.

COMMENTS: This rock represents a finely fractured and albite veined/extensively replaced lava with phenocrystal ferromags. markedly subordinate to feldspar (hence leuco-). The albite cement grades into semi-massive aggregates with "ghosts" of submillimetric to centimetric scale "jig saw pattern" - fractured lava clasts. The late siliceous veinlets are essentially unstressed and unmineralised.

mu : microns

SAMPLE NO.: 515618. 320.2m (DCA 0019).

CLASSIFICATION: Basaltic Tuff.

COMPOSITION: Loose framework of basaltic lava clasts with fresh to weakly chlorite-epidote altered pale green augite-, pumpellyite-albite pseudomorphed plagioclase-, and pumpellyite-prehnite-chlorite-quartz pseudomorphed orthopyroxene phenocrysts and cloudy microcrystalline epidote-pumpellyite altered groundmass. Matrix of microcrystalline albitised and prehnite-calcite impregnated to -pseudomorphed lava and scoria clasts with disseminated to conspicuous augite and similarly altered feldspar and orthopyroxene grains. Microcrystalline albite cement with and interspersedand clots of chlorite.

FABRIC: Poorly sorted psammitic to lapilli grade lithic-crystal tuff-matrixed agglomeratic with irregular replacive masses of prehnite and subordinate calcite.

ACCESSORIES: Leucoxenised opaques, minor traces of chromite. Traces of chalcopyrite and red-brown sphalerite partly concentrated in quartz-epidote anygdales in the coarser altered basalt clasts.

COMMENTS: A randomly sorted agglomeratic basaltic lithic-crystal tuff. This rock reflects relatively marked and pervasive prehnite-pumpellyite facies alteration in comparison with typical similarly altered basalts. Weakly mineralised with a chalcopyrite-sphalerite sulphide assemblage.

mu : microns

SAMPLE NO.: 515619. 368·5m (DCA 0020).

CLASSIFICATION: Andesitic Tuff.

COMPOSITION: Framework of poorly sorted angular lava clasts with albitised plagioclase-, relatively minor chlorite-carbonate pseudomorphed ferromag. phenocrysts and chloritised/variably carbonate (cloudy impure calcite) - impregnated groundmass; disseminated to semi-conspicuous similarly altered crystal fragments. Cement of chlorite-stained anhedral quartz with a little albite and disseminated clots of carbonate.

FABRIC: Poorly sorted, incipiently bedded psammitic to lapilli grade lithic-crystal fragmental with an interclastic cavity-filling weakly marginally corrosive/replasive hydrothermal cement. Weakly sheared.

ACCESSORIES: Fine leucoxenised opaques. Traces of sericite as a minor component of the alteration assemblage.

COMMENTS: A thoroughly chlorite-calcite-albite-quartz altered lithic-crystal tuff with characteristic andesitic relict textural and compositional features. Marked contrasts with the 515618 basic tuff in terms of primary composition and the alteration assemblage.

mu : microns

SAMPLE NO.: 515620. 401.4m (DCA 0021).

CLASSIFICATION: Hybrid Breccia.

COMPOSITION: Clasts of microcrystalline-albitised "andesitic" lava with albitised/epidote-stained plagioclase and subordinate epidote-pseudomorphed amphibole and chlorite-epidote pseudomorphed pyroxene phenocrysts. Sub-ordinate clasts of chlorite-anygdaloidal "baaltic" lava with similarly altered but relatively epidotised feldspar- and relatively abundant chlorite-epidote pseudomorphed pyroxene phenocrysts. Sparse interclastic chlorite cement. Sporadic veinlets of calcite with interspersed films of quartz, albite, epidote and locally prehnite.

FABRIC: Lapilli grade moulded to locally chlorite-cemented lithoclastic with an agglomerate grade megaclast of anygdaloidal basalt. Incipiently stressed.

ACCESSORIES: Leucoxenised fine opaques, rare very fine chromite. Thinly disseminated fine to ultrafine pyrite. Rare dark red-brown sphalerite, minor traces of galena.

COMMENTS: Essentially an andesitic lava breccia with intraclasts of anygdaloidal basalt. General features consistent with a hybrid flow marginal breccia as tends to develop at contacts of semi- to contemporaneous com-positionally contrasting flows. Alternatively the basalt clasts may be strictly xenolithic. The alteration assemblage is transitional to prehnite-pumpellyite facies. Sulphide partly concentrated in anygdales and veinlets.

mu : microns

SAMPLE NO.: 515621. 435.3 m (DCA 0022).

CLASSIFICATION: Basaltic "Tuff".

COMPOSITION: Framework of basic lava clasts with fresh pale green augite-, subordinate sericitic albitised to epidote-prehnite pseudomorphed feldspar and chlorite-quartz-pumpellyite pseudomorphed orthopyroxene phenocrysts, chlorite-quartz-epidote anygdales and chloritised/cloudy microcrystalline epidote stained albite-microlitic groundmasses. Matrix/cement of microcrystalline albite with disseminated clots of chlorite, epidote, and minor pumpellyite.

FABRIC: Poorly sorted psammatic to lapilli grade lithic fragmental. Coarser clasts are cognate-xenolithic (tuff lava-textured) in part. Interclastic/weakly marginally replacive cavity-filling cement with vuggs of chlorite, epidote, minor pumpellyite.

ACCESSORIES: Minor fine leucoxenised opaque. Minor traces of chromite.

COMMENTS: Possibly strictly a flow-marginal breccia since the coarser clasts exhibit evidence of flow brecciation and the gross fabric approximates to a "jig saw" breccia (that is reflects in-situ fracturing, in part). Affinities with 515618 in terms of primary composition and the prehnite-pumpellyite facies alteration assemblage.

mu : microns

SAMPLE NO.: 515622. 235.2m (DCA 0023).

CLASSIFICATION: "Dacite Xenotuff".

COMPOSITION: Aggregates of crypto- to microcrystalline quartz with varying proportions of sericite concentrated in lensoid microfolia. Disseminated to semi-conspicuous sericite-chlorite altered "andesitic" and quartz-sericite altered "dacitic" lava clasts. Disseminated chloritised ferromag-, minor quartz and sericitised/Fe-carbonate stained to carbonate-pseudomorphed feldspar grains.

FABRIC: Variable. One margin of area sectioned represents a thoroughly sericite-chlorite altered anygdaloidal "andesitic" lava or megaclast. The remainder is a poorly sorted fine to coarse psammitic grade tuff with a vaguely relict shardy-textured matrix, minor lapilli grade lithoclasts and a weak but penetrative phyllitic overprint.

ACCESSORIES: Leucoxenised opaques, minor traces of extremely fine chromite, thinly disseminated pyrite.

COMMENTS: Some similarities with 515613. In comparison this rock is coarser grained distinctly tuffaceous and is clearly a hybrid of felsic intermediate-acid ("dacitic") and intermediate ("andesitic") components. Conceivably the xenolithic/xenocrystal base of a dacitic lithic-vitric-crystal tuff with the scoriaceous andesite representing the underlying lava.

mu : microns