SUMMARY OF PETROGRAPHIC FEATURES FOR MAC-35:

The upper part of the hole, as recognized by Steve RIchardson, is composed of rather evolved and sometimes brecciated andesitic lavas (622650, 51), and the lower two samples I examined from this section of the core (622652, 53) are both dacitic in my opinion, rather than andesitic. This progression from dacitic to andesitic lavas is very common in arc volcanoes (no analogy implied), and represents the eruption first of the evolved volatile-rich top of th magma chamber, then progressive emptying of the lower more crystal rich (and therefore mafic) sections of the magma chamber to form the overlying andesites.

Samples 622654 to 659 are logged as being from the Upper Basalt. Certainly samples 654-656, being augite-phyric basaltic lavas and lava breccias, are representative of this unit. Samples 657 and 658 are less easily related to the Upper Basalt. For a start, they are more evolved (plagioclase + augite-phyric) rather andesitic-looking rocks, and 657 has a texture more characteristic of a shallow dyke rock than a basaltic lava. Sample 658 is texturally more typical of a lava. These two samples are almost certainly from the same unit. The question is whether this unit is an unusually thick lava flow (with 657 from the slowly-cooled core, and 658 from the chilled rim), or a substantial dyke. Petrographically, it is not possible to decide between these two options, and the core log may be more useful. Certainly, this unit is more evolved (basaltic andesite or andesite) than the overlying Upper Basalts. Sample 622659, also logged as from the Upper Basalts, is petrographically more like andesitic samples 622650 and 51 from the uppermost andesite unit.

The samples 622660, 61 and 62 are from the Epiclastic (Mixed Sequence), with 660 and 661 being typical broadly dacitic lava breccias, with 661 being clearly polymict. Sample 662 appears to be a unit of highly altered lithic crystal tuff, or a coarse epiclastic sandstone.

The samples below the Mixed Sequence (663-668) are all massive to weakly brecciated formerly glassy dacitic lavas. They are more massive than the Mixed Sequence, and remind me of the massive dacite units in the lower part of the two deep Placer holes west of the Murchison Highway (BHD-01A and BHD-05). They are not like the andesites that lie directly on the micaceous greywackes in BHD-01A, so I would say they simply represent more felsic units in the footwall of this area, as in BHD-3.

SAMPLE NUMBER: MAC 35 622650 70.4m

SUMMARY: This rock is hydrothermally-altered (chlorite, followed by quartz-albite-Kspar, then calcite) monomict lava breccia dominated by formerly glassy fragments of plagioclase+ sparsely augite-phyric acid andesite.

HAND SPECIMEN:

This is a dark, strongly altered lava breccia dominated by fragments up to several cm across of sparsely plagioclase-phyric or aphyric andesitic to dacitic lava. Some matrix areas are bleached and probably silicified.

THIN SECTION DESCRIPTION:

This sample is a dacitic to andesitic lava breccia, probably monomict, or nearly so, in which fragments of plagioclase-phyric lava are set in a strongly altered and recrystallized matrix. The largest and least-altered clasts are composed of around 10 modal% of blocky to tabular prisms of strongly sericite-altered albitized plagioclase phenocrysts to about 2mm maximum length and a few chlorite+silica-altered augite(?) phenocrysts set in devitrified and recrystallized glass with a rather small-scale perlitically-cracked texture. Also present are not uncommon small FeTi oxide phenocrysts that have altered to very fine-grained magnetite-leucoxene aggregates spotted with chlorite and sericite. The groundmass of these fragments was perlitically-cracked devitrified glass containing common tiny albite microlites, and which is now quite strongly but patchily chlorite-altered with rather abundant aggregates of magnetite-leucoxene. Some of the smaller fragments have less chloritic groundmasses.

The inter-fragment areas of this sample are extremely heterogeneous in texture and mineralogy, and are due to moderate hydrothermal alteration of what was probably originally a weakly hydrofractured lava breccia. Dominant assemblages in the matrix areas are quite coarse-grained quartz-albite-Kspar intergrowths with interstitial chlorite and abundant late-stage overprinting calcite. Clearly, chlorite alteration preceded the silica-albite-Kspar veining and soaking of the inter-fragment matrix.

This sample is a moderately hydrothermally altered monomict acid andesite lava breccia dominated by chloritized fragments of plagioclase-phyric formerly glassy lava

SAMPLE NUMBER: MAC 35 622651 168.1m

SUMMARY: This rock is formerly glassy plagioclase+sparsely augite-phyric acid andesite to dacite lava with moderate hydrothermal alteration dominated by silica-chlorite±pyrite±sphalerite.

HAND SPECIMEN:

This is a dark green,andesitic lava with common altered plagioclase phenocrysts and a typical mottled texture of devitrified glass. It has an almost 'false brecciated' texture in places.

THIN SECTION DESCRIPTION:

This sample is a texturally very well-preserved plagioclase+augite-phyric andesitic lava with beautifully preserved perlitic cracks in the formerly glassy groundmass. The albitized plagioclase phenocrysts make up around 10 modal% of the rock and are well-formed tabular prisms with strong sericite alteration. Considerably less abundant are small chloritized augite phenocrysts and totally altered former FeTi oxide phenocrysts now composed of messy disaggregated leucoxenitic material.

The groundmass of this sample consists of a very fine-grained quartzo-feldspathic aggregate after devitrified glass, and it shows excellent perlitic cracking, with chlorite defining the former cracks. Patches of more intense chlorite alteration are heterogeneously distributed through the groundmass. Cracks and tension gashes are filled by polycrystalline quartz with subordinate amounts of intergrown chlorite, almost colourless Fe-poor sphalerite and pyrite.

This was a glassy plagioclase+sparsely augite-phyric acid andesite to dacite lava with moderate hydrothermal alteration (silica-chlorite-pyrite-sphalerite).

SAMPLE NUMBER: MAC 35 622652 239.7m

SUMMARY: This rock is a formerly glassy plagioclase-phyric dacitic lava with a pseudo-spherulitic blebby groundmass texture, and a low-grade burial metamorphic assemblage.

HAND SPECIMEN:

This is a massive plagioclase-phyric andesitic to dacitic lava or shallow intrusive with an unusual rather coarse-grained groundmass texture.

THIN SECTION DESCRIPTION:

This sample is a formerly spherulitic-textured glassy dacitic lava with around 7-10 modal% of albitized plagioclase phenocrysts that are mainly 0.5-1mm long, although not uncommon crystals as large as 3mm are also present. These have a dusty brown colour presumably due to submicroscopic Fe oxide dust, and most have recrystallized internally to several crystallographically discontinuous zones within each crystal. A few very small former augite crystals are pseudomorphed by sericite, rather than chlorite, and small FeTi oxide microphenocrysts are altered to fine aggregates of small sphene granules and sericite, plus minor chlorite.

The very unusual-textured groundmass of this rock has evolved from alteration and recrystallization of an originally glassy texture that at first sight appears to have been spherulitic. However, in the blebs that make up the groundmass show no characteristic radial quartz-albite rosette intergrowths characteristic of spherulites. The groundmass now consists dominantly of rather ovoid to spherical blebs around 1mm average across composed of devitrified glass with abundant unoriented tiny acicular albite microlites surrounding a coarser-grained albite or quartz+albite 'nucleus'. The interstitial areas between the rounded blebs is composed mainly of green chlorite, with trails of tiny leucoxene granules concentrated along the interfaces between the blebs and the chloritic matrix. I even considered that this was a lapilli crystal tuff, but significantly, several long prismatic plagioclase laths extend from one bleb (lapilli?) into an adjacent bleb, effectively ruling out a pyroclastic origin for this rock.

This is a plagioclase-phyric dacitic lava with a formerly glassy groundmass that has devitrified and recrystallized to a pseudo-spherulitic blebby texture.

SAMPLE NUMBER: MAC 35 622653 260.8m

SUMMARY: This rock is formerly glassy sparsely plagioclase-phyric dacitic lava breccia in which the original brecciated texture has been enhanced by strong silica-chlorite hydrothermal alteration.

HAND SPECIMEN:

This is a mid-green-grey altered polymict lava breccia with dark sparsely plagioclase-phyric lava fragments in a lighter, strongly altered matrix.

THIN SECTION DESCRIPTION:

This sample is a very strongly hydrothermally altered formerly glassy dacitic lava with sparse plagioclase phenocrysts. The latter probably make up one to 2 modal% of the rock. These are mainly less than 2mm long and are totally replaced by either dull green chlorite or fine-grained sericite. There were apparently no former mafic phenocrysts in this rock, although the extent of alteration precludes a definite statement to this effect.

The groundmass of the lava fragments was undoubtedly glassy, but has recrystallized during strong hydrothermal alteration to complex and heterogeneous mainly very fine-grained quartzo-feldspathic material spattered with spotty chlorite and containing abundant very fine-grained sericite. Small scattered pyrite grains are not uncommon, but are modally insignificant. The matrix between the lava fragments is exceptionally heterogeneous in grainsize and texture, and varies from quartz-calcite intergrowths to mostly quartz-chlorite intergrowths with overprinting calcite.

This was probably a glassy sparsely plagioclase-phyric dacitic lava breccia in which the original hydrofractured texture has been enhanced by further 'false brecciation' associated with the strong chlorite-silica ±calcite hydrothermal alteration.

SAMPLE NUMBER: MAC 35 622654 376.7m

SUMMARY: This rock is a low-grade burial metamorphosed augite-phyric basaltic lava breccia or hyaloclastite.

HAND SPECIMEN:

This is a dark green polymict basaltic lava breccia with fragments of lighter coloured lava to several cm long set in a darker matrix.

THIN SECTION DESCRIPTION:

This sample is a lava breccia dominated by augite-phyric basaltic lava fragments in a matrix of more altered and finer-grained polymict basaltic lava breccia. The main basaltic lava fragments are rather vesicular (perhaps 5 modal% of vesicles) and vesicles vary from <<1mm across to almost 1cm across. They are all filled with assemblages of quartz-pumpellyite-epidote±chlorite, and the quartz and pumpellyite always have radiating rosette habits. Perfectly fresh, euhedral augite phenocrysts <1.5mm long dominate the phenocryst assemblage, and the larger phenocrysts show significant compositional zoning. Some clots of augite crystals contain at least twenty phenocrysts, and individual crystals are much less common than crystal clots of two or more crystals. There are a few small altered olivine phenocrysts, and one 2mm-sized totally sericitized former plagioclase phenocryst. The groundmass of this basaltic lava fragment is microvesicular, and vitrophyric textured, with quartz-filled small vesicles making up about 5 modal% of the groundmass, and mainly altered elongate plagioclase microlites set in devitrified glass. The latter is almost isotropic extremely fine-grained quartzo-feldspathic material.

The matrix of this lava breccia is clearly polymict, and is composed a several textural varieties of basaltic lava, although all are augite-phyric with almost trachytic-textured groundmasses. Single crystals of augite are also present, and much of the inter-fragment material appears to have been vesicular and broken-up basaltic glass that has variably altered to fine-grained quartzo-feldspathic material with abundant disseminated granular and vein epidote and chlorite spots and streaks.

This sample is probably a hyaloclastite or subaqueous chill breccia derived from a single eruption of augite-phyric basaltic lava. The apparently diverse lava fragments simply reflect differing groundmass textures and mineralogies, which in turn are related to both the cooling rate (pillow margin, flow interior etc) and degree of alteration. The alteration is related to low-grade regional burial metamorphism.

SAMPLE NUMBER: MAC 35 62655 426.5m

SUMMARY: This rock is coarse monomict basaltic lava breccia composed of fragments of augite+sparsely plagioclase-phyric quite vesicular basaltic lava with a weak burial metamorphic overprint.

HAND SPECIMEN:

This is a very coarse-grained basaltic lava breccia with fragments in excess of 6cm across, composed of augite-phyric basaltic lava with chlorite-filled vesicles, and inter-fragment quartzose patches and bleaching at the margins of some fragments.

THIN SECTION DESCRIPTION:

This sample is a monomict, rather coarse lava breccia derived entirely from what was probably a single eruptive unit of augite+sparsely plagioclase-phyric vesicular basaltic lava. Augite phenocrysts are invariably fresh, and are mainly 0.3-2 mm long and quite euhedral. They make up about 7-10 modal% of the rock. Plagioclase phenocrysts are far less abundant, and are rather rounded, albitized tabular prisms that do not appear to be in equilibrium with the host liquid. They may reflect mixing of this more mafic basalt with a plagioclase-phyric andesitic to dacitic magma. The groundmass of all lava fragments is a similar vitrophyric-textured intergrowth of albite microlites in very fine-grained, almost isotropic quartzo-feldspathic material after devitrified glass. Vesicles are quite abundant and range from rounded to ovoid and mainly 0.5-2mm across, to smaller, more less rounded vesicles in the groundmass. All are filled either by pale green chlorite, quite beautiful radiating pumpellyite, or epidote-quartz intergrowths. Inter-fragmental areas are composed of texturally diverse sugary to coarse-grained quartzo-feldspathic (but quartz-dominated) intergrowths with abundant overprinting patchy to granular epidote.

This is a basaltic lava breccia with a low-grade burial metamorphic degradation assemblage. It differs from the preceding sample only by the presence of the reacted plagioclase phenocrysts

SAMPLE NUMBER: MAC 35 622656 521.7m

SUMMARY: This rock is a basaltic lava breccia derived from augite-phyric vesicular basaltic lavas; it has suffered strong epidosite alteration, particularly in the porous matrix.

HAND SPECIMEN:

This is another basaltic lava breccia composed of bleached (silica-altered?) and unbleached fragments to at least 5cm across of basaltic lava in a darker chlorite-rich matrix that forms only a small proportion of the rock.

THIN SECTION DESCRIPTION:

This sample is a rather altered augite-phyric basaltic lava breccia very similar in most respects to the previous two samples. Fragments to at least several cm across include vesicular augite-phyric basaltic lava with occasional rather reacted plagioclase phenocrysts, identical to those in sample 622655, but heavily riddled with granular epidote-clinozoisite. The groundmass of most fragments is isotropic devitrified glass, lacking the tiny plagioclase microlites present in the groundmass of the previous two samples.

The inter-fragmental matrix of this rock was probably composed of comminuted basaltic glass and occasional augite crystals. However, it has been rather strongly altered, to highly variably-textured quartzo-feldspathic material very strongly (to completely, in places) overprinted by fine-grained yellow epidote aggregates. This epidosite alteration is typically produced in oceanic settings by upwelling, briny fluids that were pumped down in near-ridge axis areas, and, having reacted extensively with basalts, are within a km or two of being discharged at the ocean floor.

SAMPLE NUMBER: MAC 35 622657 632.6m

SUMMARY: This rock is a plagioclase+augite-phyric andesitic dyke rock with a weak calcite-sericite-pyrite hydrothermal alteration assemblage.

HAND SPECIMEN:

This is quite different from the preceding three basaltic lava breccias. It appears to be a massive plagioclase-phyric andesitic lava

THIN SECTION DESCRIPTION:

This sample was a plagioclase+augite-phyric andesitic lava or shallow dyke rock. It consists of around 15 modal% of rather blocky to tabular prisms of albitized plagioclase phenocrysts that commonly occur aggregated in clots. They are fairly heavily overprinted by sericite, and up to about 2mm long. Former augite phenocrysts probably make up a few modal % of this rock and are small prisms now replaced totally by green chlorite. Former FeTi oxide phenocrysts are totally altered to aggregates of fine-grained magnetite and sphene (leucoxene).

The groundmass of this sample has a rather fluidal to trachytic texture defined by long narrow albite microlites and laths that made up almost the entire groundmass before alteration. Interstitial chlorite and tiny Fe oxides granules are common, and calcite is an abundant phase overprinting significant areas of groundmass. A 1-3mm-wide shear zone transects the rock, and is filled by calcite, sericite and abundant small idiomorphic pyrite grains.

After the three basaltic breccia sections from overlying strata in this hole, this sample is quite petrographically distinct. The lath-rich, originally glass-poor groundmass suggests to me that this may be an andesitic dyke rock. It has suffered weak to moderate hydrothermal alteration (calcite-sericite-pyrite) overprinting an original low-grade burial metamorphic assemblage.

SAMPLE NUMBER: MAC 35 622658 697.4m

SUMMARY: This rock is a plagioclase+augite-phyric evolved basaltic lava that has suffered strong epidote alteration probably during burial metamorphic degradation.

HAND SPECIMEN:

This is a rather dull green, epidote-altered intermediate to mafic massive lava with abundant altered plagioclase and mafic phenocrysts

THIN SECTION DESCRIPTION:

This sample is a texturally reasonably well-preserved basaltic lava, although the mineralogical alteration is extreme, with extensive epidote replacement of groundmass and phenocrysts. Due to the strong epidote alteration of both former plagioclase and augite phenocrysts, it is difficult to judge their primary abundances, but probably plagioclase was slightly more abundant than augite (around 12-15 modal% and 5-10 modal%. Some phenocryst are up to 4mm long, although most are 1-2mm long. Augite phenocrysts are altered to epidote plus chlorite, whereas former plagioclase crystals are altered to dominant epidote and minor sericite and chlorite. Not uncommon FeTi oxide phenocrysts are totally replaced by messy leucoxenitic material.

The groundmass of this sample was a vitrophyric intergrowth of albite microlites in glass. The latter has devitrified to exceptionally fine-grained quartzo-feldspathic material spotted with tiny leucoxene granules and chlorite flakes and aggregates. Small veinlets and irregular patches of calcite cut and overprint the groundmass.

This is an evolved plagioclase+augite-phyric basalt that has suffered strong epidote-alteration, although probably not during hydrothermal alteration.

SAMPLE NUMBER: MAC 35 622659 757.5m

SUMMARY: This rock is plagioclase+sparsely augite-phyric dacitic to acid andesitic lava from the central portions of a thick cooling unit that has suffered strong carbonate alteration.

HAND SPECIMEN:

This is a dark green rather chloritic and altered plagioclase-phyric dacitic lava.

THIN SECTION DESCRIPTION:

This sample is a quite strongly hydrothermally-altered plagioclase-phyric dacitic to andesitic lava composed of about 12-15 modal% of rather blocky albitized plagioclase phenocrysts set in a fine- to medium-grained vitrophyric textured groundmass. The plagioclase phenocrysts are up to 5mm across and many are overprinted by very fine-grained sericite and calcite. Thoroughly chloritized former augite prisms make up about 1 modal% of the rock and ar rarely longer than 0.5mm. Former FeTi oxide phenocrysts are uncommon, and have been totally replaced by sericite, chlorite and tiny grains of sphene and magnetite.

The groundmass of this sample consists of an intergrowth of bladed albite laths with interstitial chlorite and tiny leucoxene blebs. This texture was approaching holocrystalline, implying that the sample was well-removed from the glassy margins of these dacitic lava flows. In places, groundmass chlorite is quite abundant, although the rock is not strongly chloritized. Calcite is abundant though, and overprints probably 30-40 modal% of this sample. It occurs as irregular overprinting patches, as well as narrow veins. A single small idiomorphic pyrite grain occurs set in calcite.

This was a dacitic to acid andesitic lava that has suffered strong carbonate alteration.

SAMPLE NUMBER: MAC 35 622660 785.9 m

SUMMARY: This rock is an unusual lava breccia composed of almost aphyric dacitic to acid andesite formerly glassy lava fragments; it has suffered moderate sericite-calcite hydrothermal overprinting.

HAND SPECIMEN:

This is a dull green, mottled almost aphyric andesitic to dacitic lava, probably originally glassy, which appears to have suffered either hydrofracturing and healing of the fractures, or 'false brecciation', although fragments are not clearly defined..

THIN SECTION DESCRIPTION:

This sample is a weakly plagioclase-phyric dacitic(?) lava breccia with a most unusual texture, composed of small blebs and fragments, mostly 2-5mm across, of formerly glassy lava, with poorly-defined margins due to strong recrystallization and alteration. Only occasional sudden changes in groundmass texture. Two dominant textural domains are obvious. One is typical of devitrified felsic glass that has recrystallized to a rather coarse-grained quartzo-feldspathic mosaic, overprinted by fine-grained sericite and calcite. The other type, far more abundant, has a considerably finer-grained quartzo-feldspathic intergrowth with occasional small plagioclase (albitized) phenocrysts, and an alteration texture in which narrow chlorite aggregates forms globular or spheroidal structures, almost resembling wall-to-wall vesicles. Sericite overprints these domains as light discontinuous streaks. This is a strange devitrification texture that has probably been enhanced by the moderate hydrothermal alteration suffered by this sample. A 4mm wide veinlet of calcite and strongly strained quartz cuts the sample, and has a rim of calcite. Calcite also occurs as irregular patches replacing significant areas of groundmass.

This rock was probably a dacitic to acid andesitic, almost aphyric glassy lava breccia in which original devitrification textures have been modified by moderate hydrothermal alteration (sericite-calcite).

SAMPLE NUMBER: MAC 35 622661 881.0m

SUMMARY: This rock is a polymict dacitic lava breccia with weak hydrothermal alteration (sericite-calcite assemblages).

HAND SPECIMEN:

This is a polymict felsic lava breccia with both greenish and cream coloured lava fragments to at least several cm long in a much finer-grained matrix.

THIN SECTION DESCRIPTION:

This sample is a clear polymict felsic lava breccia dominated by glassy lava fragments of dacitic composition, but showing a variety of alteration assemblages. The largest and best preserved lava fragments (cream coloured in hand specimen) are moderately plagioclase-phyric, formerly glassy dacitic lava with 7-10 modal% of albite phenocrysts averaging around 1mm long, with slight sericite speckling. No mafic phenocrysts were present, and the groundmass is highly variable from fragment to fragment, mainly being composed of a quartzo-feldspathic mosaic intergrowths riddled with tiny albite microlites that were set in the original glass. Other lava fragments have fewer plagioclase phenocrysts and abundant very fine-grained chlorite in the groundmass, that was also originally glassy. Small blebs of quartz are set in the chlorite. These more chloritic fragments probably reflect a more mafic precursor, perhaps an acid andesite composition.

The matrix of this lava breccia is highly variable in texture and mineralogy, and was originally composed of glassy chips and finer-grained glassy material. It is now dominated by quartzo-feldspathic intergrowths that vary from very fine-grained and sugary to rather coarser and ragged. Sericite heavily overprints some areas of groundmass, forming a mesh through the altered matrix. Calcite forms discontinuous veinlets and irregular patches overprinting both lava fragments and the matrix.

This was a polymict dacitic lava breccia that shows no sign of reworking by water, and may have formed by mass flows off a dacitic lava dome or plug. It shows weak sericite-calcite hydrothermal alteration.

SAMPLE NUMBER: MAC 35 622662 809.7m

SUMMARY: This rock is an intensely hydrothermally altered (calcite-chlorite-pyrite) epiclastic sandstone or lithic crystal tuff derived from plagioclase-phyric glassy felsic volcanics.

HAND SPECIMEN:

This is a dark green epiclastic sandstone or lithic tuff with occasional small blebs (to ~2mm across) of dark reddish hematite or Fe-carbonate.

THIN SECTION DESCRIPTION:

This sample is a very strongly altered tuffaceous (epiclastic) sandstone or lithic crystal tuff dominated by broken plagioclase phenocrysts and indistinct clasts of formerly glassy lava. The primary detrital texture is not at all obvious due to the intense sericite-calcite overprint, but the common broken plagioclase crystals, some up to 2mm long, and the rather fine-grained fragmental texture clearly indicates that this is not a lava or lava breccia. The sandstone/tuff was matrix supported, and although it is almost impossible to estimate, I suggest that the detrital plagioclase and lithic clasts probably made up only about 30 modal% of the rock. The remainder was presumably vitric ash and comminuted plagioclase phenocryst debris.

The alteration of this rock is pronounced. Plagioclase was strongly altered to sericite before a more intense alteration, expressed mainly by dense but very fine-grained calcite - (subordinate) chlorite overprinting that has obliterated most of the original texture. Abundant very fine-grained pyrite crystals are disseminated through the calcite-chlorite, but are all altered to translucent red sericite. Chlorite also occurs as small angular patches and fracture fillings, often with stubby crystals of Kspar growing into the chlorite. The reddish patches evident in hand specimen are seen to be large calcite patches riddled with submicroscopic hematite.

This was an epiclastic sandstone or lithic crystal tuff derived from plagioclase-phyric felsic glassy lavas and tuffs. It has suffered intense calcite-chlorite-pyrite hydrothermal alteration.

SAMPLE NUMBER: MAC 35 622663 915.5m

SUMMARY: This rock is an almost aphyric, formerly glassy massive dacitic to rhyolitic lava

HAND SPECIMEN:

This is a light brown massive almost aphyric felsic lava with occasional quartz veinlets.

THIN SECTION DESCRIPTION:

This sample is a massive, formerly glassy and virtually aphyric dacitic to rhyolitic lava. The glass has devitrified and recrystallized to a rather coarse-grained quartzo-feldspathic mosaic composed of anhedral patchy small (around 0.1-0.2mm) quartz grains intergrown with sericitized feldspar that produces an effect rather like a fine-grained holocrystalline granitic rock. A few 1mm-sized albite phenocrysts are present but are heavily overprinted by calcite and sericite. Fine-grained calcite is common throughout the rock, and the few veinlets that transect this sample are composed of intergrown crystalline calcite and quartz and a few small pyrite crystals.

This is a petrographically simple rock that was originally a massive, very sparsely plagioclase-phyric entirely glassy dacitic to rhyolitic lava.

SAMPLE NUMBER: MAC 35 622664 980.3m

SUMMARY: This rock is a weakly plagioclase-phyric monomict dacitic or acid andesite lava breccia with moderate chlorite-silica hydrothermal alteration.

HAND SPECIMEN:

This is a dark green rather strongly altered fragmental andesitic to dacitic lava breccia with fragments up to several cm long with quite diffuse, poorly-defined margins.

THIN SECTION DESCRIPTION:

The fragmental texture of this sample is much less evident in thin section than in hand specimen. The rock consists of domains of quartzo-feldspathic intergrowths after glass in which chlorite is insignificant, and domains in which chlorite is abundant. These differences don't reflect different original fragment types, but rather result from heterogeneous alteration and recrystallization.

Rather ragged plagioclase (albite) phenocrysts, mainly less than 1mm long and grouped in multi-crystal clots, make up around 3-5 modal% of the rock and are distributed fairly evenly through both the chlorite-rich and chlorite-poor domains. The latter domains are composed of relatively coarse-grained, sugary-textured quartzo-feldspathic mosaic intergrowths with sericite speckling and minor interstitial chlorite. Chlorite-rich domains lack quartzo-feldspathic matrix but carry small albite microlites, indicating slightly slower cooling rates than the quenched glass that formed chlorite-poor areas. Matrix areas between fragments are not obvious, as recrystallization of the glass in the fragments and the matrix has produced similar textured quartzo-feldspathic intergrowths.

This sample was a monomict glassy lava breccia, probably of dacitic to acid andesitic composition, that has suffered weak hydrothermal alteration (silica-chlorite).

SAMPLE NUMBER: MAC 35 622665 1076.8m

SUMMARY: This rock was a moderately plagioclase-phyric dacitic lava with a vitrophyric groundmass, and a chlorite - sericite -silica burial metamorphic alteration assemblage.

HAND SPECIMEN:

This is an almost black plagioclase-phyric massive felsic lava.

THIN SECTION DESCRIPTION:

This sample is a texturally well-preserved moderately plagioclase-phyric dacitic lava with a formerly largely glassy groundmass. Blocky to tabular albitized plagioclase phenocrysts mainly less than 1 mm long occur most commonly as clots of subhedral crystals. They are always lightly dusted with ultra fine-grained hematite and much less abundant fine sericite, and make up around 5-8 modal% of the sample. A few small chloritized phenocrysts that were probably augite are also present, but these are modally insignificant. Similarly, small former FeTi oxide phenocrysts are totally altered to messy leucoxene.

The groundmass of this sample was composed of glass charged with small albite microlites. Glass devitrified and then recrystallized to a fairly even-textured, homogeneous quartzo-feldspathic aggregate that is very fine-grained, but characterized by occasional larger angular patches of polycrystalline quartz. Both chlorite and sericite are quite abundantly disseminated throughout the groundmass, although the amount and distribution of chlorite suggest that it is of burial metamorphic origin rather than localized hydrothermal origin. The chlorite-sericite alteration assemblage of this massive dacitic lava contrasts with the calcite-sericite-(coarser grained quartzo-feldspathic intergrowth) of sample 622663, and accounts for the strikingly different colour of these two initially fairly similar dacites.

SAMPLE NUMBER: MAC 35 622666 1133.1m

SUMMARY: This rock is formerly vitrophyric-textured, moderately plagioclase-phyric dacitic lava with epidote-silica-chlorite low-grade regional metamorphic alteration assemblage. It was originally very similar to sample 622665.

HAND SPECIMEN:

This is a dark brown massive plagioclase-phyric dacitic lava with quartz veinlets and quartz-filled tension gashes.

THIN SECTION DESCRIPTION:

This sample is a moderately plagioclase-phyric dacitic lava that was originally probably very similar to the preceding sample 622665. It consists of about 5 modal% of subhedral albitized plagioclase phenocrysts with the pinkish colour typical of disseminated hematite dust, that are mainly aggregated in multi-crystal clots of 4 or 5 crystals. Several small cognate inclusions of microgabbro up to 2mm long consist of small tabular plagioclase phenocrysts and much less abundant tiny chloritized augite crystals. These are probably crystal aggregates that formed on the walls of the conduit through which this magma was passing to eruption, and were plucked off by the erupting magma. A few small chloritized augite crystals, and leucoxene-altered FeTi oxides are also present.

The groundmass of this rock was essentially identical to the groundmass of the previous sample. It was a vitrophyric intergrowth of albite laths in glass that has devitrified and then recrystallized to fairly fine-grained quartzo-feldspathic material with occasional spots of coarser-grained anhedral polycrystalline quartz. Unlike 622665. this sample has no sericite in the groundmass, and chlorite is less abundant, but quite common. Instead, clots and small patches of yellow epidote are common throughout the rock, and a single vein of calcite carries spectacular long hematite bladed crystals. Such an abundance of epidote is unusual in metadacites from the Mount Read Volcanics. Epidote is normally restricted to andesitic and more mafic rocks which originally contained plenty of Ca. The act that these two samples (665 and 666) contain more chlorite (665) and more epidote (666) than typical dacites suggests that they may be compositionally transitional to acid andesites. The alteration assemblage is low-grade regional burial metamorphism related.

SAMPLE NUMBER: MAC 35 622667 1155.0m

SUMMARY: This rock is a formerly glassy and hydrofractured plagioclase-phyric dacitic lava that has been false brecciated during a hydrothermal alteration event that produced chlorite-silica-sericite assemblages,

HAND SPECIMEN:

This is a massive, almost black massive plagioclase-phyric dacitic lava with pinkish albite phenocrysts.

THIN SECTION DESCRIPTION:

This sample is an finely autobrecciated or false brecciated plagioclase-phyric dacitic lava. Despite the hand specimen showing no sign of brecciation, it is very obvious in hand specimen, as a relatively small-scale jigsaw fit texture with the largest fragments being almost 1cm and the smallest <<<1mm. Blocky to tabular albitized plagioclase phenocrysts are mainly around 1mm long, and are charged with hematite dust, giving them their distinctive pink colour. No former mafic phenocrysts are evident, but not uncommon former FeTi oxide phenocrysts are altered to messy leucoxene aggregates.

The groundmass of this sample was clearly glassy, and it recrystallized to a fairly fine-grained quartzo-feldspathic aggregate that has been subsequently overprinted by quite pervasive silica-chlorite-sericite alteration. The rock was probably hydrofractured but not brecciated, and hydrothermal alteration has enhanced the original incipient brecciation texture to produce a variable jigsaw fit false brecciation texture in which the inter-fragment matrix is paler and cleaner (chlorite-poor) relative to the fragments themselves. The last event in the alteration of this rock was limited calcite veining.

This was a hydrofractured moderately plagioclase-phyric dacitic lava that suffered quite strong chlorite-silica-sericite hydrothermal alteration and false brecciation.

SAMPLE NUMBER: MAC 35 622668 1181.9m

SUMMARY: This is a formerly glassy, weakly hydrothermally-altered (calcite-sericite) massive plagioclase-phyric dacitic lava.

HAND SPECIMEN:

This is a plagioclase-phyric massive dacitic lava with gradational zones of colour change from fresher almost black lava to light brown bleached and silicified lava.

THIN SECTION DESCRIPTION:

This sample is a massive moderately plagioclase-phyric formerly glassy lava. Albitized plagioclase phenocrysts make up around 10 modal% of the rock, and are mainly subhedral tabular crystals that are gathered in multi-crystal clots to about 2mm across. Dusty hematite throughout the plagioclase phenocrysts has preserved ghost compositional zoning in the crystals. A few small totally chloritized augite crystals are also present, and occasional small FeTi oxides are altered to leucoxene.

The groundmass of this sample was largely glassy originally, composed of occasional tiny albite microlites in glass that devitrified an recrystallized to a very fine-grained quartzo-feldspathic material with common tiny chloritic spots and larger anhedral grains of polycrystalline secondary quartz. The gradual change from more pinkish altered lava to almost black less altered lava is shown across the section by a significant decrease in the amount of disseminated secondary calcite and sericite, and an increase in the abundance of fine-grained chlorite in the groundmass. The sample is cut by strained veinlets of calcite and intergrown quartz.

This was a moderately plagioclase-phyric largely glassy dacitic lava that has suffered weak hydrothermal alteration, producing pinkish calcite-sericite alteration in an otherwise almost black dacitic lava.