

**SAMPLE:** 562801      333.8m

**SUMMARY:** This rock is a lapilli volcanoclastic derived almost entirely from detritus from submarine, glassy andesite lavas.

**HAND SPECIMEN:**

This rock is a grey-green volcanoclastic sandstone composed dominantly feldspar-phyric andesitic clasts or fragments; rock is traversed by elongate streaky zones of silicification (?). Max. size of clasts is ~1cm, but most are much smaller.

**THIN SECTION DESCRIPTION:**

This sample is clearly a volcanoclastic sediment, although it must have had a high original detrital glassy ash content. It is composed of three major clasts types; most abundant and notable are angular to subhedral phenocryst fragments of augite, and clasts of almost euhedral to slightly rounded strongly altered albite phenocrysts, and somewhat larger lithic clasts mainly derived from glassy andesites. The augite crystal debris forms about 5 modal% of this rock and is quite fresh; the crystals are clear, rarely longer than 1mm, and also occur as phenocrysts in some of the larger lithic clasts. They are typical andesitic clinopyroxenes. Former plagioclase phenocrysts and crystal fragments were probably about as modally abundant as the augite, but are more difficult to 'see', due to strong sericite-clay alteration. Lithic clasts constitute about 3-5 modal% of this rock, but are also difficult to differentiate from the devitrified formerly glassy ash matrix. Most lithic clasts were glassy plagioclase- or plagioclase+augite -phyric andesites and dacites. The groundmasses of these lava fragments is invariably devitrified and rather dark, often with calcite overprinting the original groundmass. Another common clast type has similar phenocryst assemblages to that described, but a vitrophyric groundmass charged with tiny albite microlites.

The matrix of this rock is a dark murky mixture probably of comminuted glassy lava fragments similar to those just described, and glassy ash. The glass has totally devitrified and recrystallized to messy extremely fine-grained quartz-albite-sericite intergrowths with no regular fabric. Lacy calcite overprints areas of groundmass. Several bands of constantly finer-grained detritus, some only a few mm wide, are almost certainly discrete beds. Some other zones, in places almost perpendicular to the bedding, are characterized by cleaner matrix areas, and probably represent zones that were soaked in silica solutions and which recrystallized largely as very fine-grained quartz without the (sericitized) feldspar.

This is clearly a lapilli volcanoclastic derived largely, if not entirely from submarine, glassy andesitic lavas.

**SAMPLE: 562802**

481.2m

**SUMMARY:** This rock is a lapilli volcanoclastic composed of lithic clasts and feldspar crystals and crystal fragments derived entirely from dacitic glassy volcanics. It has suffered strong pressure solution

**HAND SPECIMEN:**

This rock is a dark grey-green lapilli volcanoclastic composed of clasts of fine-grained, sometimes feldspar-phyric formerly glassy lavas, mainly less than 5mm across.

**THIN SECTION DESCRIPTION:**

This sample is a volcanoclastic sandstone (lapilli volcanoclastic) that despite its striking hand-specimen similarity to the previous rock, is quite different in thin section and provenance. The sample lacks the fine-grained devitrified messy matrix of 562801, and consists almost entirely of framework grains composed of either clasts of formerly glassy felsic lava, or phenocryst fragments derived therefrom. These clasts are mainly 1-3mm across, and are remarkably interlocked with adjacent fragments, due to intense pressure solution at clast boundaries; this is evident by the dark rims on every grain composed of 'insoluble' components concentrated on grain boundaries during pressure solution. The clasts are invariably formerly glassy, plagioclase-phyric or aphyric probably dacitic lavas. The glassy groundmasses have devitrified and recrystallized to a variety of different textures, with rather coarse snowflake textures perhaps being dominant. Plagioclase phenocrysts were albitized, and are mainly 1-2mm across and slightly resorbed blocky prisms speckled with sericite. Multi-crystal clots are abundant, and discrete detrital albite phenocrysts make up a significant amount of the finer grain size fraction in this rock. Interestingly, no quartz phenocrysts, and only a few small chloritized augite phenocrysts were noted. Alteration phases include uncommon chlorite, leucoxene and overprinting calcite.

This sample is clearly a volcanoclastic sandstone that suffered strong winnowing of finer matrix, and subsequent pressure solution. It is derived entirely from plagioclase-phyric and aphyric dacitic glassy lavas.

**SAMPLE: 562803**      502.4m

**SUMMARY:** This rock was a glassy plagioclase-phyric evolved andesitic or dacitic lava.

**HAND SPECIMEN:**

This rock is a massive grey-green finely porphyritic andesite lava transected by cm-sized calcite streaks that may be very elongate vesicles.

**THIN SECTION DESCRIPTION:**

This is a vesicular, formerly glassy plagioclase-phyric andesitic to dacitic lava with an unusual groundmass texture due to devitrification of glass. It was composed of about 3-5 modal% of tabular albitized plagioclase phenocrysts up to 2mm long set in glass. The plagioclase has been strongly sericitized. A few elongate chloritized mafic phenocrysts were probably augite, and FeTi oxide microphenocrysts are present but rather uncommon and altered to leucoxene. Long narrow apatite microphenocrysts are present but not common.

The groundmass of this lava was glassy, but has devitrified and recrystallized to a most unusual mottled intergrowth composed of curving and impersistent domains of three types. Most abundant is a relatively coarse-grained but 'dirty' snowflake textured mosaic, rendered murky by the presence of tiny clay- or sericite-altered plagioclase microlites. These zones pass outward into even murkier areas in which tiny chlorite flakes are riddled through glass and leucoxenitic blebs are common. These zones grade into areas composed entirely of secondary polycrystalline quartz; the latter reach more than 1mm long. This unusual devitrification texture may have developed in response to a more fluid-assisted alteration than the normal devitrification textures seen in felsic Mount Read lavas, with the domains in the groundmass defining 'diffusion fronts'. Vesicles are relatively abundant, and vary from strongly elongate (but not deformed) to almost rounded, with the larger vesicles being most elongate. All vesicles are filled by calcite, often with a quartz border. Several stylolitic zones only a fraction of a mm wide are defined by concentrations of tiny hematite(?) grains.

It is difficult to judge whether this sample was a dacite or an evolved andesite. The paucity of (former) augite phenocrysts compared to Que andesites with only a few % MgO suggest that the rock may well have been dacitic. However, the amount of fine-grained chlorite in the groundmass, and the un-dacite-like (new term) devitrification texture make me lean more to an evolved andesite.

**SAMPLE: 562804.**

545.7 m

**SUMMARY:** This rock was probably a polymict fine-grained lava breccia derived from evolved plagioclase-phyric andesitic glassy lavas,

**HAND SPECIMEN:**

This rock is a dark green andesitic lapilli volcanoclastic composed of feldspar-phyric and chloritic lithic clasts, mainly less than a few mm long.

**THIN SECTION DESCRIPTION:**

It is obvious in thin section that this rock is either a lapilli volcanoclastic or fine-grained polymict lava breccia. Dominant clasts or fragments are highly vesicular to non-vesicular quite strongly plagioclase-phyric andesites that had glassy to vitrophyric groundmasses. Many fragments are highly angular. One such fragment is almost 1cm long. Although a variety of clast types are evident, most notably varying in the extent of vesiculation, it is not so evident that these fragments need be from separate lava flows. All have partially sericitized elongate tabular plagioclase phenocrysts to 2mm long maximum, that commonly occur in glomeroclasts, and very fine-grained formerly glass-dominated groundmasses. Chloritized mafic phenocrysts are not common, but present in many fragments. In some fragments, groundmass has been replaced by chlorite, and shows a weak foliation.

Between fragments, the matrix is a relatively coarse-grained polycrystalline quartz plus minor albite intergrowth. It is most unlike similar intergrowths replacing glass, and seems to be more a replacement, or void filling. Vesicles are filled by coarse-grained polycrystalline clear quartz sometimes intergrown with minor chlorite.

This rock was probably a polymict fine-grained lava breccia derived almost entirely from evolved andesitic glassy lava flows. If it suffered any reworking, it had the effect of eliminating any matrix, so that matrix voids between packed angular lava fragments (and vesicles) were subsequently filled by silica.

**SAMPLE: 562805**

621.75m

**SUMMARY:** This rock was a hyaloclastite derived from an augite-phyric basalt. It contains a low greenschist facies alteration assemblage.

**HAND SPECIMEN:**

This rock is a grey-green lava breccia with diffuse-edged (highly altered?) clasts of dacite or andesite in a darker more chlorite-rich matrix.

**THIN SECTION DESCRIPTION:**

This sample is likely to have been a monomict glassy lava breccia or hyaloclastite composed dominantly of augite-phyric basaltic glass fragments to almost 1cm long. Many fragments were exceptionally vesicular, crystal-free glass that altered to pale brown to honey coloured sideromelane in which quite large (to 3mm) clear augite phenocrysts are set. The augite phenocrysts are euhedral and are commonly partially altered to calcite and chlorite. No plagioclase phenocrysts were present in this sample. Less vesicular glassy lava fragments do not show sideromelane alteration, but rather show heterogeneous and rather messy quartz-albite-chlorite-sericite mosaic intergrowths. In many places, these lighter coloured areas texturally resemble alteration-brecciation rather than primary volcanic brecciation, and appear to have resulted from the passage of hot fluids through the mass of glassy fragments, leaving some sideromelane areas 'unstewed'; in such areas, augite phenocrysts have been quite strongly altered to chlorite. Vesicles are filled with quartz and calcite that is riddled with sheaves of pale green actinolite needles. Veinlets of lower-temperature actinolite-free calcite cut the rock.

This was probably a basaltic hyaloclastite derived from a single flow of vesicular, augite-phyric basalt. It has suffered fairly strong hydrothermal alteration, reaching greenschist facies as indicated by the unusual presence of actinolite; temperatures of the calcite-quartz-actinolite alteration assemblage would have been around 300-350°C.

**SAMPLE:** 562806 757.1m

**SUMMARY:** This rock was a glassy plagioclase+augite-phyric evolved andesitic lava.

**HAND SPECIMEN:**

This rock is a dark green massive aphyric basaltic or andesitic lava.

**THIN SECTION DESCRIPTION:**

This rock was a sparsely plagioclase+augite-phyric andesitic lava with a glassy groundmass. It has been quite strongly recrystallized and altered. Albitized plagioclase phenocrysts are totally replaced by very fine-grained sericite, as is albite in the recrystallized groundmass, resulting in the phenocrysts being very hard to differentiate from surrounding matrix, and precluding sensible modal abundance determination. However, a best guess would be that this sample had 5-10 modal% of plagioclase phenocrysts; these were less than 1mm long, and occasionally occur in multi-crystal clots. More obvious but much less abundant are chloritized augite phenocrysts that are less than 1mm long euhedra. FeTi oxide phenocrysts and microphenocrysts are altered to leucoxene, and were not uncommon. Apatite microphenocrysts are also notable but not common.

The groundmass of this sample was undoubtedly glassy. It has recrystallized after devitrification to a messy quartz-albite uneven snowflake mosaic in which the feldspar is largely replaced by fine-grained sericite. Angular patches of polycrystalline quartz to several mm, and green chlorite, are common, and tiny leucoxenic blebs riddle the quartz-albite(sericite) mosaic.

This rock was probably a glassy evolved andesite lava, as suggested by the relatively large apatite microphenocrysts and abundance of Ti-alteration phases in the groundmass among other things. Texturally, and in the size of the plagioclase phenocrysts, the rock is unlike typical dacites from the Que-Hellyer area.

**SAMPLE: 562807**

789-35m

**SUMMARY:** This rock was a polymict glassy dacitic to andesitic lava breccia that has suffered strong quartz-pyrite-sericite alteration, especially in the matrix areas.

**HAND SPECIMEN:**

This rock is a very strongly altered polymict lava breccia with dacitic(?) to chloritic basalt lava fragments to at least 4cm long in a carbonated matrix that contains abundant disseminated and local concentrations of pyrite.

**THIN SECTION DESCRIPTION:**

This sample was probably originally a polymict lava breccia composed of plagioclase-phyric dacite and evolved andesite lava fragments that were quite glassy. Lava fragments are angular and show a diversity of devitrification-recrystallization textures that have, in turn, been overprinted by intense quartz-pyrite alteration and calcite alteration. Most fragments appear to have been evolved andesites with small tabular albitized plagioclase phenocrysts that are thoroughly sericitized. In fact many fragments are little different from the lava described above (562807). Mafic phenocrysts are rare in these fragments. A small percentage of the fragments are chloritized vesicular glass probably derived from basaltic glass. Curved fragments of vesicular glass entirely replaced by sericite may have been more felsic.

The matrix of this rock is exceptionally altered. It is now a relatively even-textured and very fine-grained quartz-feldspar mosaic, with dominant quartz, and is riddled by abundant and quite large pyrite crystals and sericite. Calcite probably post-dates the quartz-sericite-pyrite alteration and overprints quite large areas of the section. It is not associated with pyrite alteration.

This sample was probably a polymict lava breccia dominated by glass andesitic to dacitic lava fragments. Strong alteration, particularly of the matrix was associated with the passage of fluids through the rock that produced first strong quartz-sericite-pyrite alteration, and subsequently calcite alteration.

**SAMPLE: 562808**

809.5m

**SUMMARY:** This rock was a sparsely plagioclase+augite-phyric glassy andesitic lava.

**HAND SPECIMEN:**

This rock is a dark green mottled massive andesitic lava.

**THIN SECTION DESCRIPTION:**

This is a petrographically simple and texturally well-preserved sparsely plagioclase+augite-phyric andesitic lava not very different from 562806, except that this sample has a more uniform groundmass. Plagioclase phenocrysts are small (<0.5mm) and make up only about 2-3 modal% of this rock. They are tabular to elongate prisms quite different from the large blocky plagioclase phenocrysts that dominate the felsic lavas in the Mount Read Volcanics. Small elongate former augite phenocrysts are chloritized, and FeTi oxide microphenocrysts are altered to leucoxenitic material.

The groundmass of this sample was entirely glassy. It has devitrified, then crystallized to a very even-textured sugary intergrowth of quartz and albite that is permeated by quite abundant fine-grained chlorite and sericite. Remarkably sinuous stylolitic banding transects the rock in many places, and is marked by an abundance of leucoxenitic material that is presumably insoluble residues from pressure solution. This banding is responsible for the feint mottling seen in the hand specimen.

The shapes of the feldspar phenocrysts, and the abundance of chlorite in the groundmass suggest to me that this was a glassy andesitic lava.