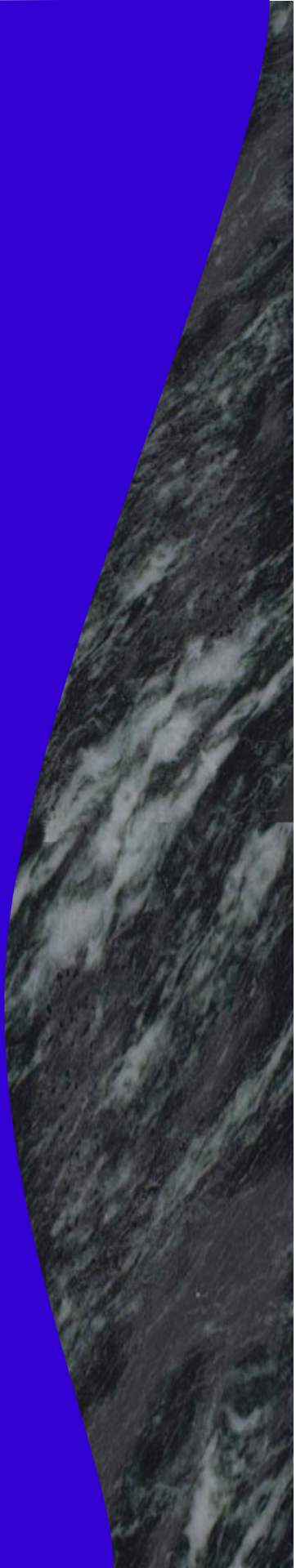

PETROGRAPHIC REPORT

8 Rocks from the Upper Sterling Valley, Drillhole MXUD02, W Tasmania

for

Unity Mining
(attn. Mike Blake)

7/5/2013

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Petrographic Summary Report

Background

Eight samples from drillhole MXUD02 from the Moxon Saddle area within Unity's tenements at the head of the Sterling Valley (Figure 1) were submitted for thin section examination to attempt to better characterize the rocks with respect to defining their rock type and alteration style. Wholerock lithogeochemical analyses were provided for all samples, and a summary drill log of key lithologies is given in Figure 2..

All samples were prepared as standard (unpolished) thin sections on the basis of their lacking significant opaque phases. Both the thin section offcuts and thin sections themselves were scanned, and these scanned images are incorporated in the description of each sample to provide visual detail on the rocks examined and complement the representative photomicrographs provided. Table 1 provides summary petrographic data for the rocks examined.

Summary and Implications

Sample 16303 and 16304 are strongly to intensely foliated, finely plagioclase-phyric metabasic rocks with little textural preservation, especially of groundmass, to provide useful information about their ancestry. Both show intense chlorite-quartz-brown carbonate alteration, although the carbonate veining and overprinting tends to post-date the chlorite-quartz alteration. Vague traces of a fine-grained, possibly originally glassy groundmass in 16303 suggest that these rocks may have been lavas rather than basaltic dykes. Their significant foliations suggest proximity to a high strain zone, and much of the alteration, especially the carbonate development, may have occurred within the fault zone.

Samples 16305 and 16309 are much better preserved mafic rocks, lacking foliation, with the latter being very well preserved. Both are clearly holocrystalline, basaltic to doleritic dyke rocks, and common features such as the presence of blocky, barely altered plagioclase phenocrysts, occasional chloritized olivine phenocrysts, and the presence of two opaques (ilmenite and Ti-magnetite) in the groundmass indicate that these dykes are comagmatic. The presence of olivine phenocrysts along with Ti-augite and the two opaques in the fresher sample indicates transitional alkaline affinities for these rocks, suggesting but not proving a Tertiary age for these rocks, an age supported by the absence of any deformation features in these dykes. They are definitely not Jurassic dolerite dykes (see compositional data), and other W Coast Mesozoic dykes are lamprophyric.

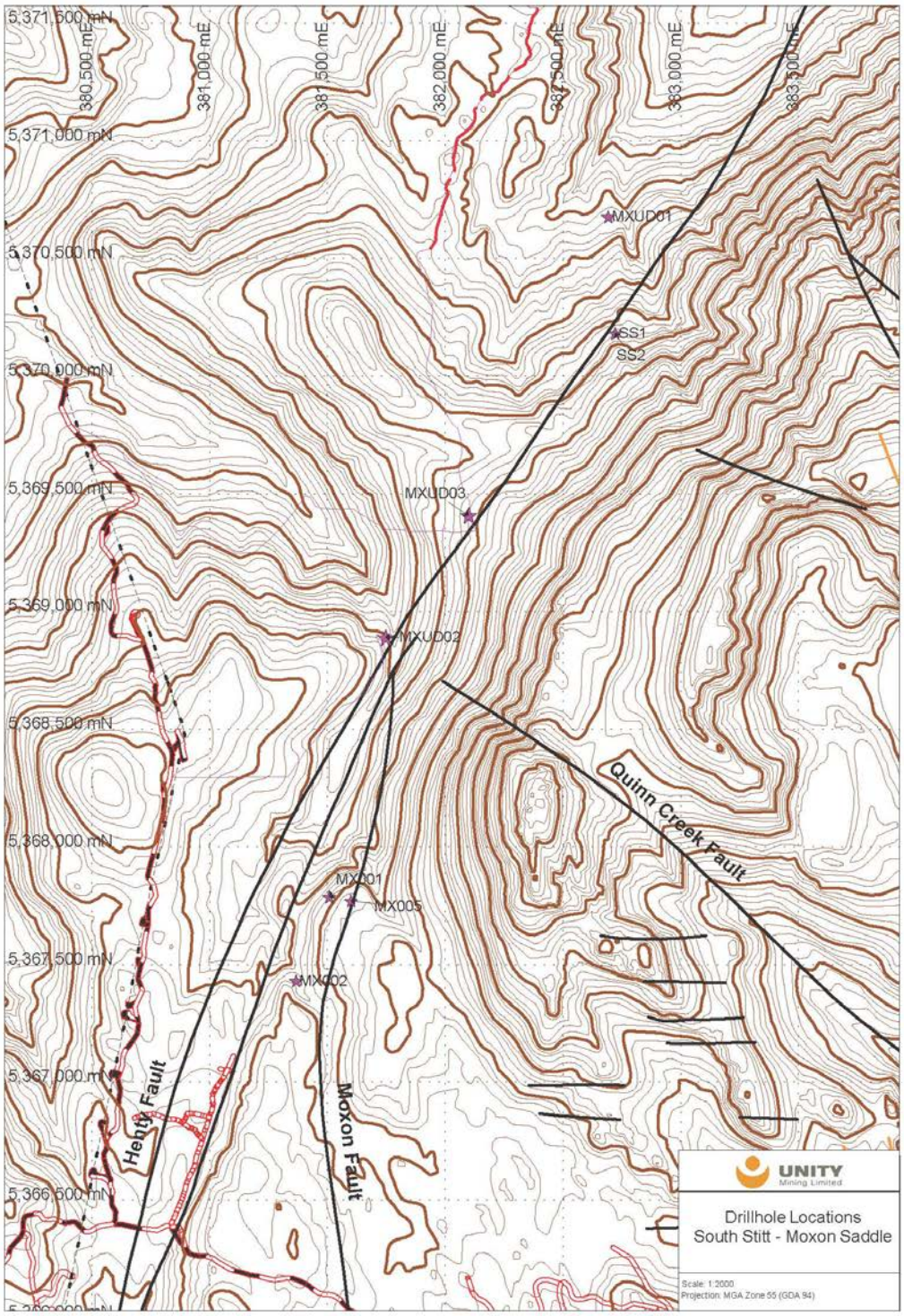


Figure 1: Location of drillhole MXUD02, Moxon Saddle

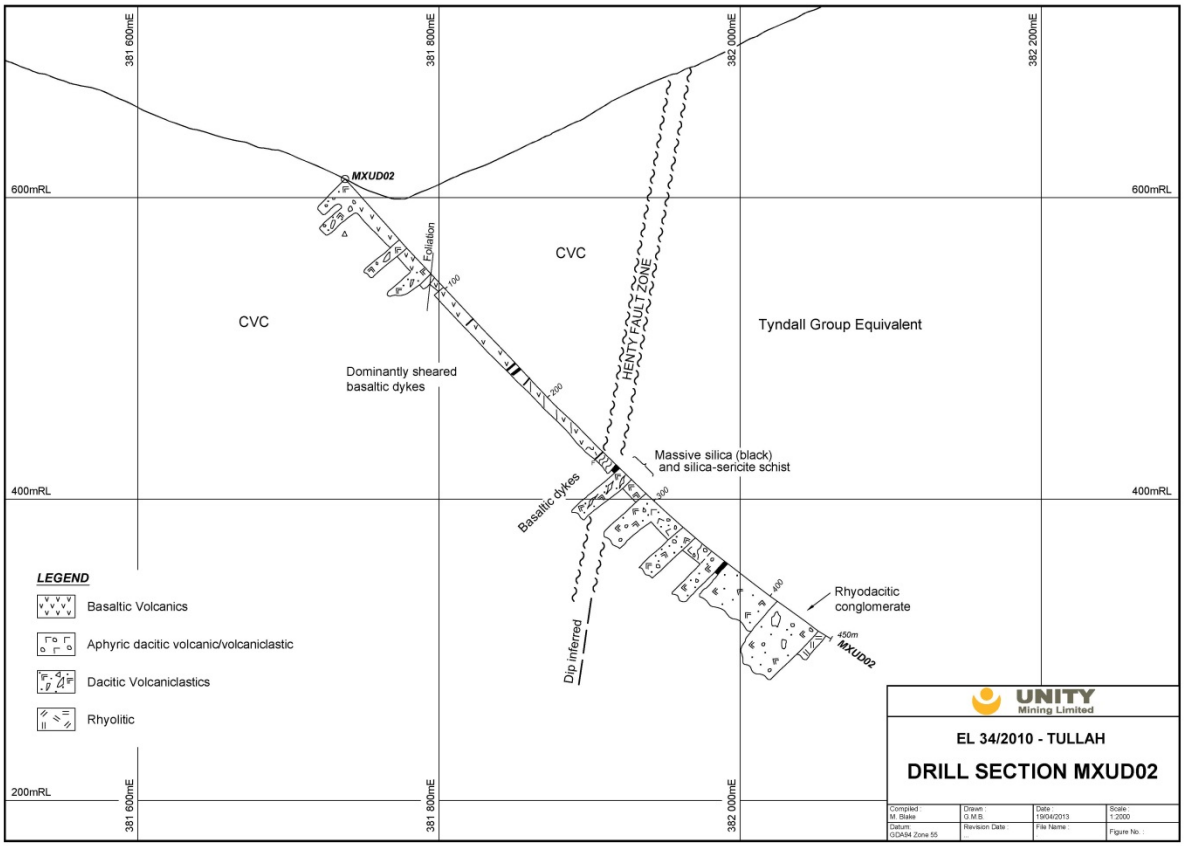


Figure 2: Summary log of drillhole MXUD02, Moxon Saddle

Samples 16306, 16307 and 16308 are petrographically very similar volcaniclastic coarse sandstones to granule conglomerates with a poorly sorted matrix, and all clastic material derived from glassy plagioclase+quartz-phyric felsic volcanics lacking mafic phenocrysts. A distinctive feature of all three samples, but best displayed in 16307, is the presence of common pumice fragments, including some distinct tube pumice fragments to 5mm long and probably originally larger. Other clasts appear to have been formerly glassy rhyolitic lava. The poorly sorted matrix of these rocks is dominated by the alteration products of silty to sandy material that was either vitric ash and comminuted glassy material, or broken plagioclase and quartz phenocryst detritus.

Sample 16310 is a quite different felsic rock, probably dacitic in composition, with common broken quartz, plagioclase and biotite phenocrysts in a very fine-grained, even –textured groundmass, suggesting that it may have been deposited from a ash flow. However it shows no fiamme , obvious welding, or vitroclastic textures that might be expected in the groundmass of a rock formed from a hot ash cloud.

Alteration

The two strongly sheared and foliated mafic rocks from around 210-261m are considerably more altered than rocks deeper in the hole, suggesting that much of the pervasive chlorite-quartz-carbonate alteration in these rocks was either formed, or enhanced, in the fault zone responsible for the strong foliation in these rocks.

The felsic volcaniclastic rocks between 277m and 303m depth in this hole show weak to moderate chlorite-quartz-sericite hydrothermal alteration, barley more than expected from regional burial metamorphism of such porous, reactive rocks.

The deepest sample 16310 (445.5m) shows a distinctive, strong khaki biotite alteration with subordinate fine-grained trails of magnetite and chlorite, the latter likely deriving from biotite alteration. The development of the pervasive fine-grained khaki biotite through this rock may reflect either porphyry Cu-Au-style potassic alteration (need to stain to check for fine-grained Kspar), or the proximity to a granite, with the biotite being a contact metamorphic effect.

The two holocrystalline mafic dyke rocks (16305 and 16309) show very weak carbonate-chlorite alteration with minor sericite in plagioclase), especially 16310, in which Ti-augite is quite fresh.

Lithogeochemical Considerations

Felsic Rocks

The lithogeochemical data provided show that the three felsic volcaniclastic rocks between 277m and 302.8m have typical rhyolitic Ti/Zr values (8.6-13.0), and major elements (Al, Mg, Fe and Ti) that are very similar and appropriate for volcaniclastic rocks dominated by detritus from felsic volcanics.

In contrast, sample 16310, the plagioclase+quartz+biotite-phyric dacite, shows an expected higher Ti/Zr (35), higher Mg, Sc, V and Co, and yet shows lower Y and Zr, indicating that the magma from which this rock crystallized is quite unlike the typical quartz+feldspar-phyric volcanics that were eroded to form samples 16306, 16307 and 16308. Without full major element and REE data it is only possible to hazard a guess, but this rock is geochemically very unusual with respect to all data I have on MRV felsic rocks, especially with respect to its unusually low Zr (90ppm), and Y (16ppm).

Most dacites and rhyolites in all units in the MRV have 1.5 to 2 times these abundances. I note, however, that its very high Th content (20.8ppm) suggests a very crustal 'flavour' and invites comparison with Tyndall Group and younger MRV suites relative to the less crustally influenced Central Volcanic Complex. More work is required to understand this unit, its internal variation, thickness, distribution and significance, including more petrographic work and lithogeochemistry.

Mafic Rocks

The two strongly foliated mafic rocks from 210.1m and 261.0m have unusually (10.9% and 14% MgO respectively), and correspondingly high Cr (464, 1120ppm respectively), Ni (309, 679ppm) and low TiO_2 (0.28%, 0.32%). These values are likely to be well removed from protolith values, given the intense foliation and carbonate-quartz-chlorite alteration that characterizes these rocks, but they suggest relatively primitive basalt precursors. Furthermore, Zr values are bizarrely less than Y values. Interpolated from the La, Ce and Y values provided, near-flat REE patterns are likely for these basalts.

The affinities of these extremely altered basalts is very difficult to determine on the basis of available evidence. They are significantly more magnesian than typical Henty Dyke Swarm rocks.

A second suite of mafic rocks is represented by samples 16305 and 16309. These are texturally very well preserved, finely holocrystalline basaltic dyke rocks, with 16309 being particularly wellpreserved. Lithogeochemical for this sample, in particular, will be little removed from protolith values.

Comparison of the compositions of the two dykes shows strong similarities, especially for the immobile elements (Ti, Zr, Y, Nb, La, Ce, Cr, V, Sc), for which element abundances are impressively similar (mainly <<10% of the measured value). This strongly supports the suggestion from petrography that these rocks are comagmatic. As noted above, the fact that the sample from 266.15m depth occurs within strongly foliated rocks (e.g., 16304 @ 261.0m depth) but is itself undeformed suggests that these two dyke rocks post-date any movement on the faults in this local system close to the major Henty Fault.

In terms of affinities, the following points are made:

They have ~1.5% TiO_2, 6.2-6.7% MgO, total Fe as FeO 8.3-8.8%, Ti/Zr from 60-80, and ~30x chondritic La, Nb around 7-8ppm, Y 24-25ppm, and 112-148ppm Zr.

Without the SiO_2 abundances in these rocks, it is difficult to discuss alkalinity, but the low Fe and rather low TiO_2 contents do not support the idea that these were strongly evolved tholeiitic basalts such as most of those in the Henty Dyke Swarm. Their TiO_2>1% and many other compositional features (plus petrography) rule against these rocks being correlated with the extensive Jurassic dolerites across Tasmania. This leaves the option that they are either post-kinematic Devonian basalts, which are known from eastern Tasmania, or Tertiary basalts, perhaps broadly associated with those exposed around Granville Harbour and further north in western Tasmania.

From the online wholerock geochemical database of Mineral Resources Tasmania, a number of Tertiary basalts from the Wynyard region, for example, have key major and trace element compositions very close to the two basalt dykes under consideration. For example, the average Zr, Y and Nb contents of three Cenozoic basalts (C1734, C1738 and C1740) from the Wynyard area with 6-8% MgO and 1.50 – 1.62%% TiO_2 are 96ppm Zr, 8ppm Nb and 20ppm Y, all very close to those of the MXUD02 basalt dykes. It is concluded that these dykes represent a southern manifestation of the same Tertiary transitional alkaline intraplate basaltic magmatism as those well studied basalts in northern Tasmania.

TABLE 1: Summary of Petrographic Features: Upper Sterling Valley Hole MXUD02

Sample	Depth (m)	Description
16303 *plagioclase-pale significant*	@ 210.1m	*A strongly foliated, probably formerly quite glassy, sparsely and finely phyric lava with an evolved basalt or basaltic andesite composition. It shows a pervasive brownish carbonate-chlorite alteration, but small plagioclase phenocrysts are preserved, suggesting that the foliation and current alteration assemblage developed within a fault zone.*
16304	@ 261.0m	*An intensely foliated and veined rock, probably originally basaltic to andesitic, with no useful protolith textural information preserved. It consists of interleaved, crenulated chlorite, pale brown carbonate and very fine-grained quartzose domains.*
16305 *be*	@ 266.15m	*A finely holocrystalline, weakly vesicular sparsely but rather coarsely plagioclase-phyric basaltic dyke rock with tow opaques in the groundmass suggesting a transitional alkaline affinity. It shows weak chlorite-carbonate alteration, and is likely correlated with the better preserved basaltic dyke from 361.4m depth in this hole. It may of Tertiary age.*
16306 *altered*	@ 277.2m	*A felsic volcaniclastic conglomerate with clasts to several cm long of quartz+plagioclase -phyric, formerly glassy lava, and less common, very fine-grained vitric ash, set in a poorly sorted matrix that was rich in vitric ash, glassy chips, and broken quartz crystals. The alteration assemblage is quartz-chlorite-minor pyrite, with many clasts showing strong silicification, and chlorite tending to be restricted to matrix*
16307 *~1cm formerly the*	@ 284.95m	*A volcaniclastic coarse sandstone to granule conglomerate with clasts to across in which the clast population is dominated by quartz- and plagioclase-phyric glassy felsic lavas, with quartz, plagioclase and comminuted pumice/vitric ash making up matrix. The alteration assemblage is quartz-chlorite-sericite-minor pyrite, representing a weak to moderate hydrothermal assemblage.*
16308	@ 302.85m	*Another coarse, volcaniclastic sandstone to granule conglomerate with pronounced petrographic similarities to the preceding sample from 284.95m depth in this drillhole, and it is dominated by formerly glassy to pumiceous clasts of felsic lava with plagioclase, or plagioclase+quartz phenocrysts. Alteration is moderately quartz-chlorite-sericite.*
16309	@ 361.45m	*A weakly vesicular plagioclase+olivine-basalt dyke, approaching a dolerite texturally, with plagioclase, pink Ti-augite and both Ti-magnetite and ilmenite in the groundmass. Alteration is weak chlorite-carbonate-sericite. This rock is very close petrographically to, but better preserved than, the mafic dyke from 266.15m depth in this hole (#16305), and both are probably transitional alkaline basalts, of possible Tertiary age.*
16310 *forming or*	@ 445.35m	*A plagioclase+quartz+biotite+FeTi oxide-phyric dacitic volcanic in which the broken phenocrysts suggest an ash flow origin rather than a coherent lava. It shows strong and pervasive khaki biotite alteration, with patchy fine-grained secondary magnetite, a distinctive alteration assemblage resembling porphyry Cu-Au-style potassic alteration, alternatively, the contact metamorphic effects of a nearby granitic intrusion.*

SAMPLE NUMBER 16303

PETROGRAPHIC DESCRIPTION

This is a strongly foliated, probably formerly quite glassy, sparsely and finely plagioclase-phyric lava with an evolved basalt or basaltic andesite composition. It shows a pervasive pale brownish carbonate-chlorite alteration, but small plagioclase phenocrysts are preserved, suggesting that the foliation and current alteration assemblage developed within a significant fault zone.

SAMPLE NUMBER 16303

THIN SECTION DESCRIPTION

This is a quite strongly foliated, moderately- and finely plagioclase-phyric basaltic andesite or evolved basalt, with foliation development destroying the protolith groundmass texture and precluding confident evaluation of whether this was a lava or a dyke rock. Despite the textural modifications, clear, small and often broken plagioclase phenocrysts are present, most rather elongate prisms up to ~1mm long, and entirely albitized, often with strong speckling by sericite and chlorite. There may have been a few former mafic crystals, almost certainly augite, but these are thoroughly chloritized and stretched into the foliation.

The groundmass of this rock is largely obliterated by the foliation, but it clearly lacks plagioclase laths and microlites. Given the preservation of small phenocrysts of plagioclase, this might suggest that the sample was originally a quite glassy lava. It now consists of a texturally complex, foliated intergrowth of a brown carbonate, common chlorite, and a few modal% of fine-grained opaques (mostly altered Ti-magnetite, now leucoxene and subordinate hematite), plus a few modal% of anhedral, secondary and quite fine-grained quartz. The foliation is defined by elongate of carbonate streaks and patches, and also by the wavy, streaky chlorite.

Alteration and Veining

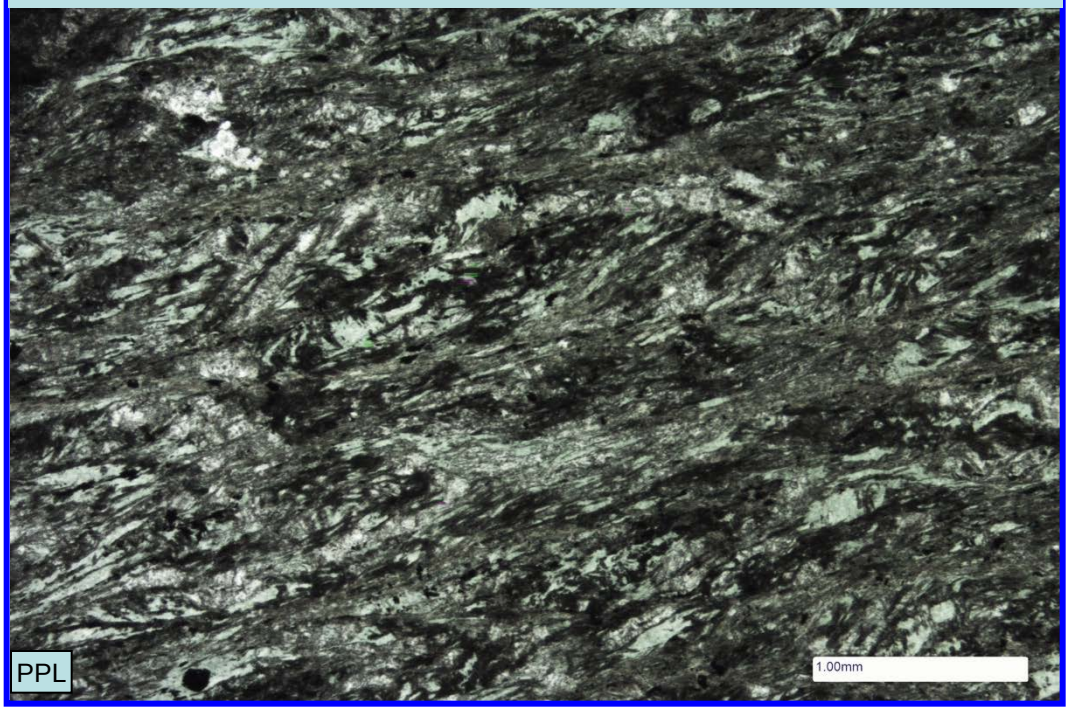
The alteration in this sample, with strong carbonate-chlorite development, but preservation of phenocrystal plagioclase, with no obvious sulfides and strong foliation development, has all the markings of a fault-related hydrothermal overprint. Veining is restricted to a few narrow, sub-cm long quartzose veinlets.

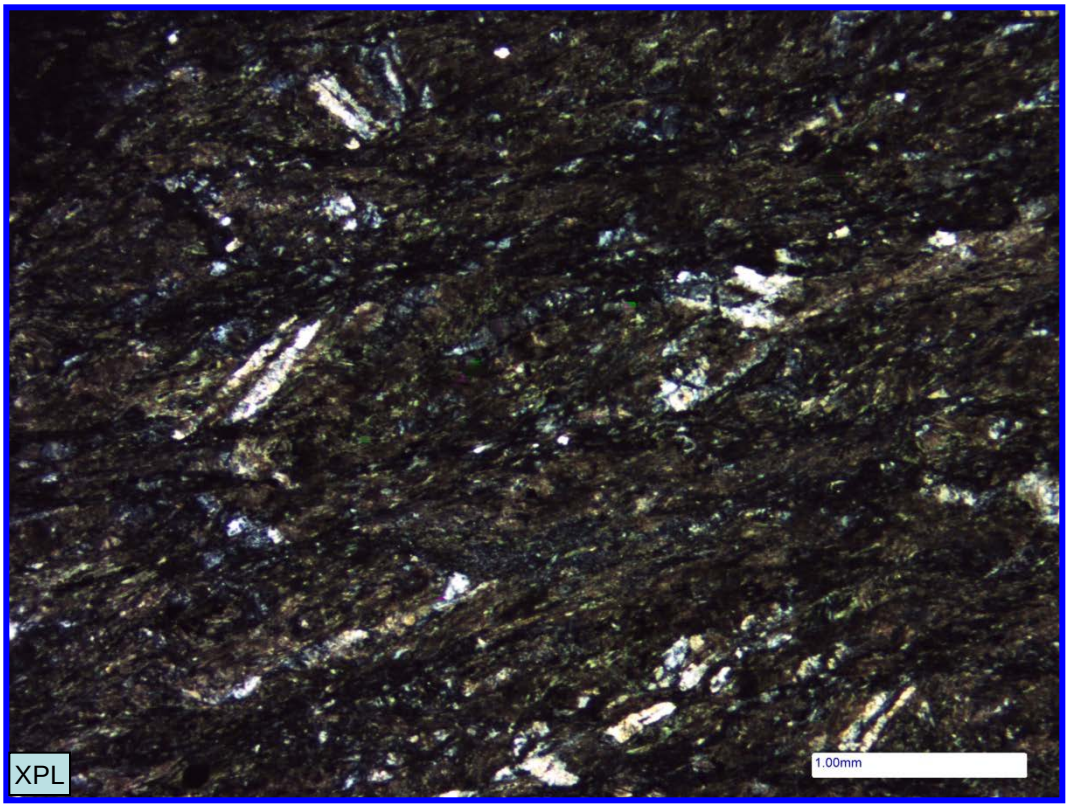
Other Comments

The rock was probably an evolved basalt or basaltic andesite lava, although it is hard to preclude it being a shallow, narrow dyke rock. The strong foliation and pervasive chlorite-carbonate alteration suggest it was recrystallized and hydrothermally altered in a fault zone.

SAMPLE NUMBER 16303

Strongly foliated rock with streaky chlorite and pale brown carbonate, and occasional small albitized plagioclase phenocrysts

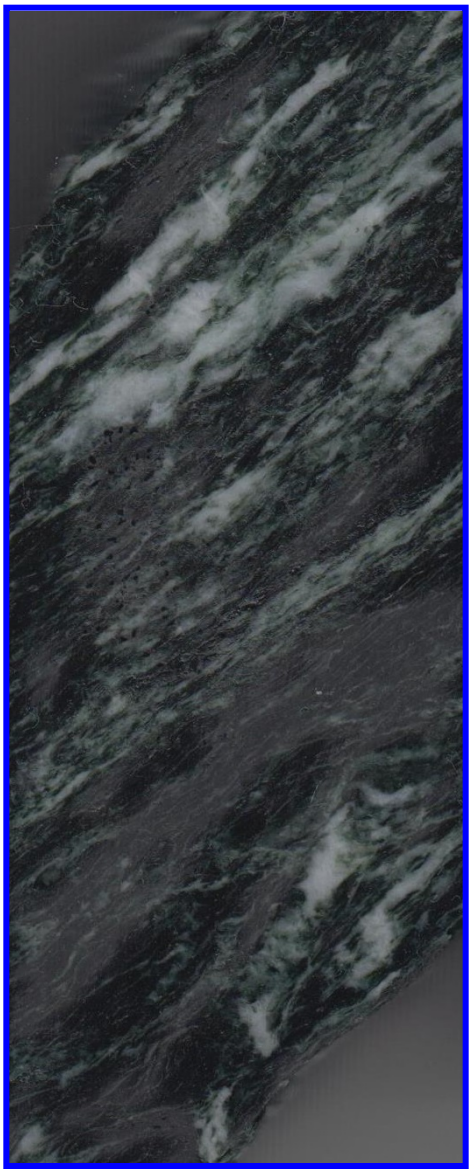




SAMPLE NUMBER 16304

PETROGRAPHIC DESCRIPTION

This is an intensely foliated and veined rock, probably originally basaltic to andesitic, with no useful protolith textural information preserved. It consists of interleaved, crenulated chlorite, pale brown carbonate and very fine-grained quartzose domains.



SAMPLE NUMBER 16304

THIN SECTION DESCRIPTION

This is an intensely foliated and veined rock with almost no preservation of protolith mineralogy and texture apart from a few small, albitized plagioclase crystal fragments, but it is not even clear whether these represent former phenocrysts or not.

Alteration and Veining

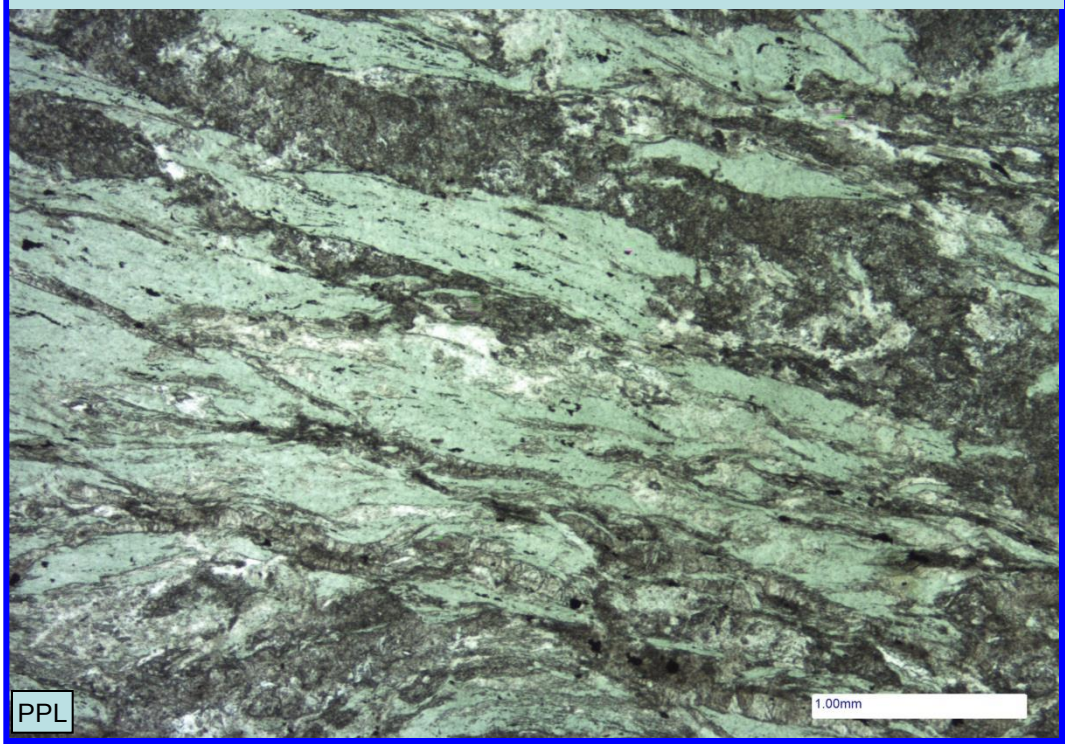
The rock consists almost entirely of interleaved, narrow, discontinuous and crenulated bands of pale green chlorite and pale brown fine-grained carbonate, with subordinate very fine-grained and texturally variable quartzose bands. The carbonate bands commonly transect the quartzose and chlorite bands. The latter all contain scattered, tiny opaque grains that appear to be leucoxene/titanite, not pyrite. The bands of chlorite. Quartz and carbonate show common boudinaging and drawing out into the foliation.

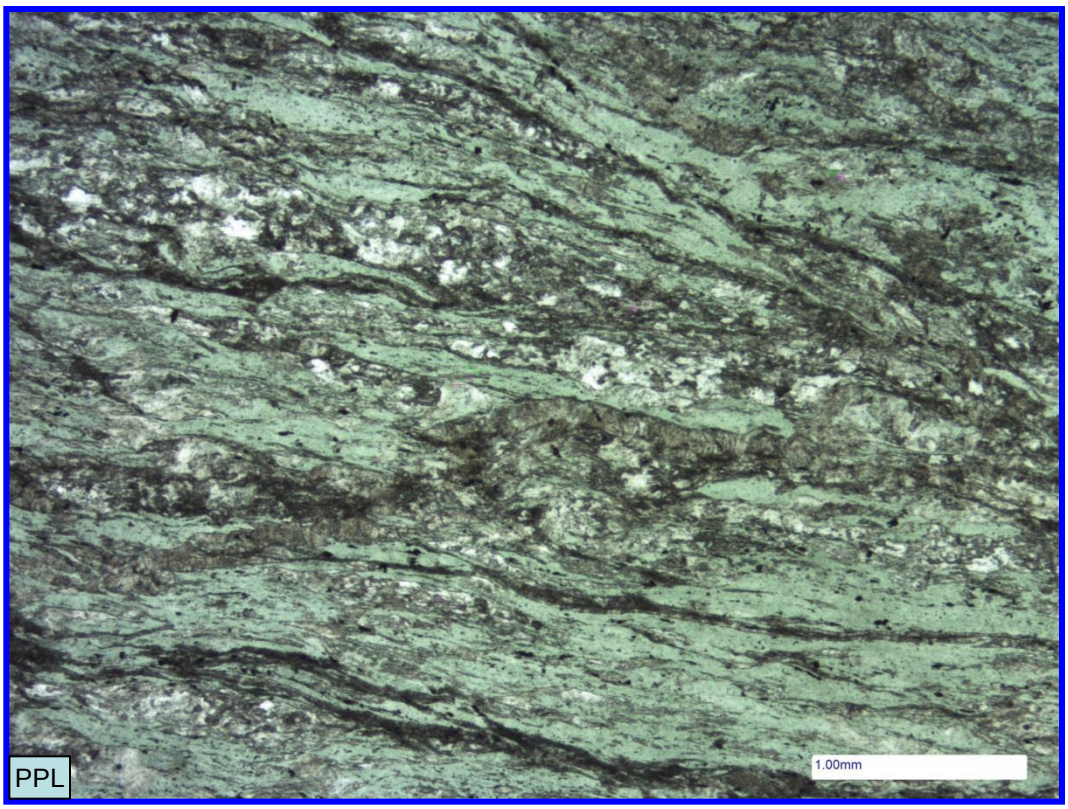
Other Comments

My impression is that this was originally a basaltic or andesitic lithology given the significant (~50modal%) amount of chlorite in the rock. It is not possible to determine whether it was volcanic or intrusive due to textural obliteration accompanying foliation development. The dominant foliation has clearly itself been crenulated, with small drag folds present between in domains between more strongly developed foliation planes. The brownish carbonate in this and the preceding slide appear to be too dark to be calcite, and may be ankerite. The intense alteration and chlorite-carbonate-dominant alteration suggest that the rock recrystallized in a major fault zone.

SAMPLE NUMBER 16304

Brown carbonate domains, green chlorite & pale quartzose spots and streaks

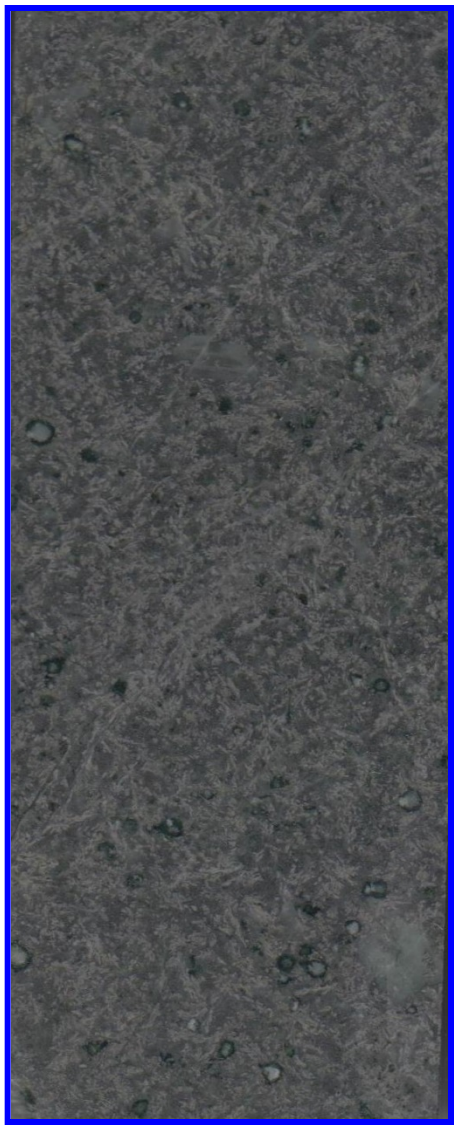




SAMPLE NUMBER 16305

PETROGRAPHIC DESCRIPTION

This is a finely holocrystalline, weakly vesicular sparsely but rather coarsely plagioclase-phyric basaltic dyke rock with two opaques phases in the groundmass, suggesting transitional alkaline affinities. It shows weak chlorite-carbonate alteration. It is very similar petrographically to the better preserved basaltic dyke from 361.5m depth in this hole, and may be Tertiary in age.



SAMPLE NUMBER 16305

THIN SECTION DESCRIPTION

This is a texturally well preserved, sparsely plagioclase-phyric dyke of likely basaltic composition. It shows a clear holocrystalline but fairly fine-grained texture defined by around 5modal% of blocky plagioclase phenocrysts set in a groundmass composed of equigranular plagioclase laths, altered augite, and common small altered FeTi oxides. The plagioclase phenocrysts range from <1 to at least 5mm long, and are well formed prisms with patchy, very fine-grained sericite alteration, but they are not albitized. Several mm-sized equant grains now composed of chlorite and pale brown carbonate have shapes suggesting they may have been former olivine phenocrysts. Scattered almost perfectly spherical chlorite-carbonate bodies (~2-3modal%) mainly 0.5-2mm across, are almost certainly vesicles.

The groundmass of this rock is an even-textured, holocrystalline intergrowth of 0.5-1mm-szed plagioclase laths, with interstitial chloritized augite and partly altered FeTi oxides. The plagioclases vary from fresh to partly sericitized, and the chloritized augite crystal sites are commonly partly overprinted by brown carbonate. The small but common (1-2modal%) FeTi oxide grains include both equant Ti-magnetite, and common, more elongate and bladed grains that are probably ilmenite.

Alteration and Veining

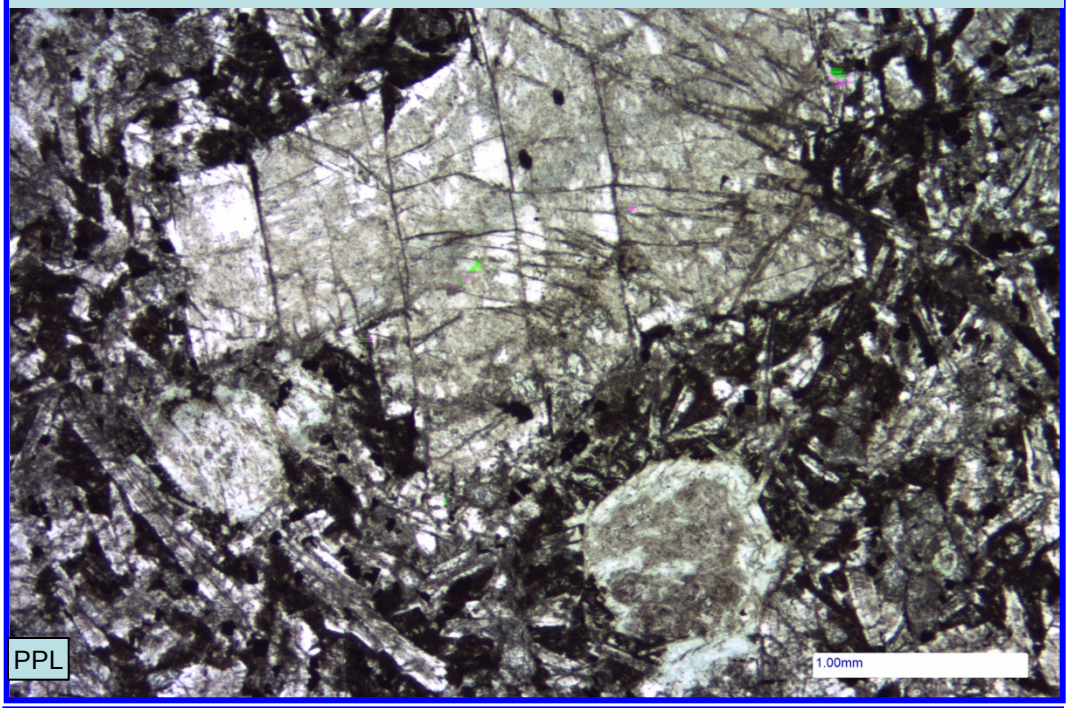
Alteration of this sample is weak chlorite-brownish carbonate-minor sericite, far less intense than in the preceding samples, and clearly not associated with foliation development.

Other Comments

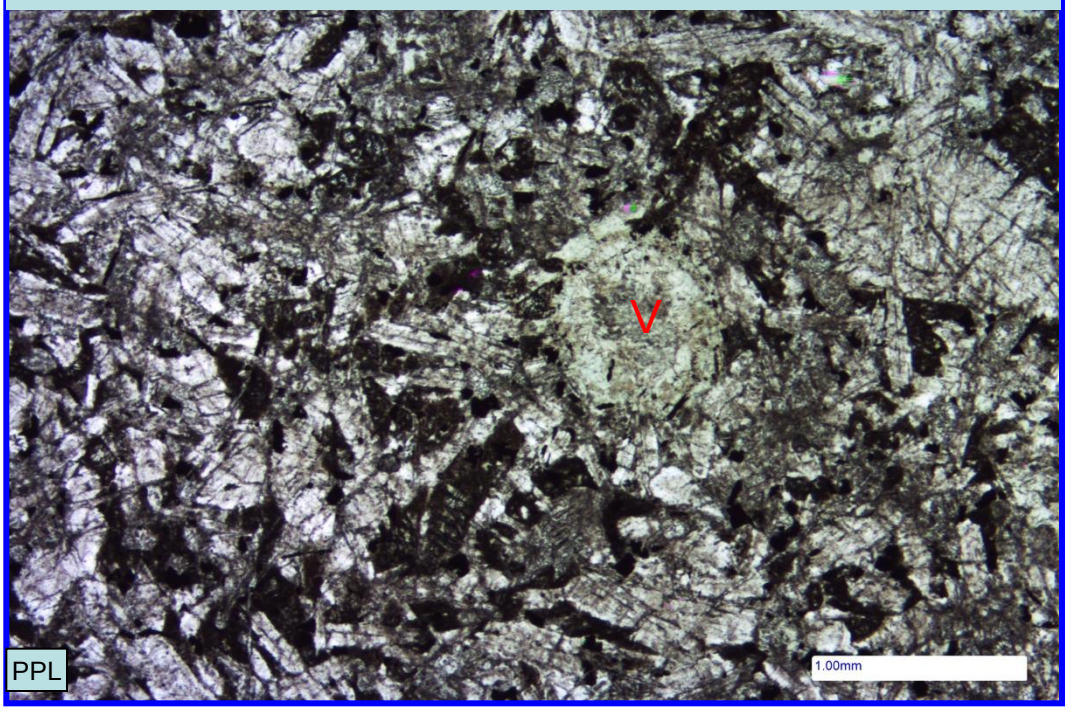
This sparsely plagioclase-phyric basaltic lava with the occasional quite large plagioclase phenocrysts and common FeTi oxides strongly resembles the better preserved rock from 361.4m depth in this set. Both appear to have been basaltic dykes of transitional alkaline affinity as judged by the altered olivine phenocrysts and two groundmass FeTi oxide phases. The fine-grained groundmass, and occasional small chlorite-filled vesicles, suggest the dyke was emplaced at a high crustal level.

SAMPLE NUMBER 16305

Lightly sericite-altered plagioclase phenocrysts in a holocrystalline groundmass

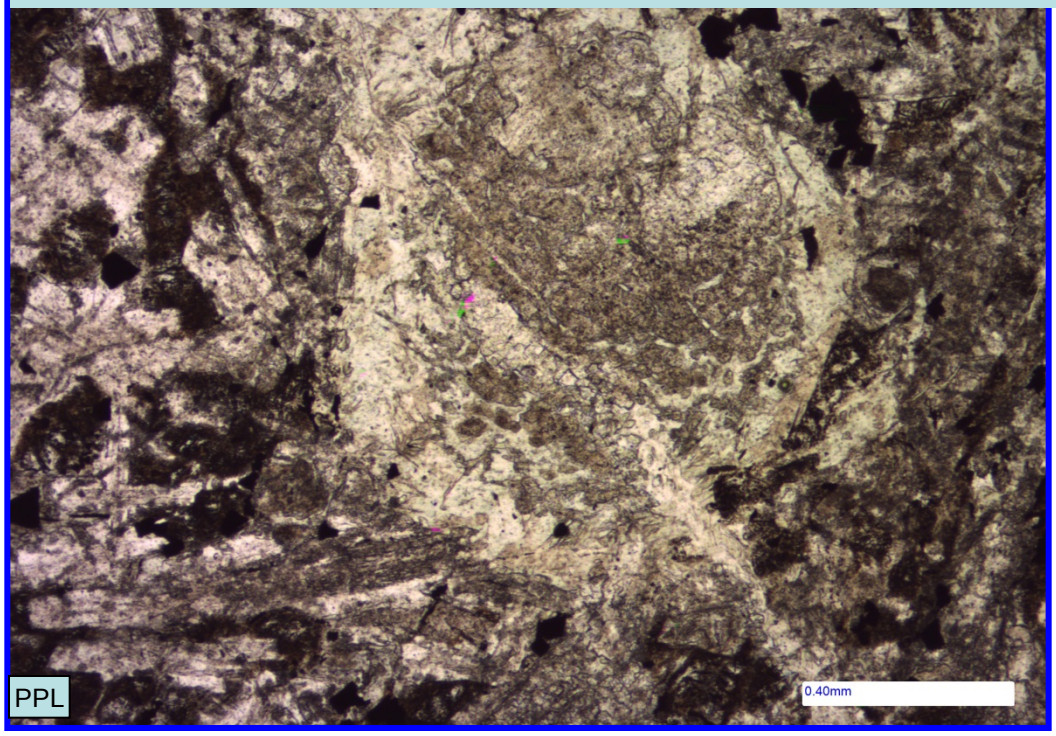


Holocrystalline groundmass of plagioclase, brown chlorite-carbonate-altered former augites, and small FeTi oxides, with 0.5mm chlorite-filled vesicle (V)

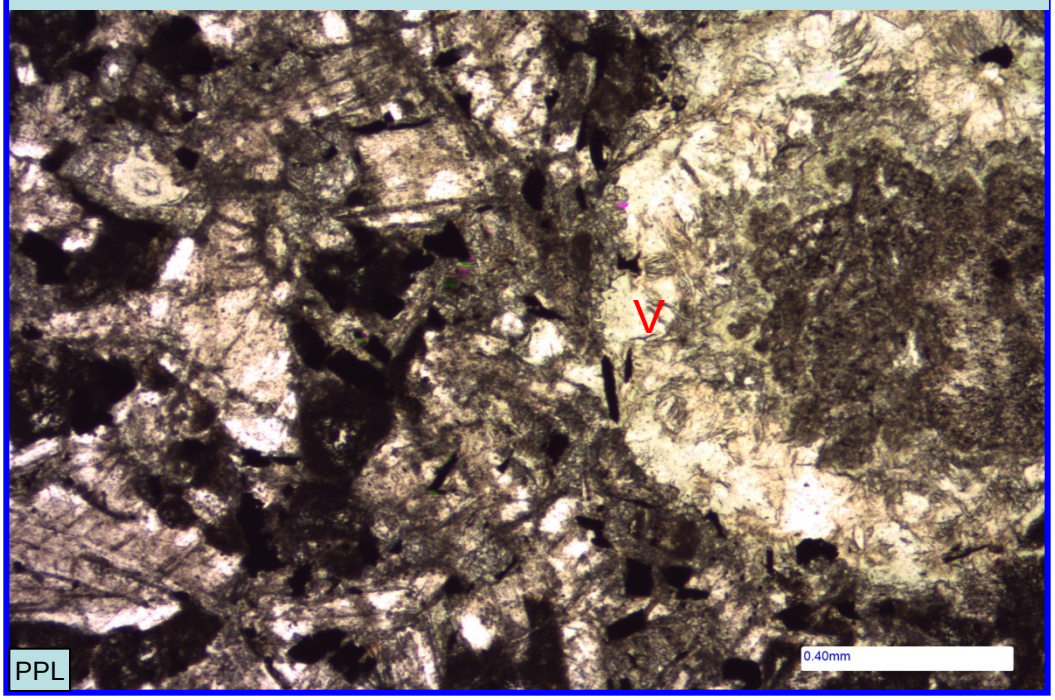


SAMPLE NUMBER 16305

Small olivine phenocryst replaced by chlorite and carbonate



Chlorite+carbonate-filled vesicle is holocrystalline groundmass showing altered brown augite &common FeTi oxides (equant Ti-mt & elongate ilm).



SAMPLE NUMBER 16306

PETROGRAPHIC DESCRIPTION

This is a felsic volcaniclastic conglomerate with clasts to several cm long of quartz+plagioclase -phyric, formerly glassy lava, and less common, very fine-grained altered vitric ash, set in a poorly sorted matrix that was rich in vitric ash, glassy chips, and broken quartz crystals. The alteration assemblage is quartz-chlorite-minor pyrite, with many clasts showing strong silicification, and chlorite tending to be restricted to matrix.

SAMPLE NUMBER 16306

THIN SECTION DESCRIPTION

As is evident from the scanned image of the rock on the preceding page, this sample is notably banded and heterogeneous, with a weak or moderate foliation, perhaps reflecting an original volcaniclastic protolith. In thin section, the volcaniclastic nature of this rock is well shown, with clasts of diverse, mainly quartz+plagioclase-phyric lithologies to a cm or more long embedded in a coarse, poorly sorted, sandy to granule conglomerate matrix. Two major lithologies make up the majority of the clast population; by far the most abundant clasts are elongate to slightly rounded, variably quartz+plagioclase-phyric rhyolitic lava clasts, most of which appear to have been originally glassy. In these clasts, the quartz phenocrysts make up perhaps 5-10modal% of the rock, with intensely quartz-sericite-altered former plagioclase phenocrysts significantly less, with the remainder being composed of texturally heterogeneous, finely sericite-peppered quartzose intergrowths after felsic glass. Occasional grains show poorly preserved by unambiguous evidence for the presence of pumice fragments in this rock. The other significant clast variety is a crystal-free, extremely fine-grained sericite-quartz intergrowth, perhaps representing a totally altered vitric ash.

As the matrix of this rock was poorly sorted volcaniclastic material derived from the same felsic glassy material as the larger clasts, it has recrystallized into textures similar to the clasts, so that clast margins are often difficult to discern. A wavy, weak to moderately developed foliation wraps around many larger grains, and is defined mainly by chlorite.

Alteration and Veining

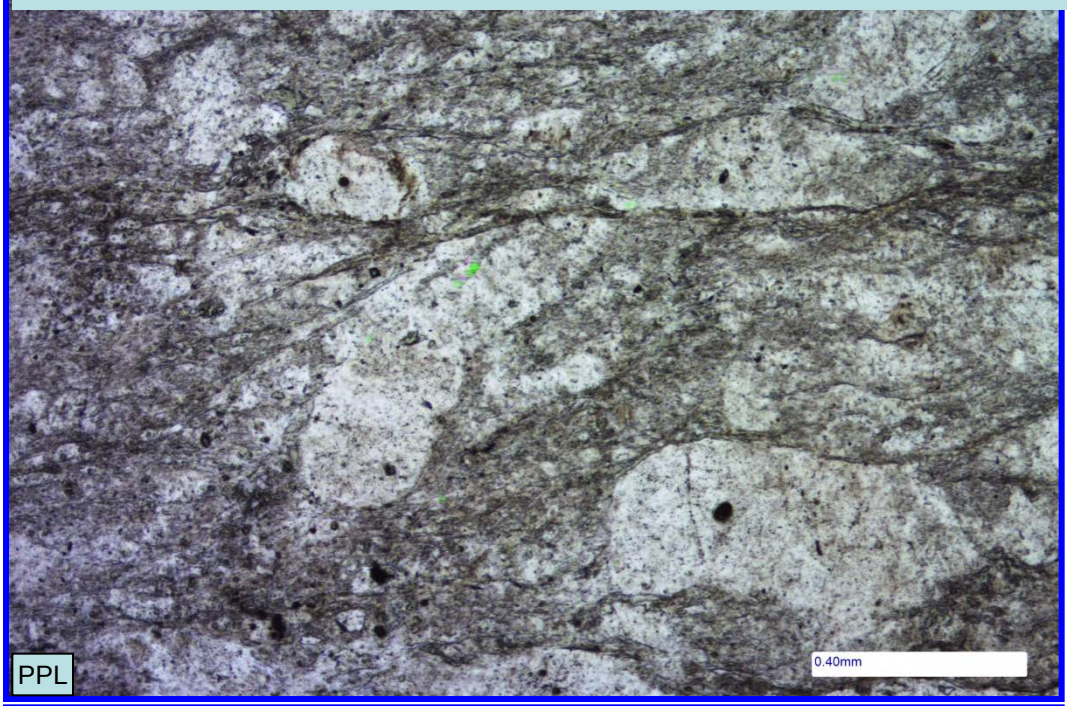
This porous, reactive rock shows a pervasive quartz-dominated alteration assemblage with subordinate chlorite and sericite, and minor fine-grained pyrite. In places, the pyrite forms small trains and aggregates, but it makes up far less than 1modal% of the sample.

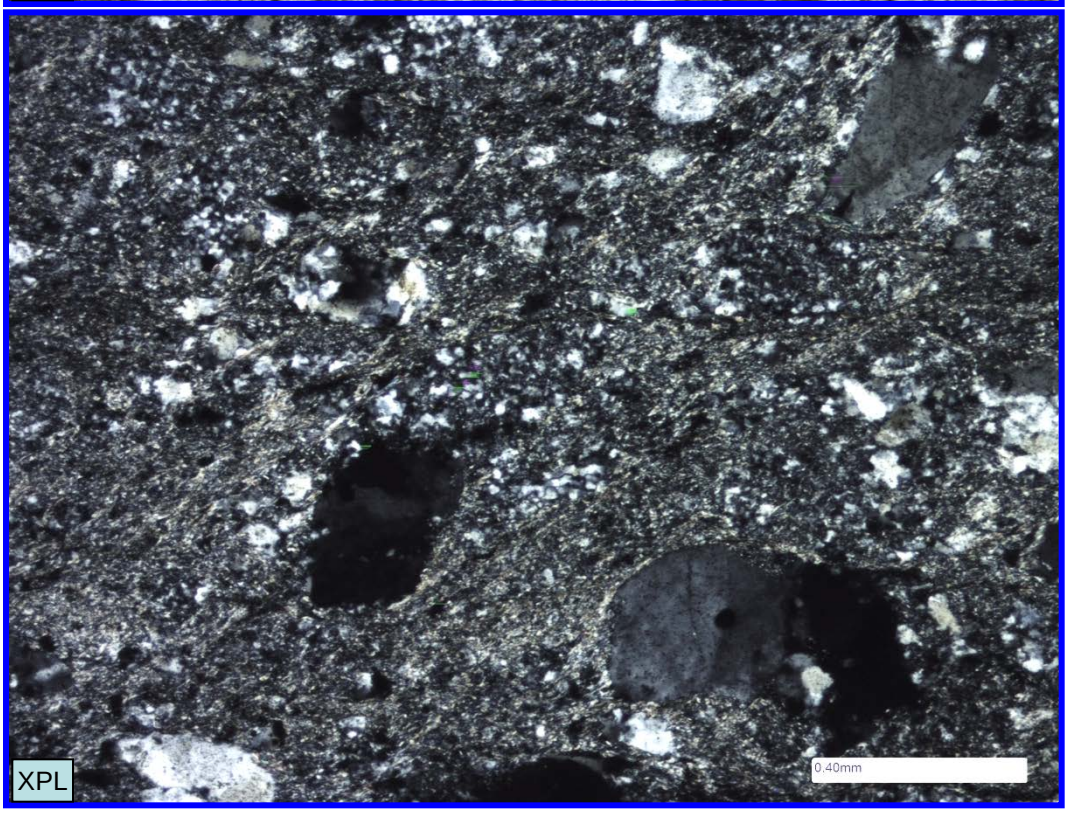
Other Comments

This volcaniclastic rock lacks the brown carbonate common in the preceding three samples, and the alteration assemblage is silica-chlorite dominated. The abundant quartz within clasts as phenocrysts, and as small detrital grains in the matrix, suggests that the provenance area was Tyndall Group and correlates, not Central Volcanic Complex rocks.

SAMPLE NUMBER 16306

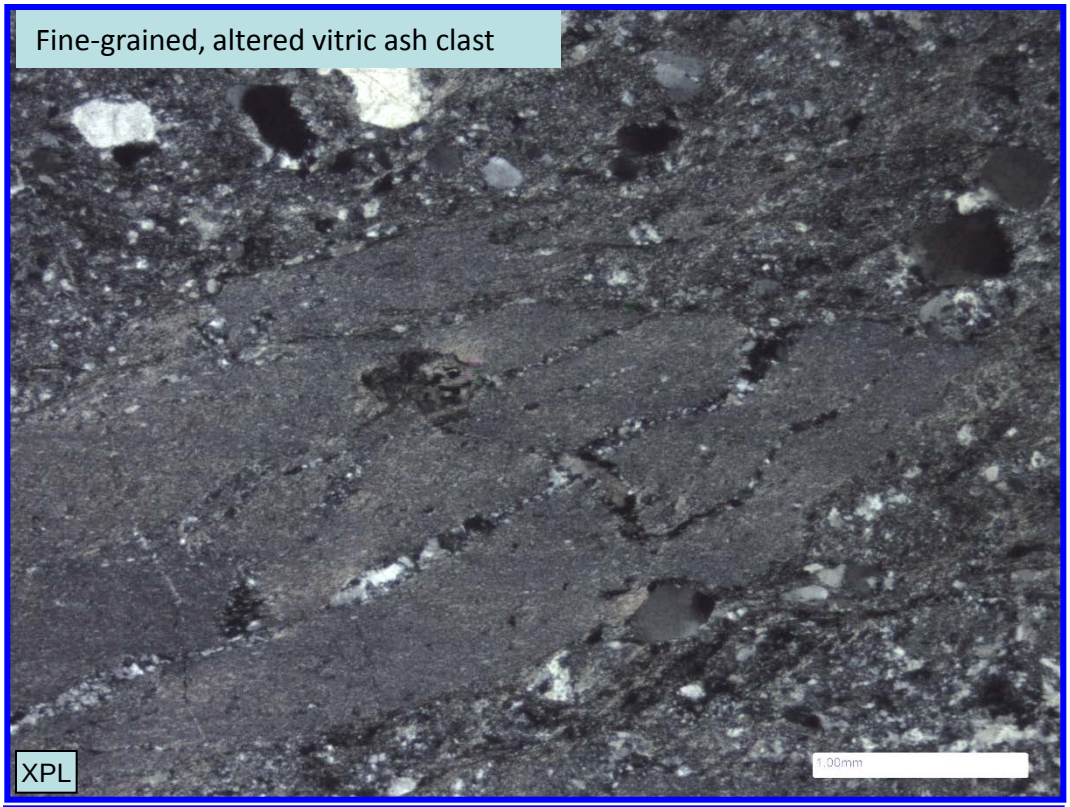
Quartz phenocryst debris in volcaniclastic sandstone with strongly altered formerly glassy matrix



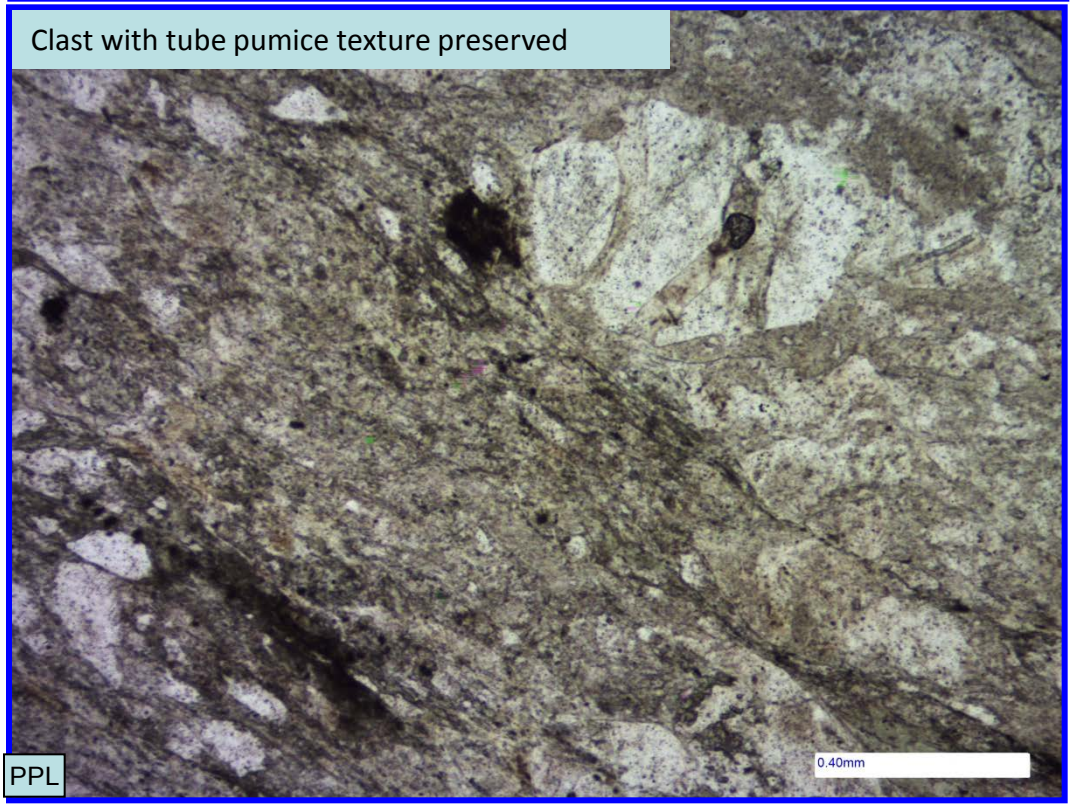


SAMPLE NUMBER 16306

Fine-grained, altered vitric ash clast



Clast with tube pumice texture preserved



SAMPLE NUMBER 16307

PETROGRAPHIC DESCRIPTION

This is a volcaniclastic coarse sandstone to granule conglomerate with clasts to ~1cm across in which the clast population is dominated by quartz- and plagioclase-phyric formerly glassy felsic lavas, with quartz, plagioclase and comminuted pumice/vitric ash making up the matrix. The alteration assemblage is quartz-chlorite-sericite-minor pyrite, representing a weak to moderate hydrothermal assemblage.

SAMPLE NUMBER 16307

THIN SECTION DESCRIPTION

This is texturally well preserved volcaniclastic coarse sandstone to granule conglomerate with excellent textural preservation, including many well preserved tube pumice clasts. The detritus making up this rock is entirely felsic in nature, and includes quartz-phyric and plagioclase-phyric felsic lavas, quartz+plagioclase-phyric felsic lavas, aphyric pumice clasts, and abundant detrital quartz and especially plagioclase phenocrysts debris. The lava clasts were clearly mainly glassy, with variable amounts (<10modal%) of quartz- or quartz+plagioclase phenocrysts. In some lava fragments, the common sub-mm plagioclase phenocrysts occur in multi-crystal clots of albitized, lightly sericitized grains. Quartz phenocrysts are less abundant than plagioclase and are mainly sub-mm, rather rounded and reacted grains with strong embayments. Matrix in this sandstone includes broken quartz and plagioclase phenocryst debris, and abundant vitric ash that has devitrified, then crystallized to a variably textured quartzose intergrowth peppered with sericite and chlorite, and difficult to discern from the groundmass of the clasts. There appear to have been no mafic phenocrysts in these lava clasts.

Alteration and Veining

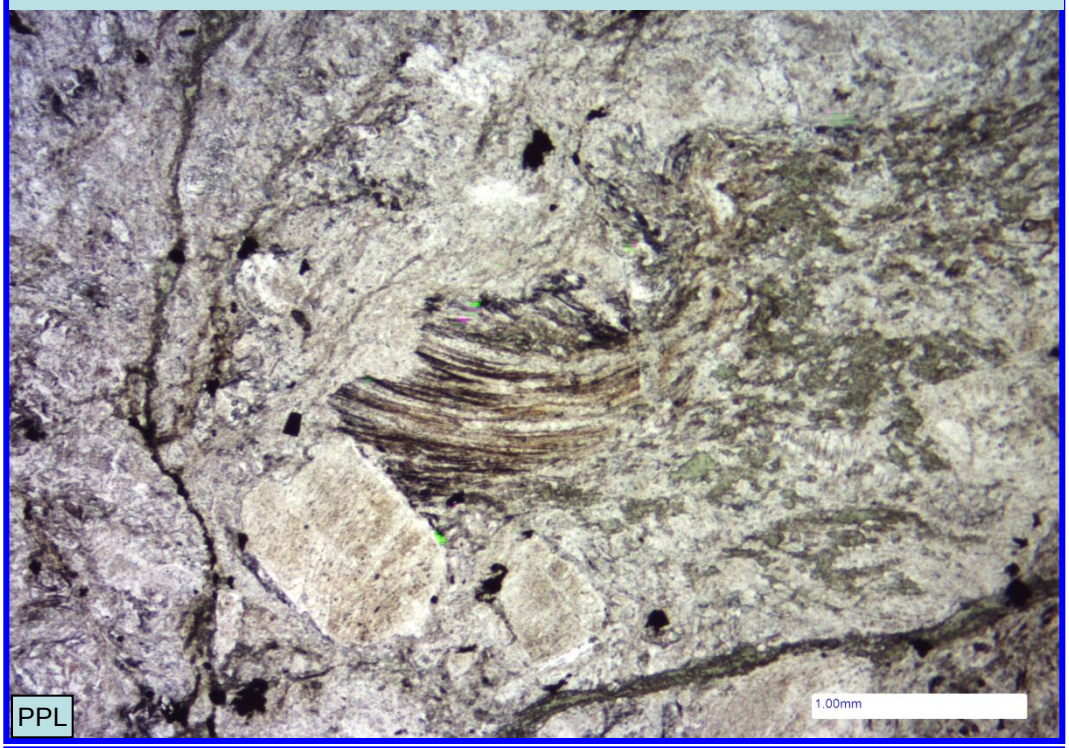
Despite the food textural preservation in this sample, it has suffered moderate quartz+chlorite+sericite+minor pyrite hydrothermal alteration. Chlorite and sericite both tend to be more abundant in the matrix of this rock. Minor pale carbonate also occurs in a few veinlets and patches, often overprinting chlorite.

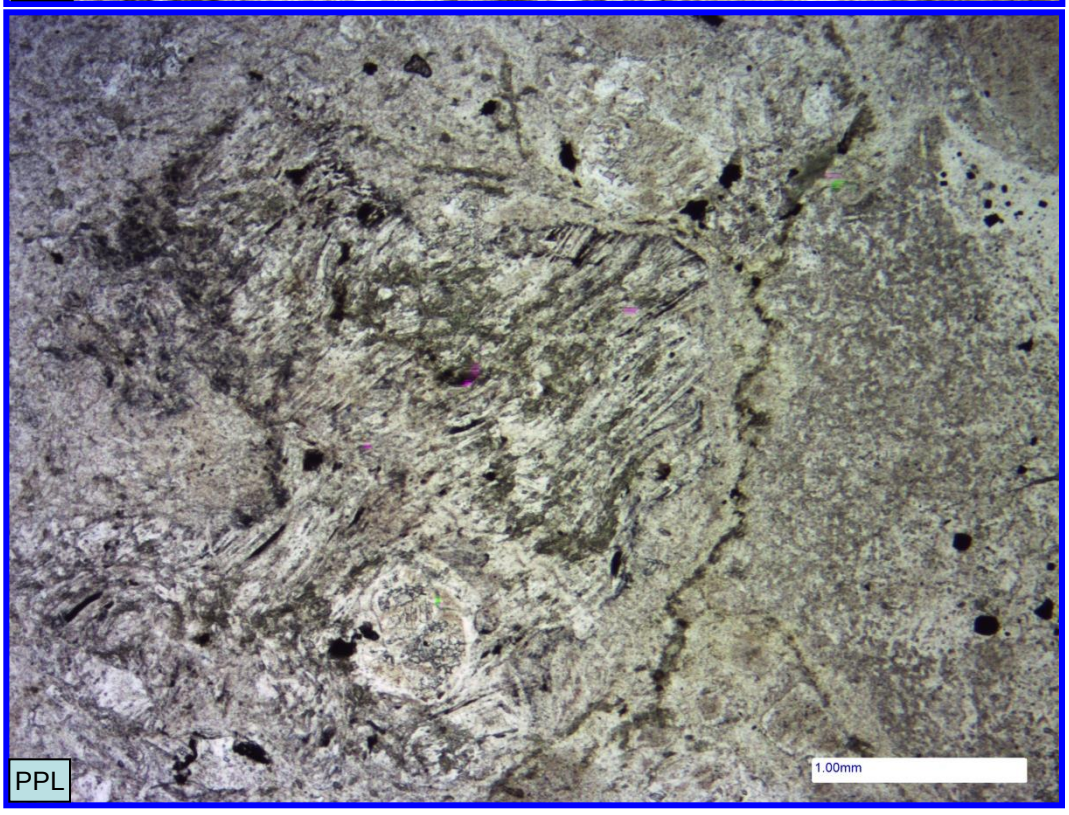
Other Comments

This pumice fragment-bearing volcaniclastic sandstone to granule conglomerate is clearly derived from a proximal felsic volcanic provenance in which explosive quartz+plagioclase-phyric lavas were the dominant component. The common quartz phenocrysts and phenocryst debris suggest that the rocks better correlate with the Tyndall Group and correlates than with the Central Volcanic Complex.

SAMPLE NUMBER 16307

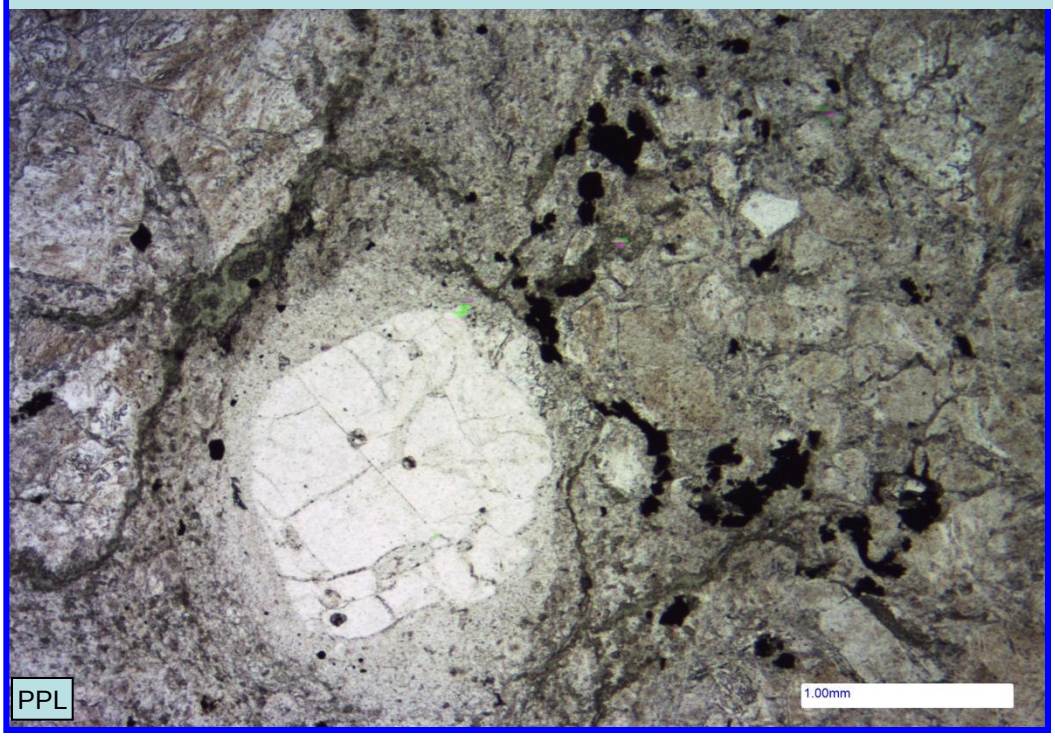
Pumice clasts in felsic volcaniclastic sandstone

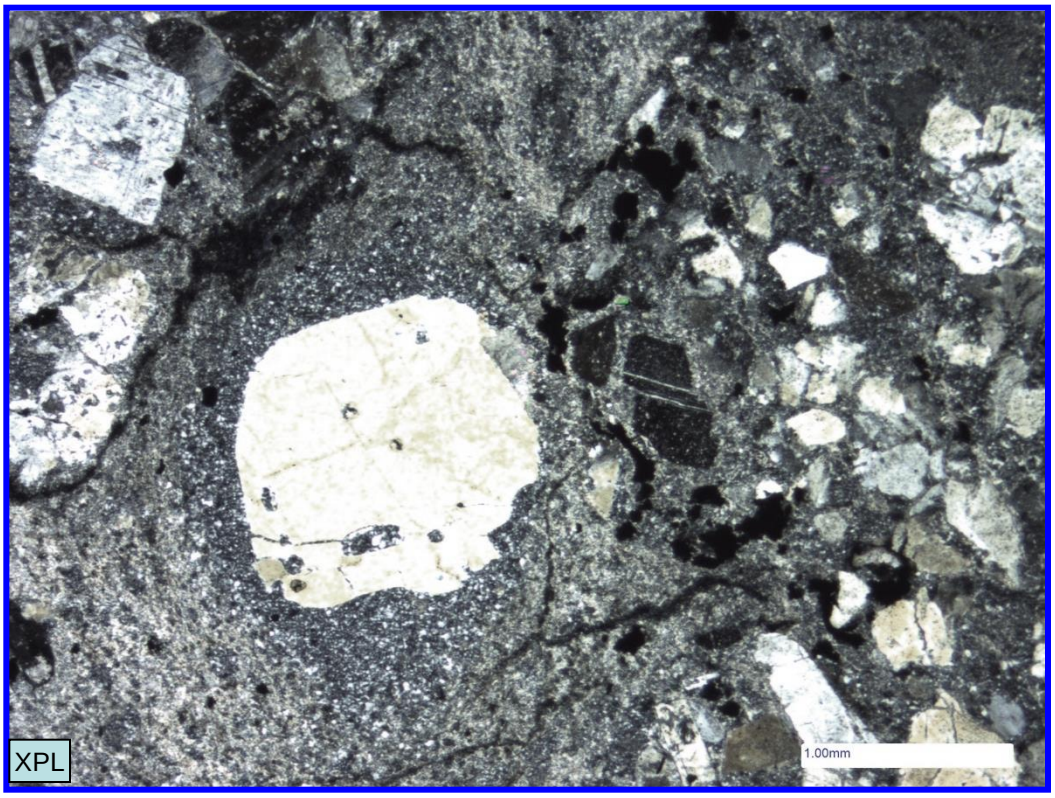




SAMPLE NUMBER 16307

Resorbed quartz, broken plagioclase phenocrysts, & local disseminated pyrite





SAMPLE NUMBER 16308

PETROGRAPHIC DESCRIPTION

This is another coarse, volcaniclastic sandstone to granule conglomerate with pronounced petrographic similarities to the preceding sample from 284.95m depth in this drillhole, and it is dominated by formerly glassy to pumiceous clasts of felsic lava with plagioclase, or plagioclase+quartz phenocrysts. Alteration is moderately quartz-chlorite-sericite.

SAMPLE NUMBER 16308

THIN SECTION DESCRIPTION

This is a weakly hydrothermally altered, poorly sorted, volcaniclastic coarse sandstone to granule conglomerate not very different petrographically from the preceding sample apart from slight foliation development in this rock. Clasts were mainly glassy, commonly pumiceous, and the matrix was also dominated by comminuted glassy chips and vitric ash, so that it is difficult to identify clast margins in the similarly altered matrix. The clasts are up to almost 1cm across, with most being plagioclase- or plagioclase+quartz-phyric felsic lavas, all of which appear to have had glassy groundmasses. In contrast to the entire phenocrysts within lava clasts, many detrital crystals in the matrix are broken and sometimes disaggregated. Tube pumice textures are occasionally preserved, and a significant proportion of the clasts were probably pumiceous. The weak foliation reflects flattening of pumice clasts and sets of discontinuous and wavy fractures that wrap around many clasts, and are marked by chlorite.

Alteration and Veining

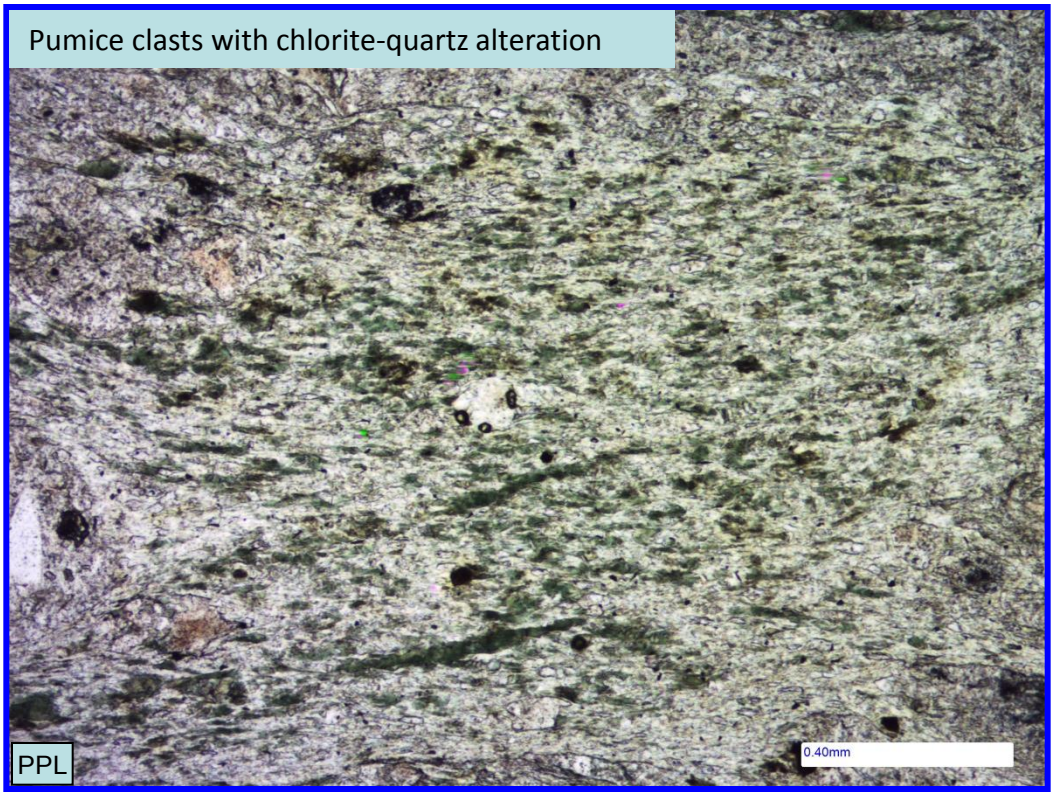
Alteration in this sample is dominated by patchy chlorite-quartz, with subordinate but not uncommon fine-grained sericite, mainly in the matrix. Most plagioclase crystals, whether detrital in the matrix or as phenocrysts in lava/pumice clasts, show patchy pale brown alteration probably attributable to submicroscopic hematite.

Other Comments

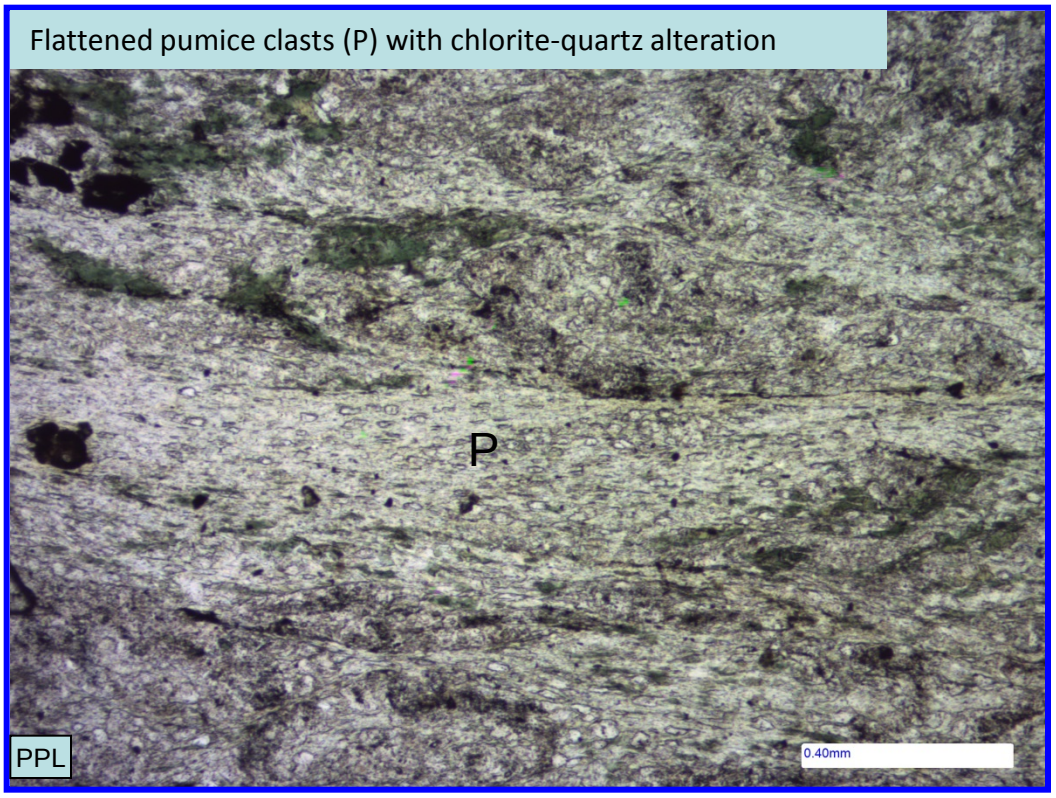
The strong petrographic similarity between this sample and the preceding rock from 284.95m depth in this drillhole suggest that they are likely from the same unit.

SAMPLE NUMBER 16308

Pumice clasts with chlorite-quartz alteration

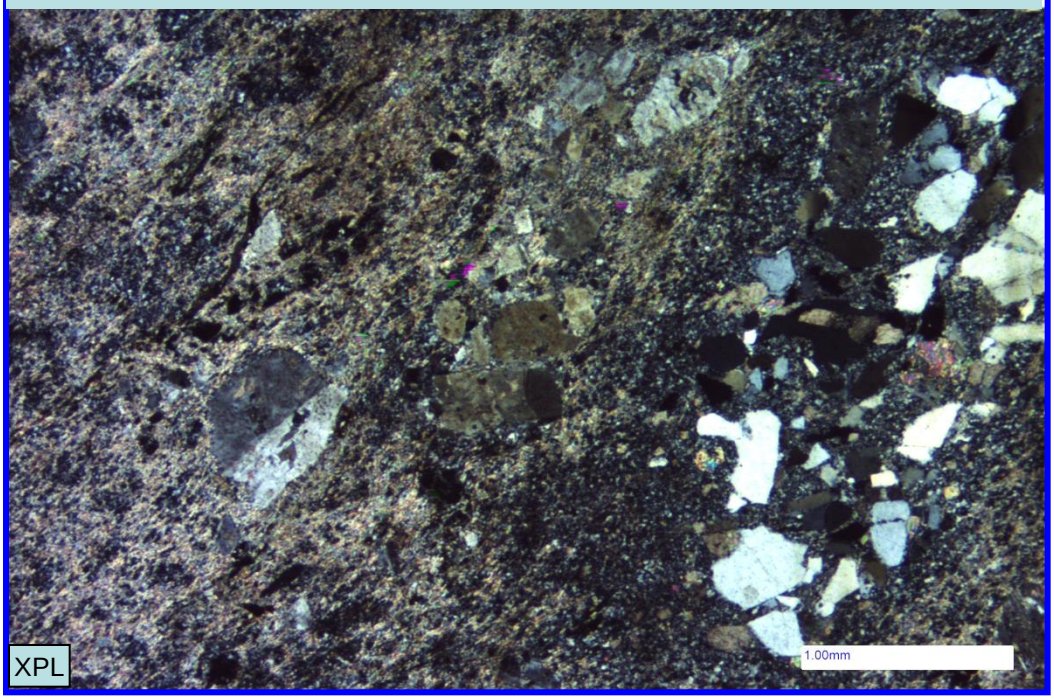


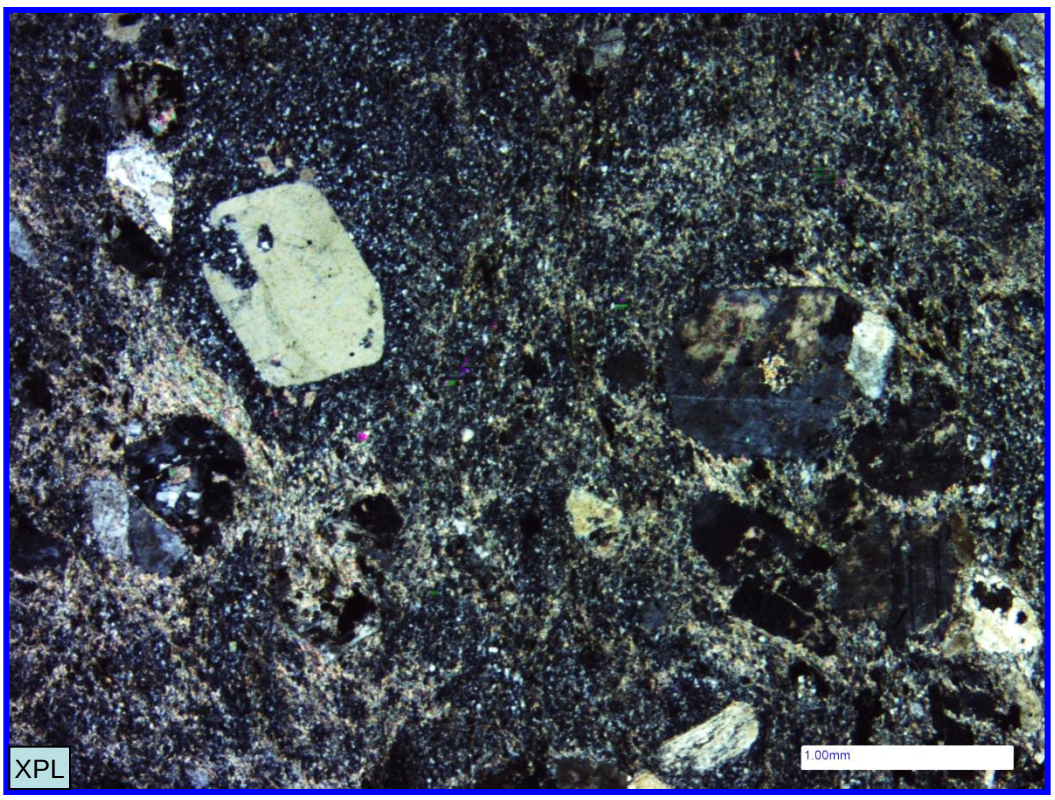
Flattened pumice clasts (P) with chlorite-quartz alteration



SAMPLE NUMBER 16308

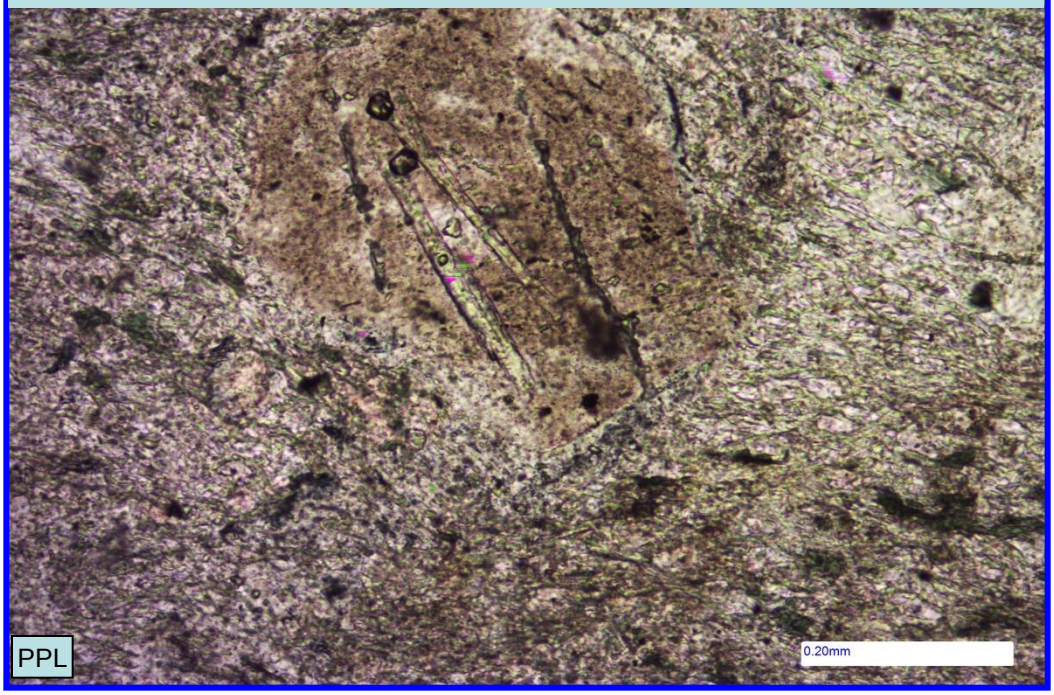
Broken quartz phenocrystal fragments and albitized plagioclase phenocrysts with patchy sericite alteration of matrix.



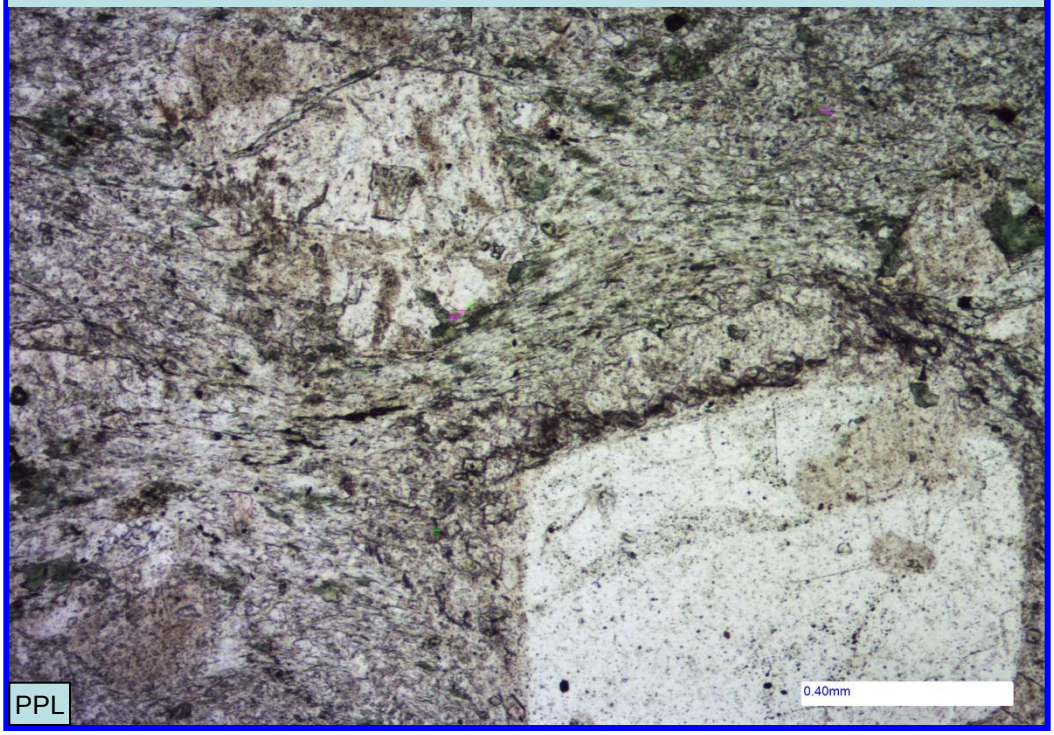


SAMPLE NUMBER 16308

Small plagioclase phenocryst showing brown, submicroscopic alteration and apatite needle inclusions



Detrital quartz and plagioclase phenocrysts , and small pumice fragments



SAMPLE NUMBER 16309

PETROGRAPHIC DESCRIPTION

This is a weakly vesicular plagioclase+olivine-basalt dyke, approaching a dolerite texturally, with plagioclase, pink Ti-augite and both Ti-magnetite and ilmenite in the groundmass. Alteration is weak chlorite-carbonate-sericite. This rock is very close petrographically to, although better preserved than, the mafic dyke from 266.15m depth in this hole (#16305), and both are probably transitional alkaline basalts, of possible Tertiary age.

SAMPLE NUMBER 16309

THIN SECTION DESCRIPTION

This is a very well preserved basaltic dyke, transitional to a dolerite texturally, and consisting of around 10-15modal% of well formed, often large plagioclase phenocrysts and 1-2modal% of altered olivine phenocrysts, in a medium-grained holocrystalline groundmass. The texture and shape/size of the plagioclase phenocrysts, and nature of the groundmass opaques, are very reminiscent of those in slightly finer-grained and far more altered dyke sample 16305 from 266.15m depth in this hole. Plagioclase phenocrysts are quite blocky and to 6mm long, with patchy but mainly light sericite alteration and weak core to rim compositional zoning. Occasional former olivine phenocrysts to 2mm long are entirely replaced by chlorite and brown carbonate.

The groundmass shows a doleritic texture defined by plagioclase laths mainly around 1mm long, with interstitial notably pinkish Ti-augite, and two distinct opaque phases, one equant (probably Ti-magnetite), the other bladed and elongate (probably ilmenite). This rock also shows scattered spherical vesicles to about 2mm across now filled by carbonate and chlorite.

Alteration and Veining

The alteration assemblage in this rock is very low-T, with chlorite, sericite and spotty brown carbonate as the key phases.

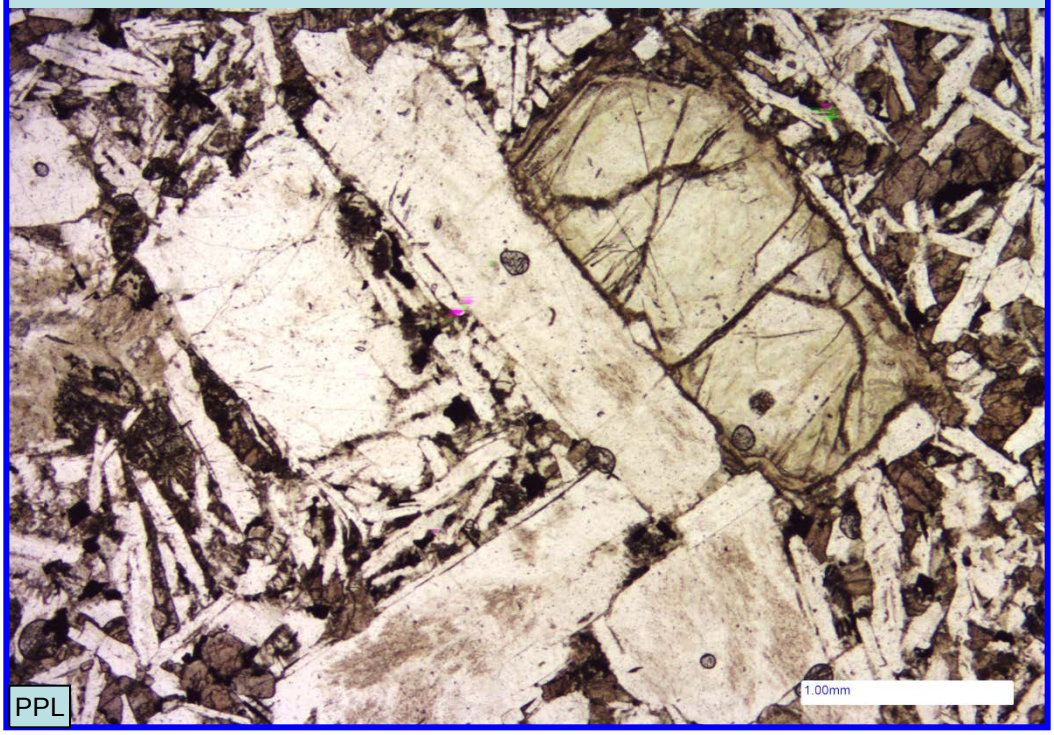
Other Comments

This rock has a very ‘transitional alkaline’ flavour petrographically, with the distinctively pink augite and two opaque phases, plus olivine phenocrysts. It is not a Jurassic-type dolerite, and not like the Hellyer-type basalts/dolerites, nor basalts from S Henty. The Henty Dykes were not olivine-phyric and don’t show pink Ti-augite. On this basis, the dyke may be Tertiary in age.

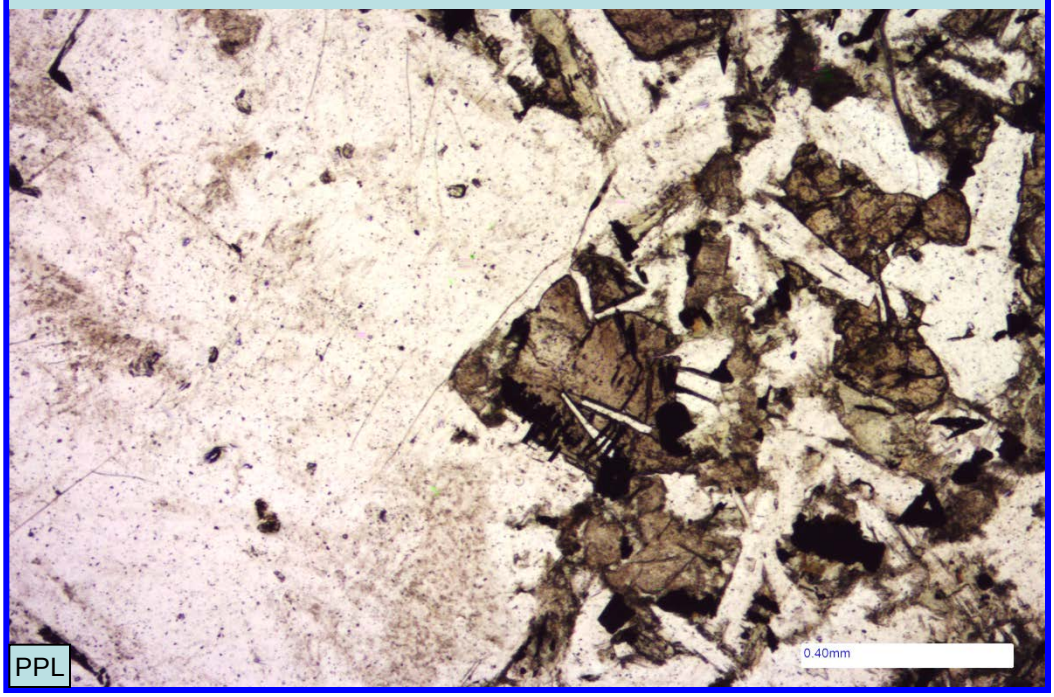
There is little doubt that this is a fresher, slightly more coarse-grained version of the rock sampled as 16305 from 266.15m depth in this drillhole. The two opaques, distinctive blocky plagioclases, and scattered small, carbonate-chlorite-filled vesicles, all argue strongly that these dykes represent the same magma type.

SAMPLE NUMBER 16309

Plagioclase & chloritized olivine phenocrysts in holocrystalline groundmass



Plagioclase phenocryst in holocrystalline groundmass showing pink Ti-augite and two types of opaques, equant Ti-magnetite & elongate bladed ilmenite.



SAMPLE NUMBER 16310

PETROGRAPHIC DESCRIPTION

This is a plagioclase+quartz+biotite+FeTi oxide-phyric dacitic volcanic in which the broken phenocrysts suggest an ash flow origin rather than a coherent lava. It shows strong and pervasive khaki biotite alteration, with patchy fine-grained secondary magnetite, forming a distinctive alteration assemblage resembling porphyry Cu-Au-style potassic alteration, or alternatively, the contact metamorphic effects of a nearby granitic intrusion.

SAMPLE NUMBER 16310

THIN SECTION DESCRIPTION

This is a plagioclase+quartz+biotite+FeTi oxide-phyric dacitic rock with an even-textured fine-grained groundmass suggesting a volcanic origin, but in which many of the phenocrysts are broken and fragmentary, perhaps indicating an origin from a pyroclastic flow rather than a coherent lava. Plagioclase phenocrysts vary from euhedral to rather rounded, and make up about 15-20modal% of this rock, with most being 1-2mm long. They are albitized, but show variable overprinting by rather coarse sericite. Quartz phenocrysts (2-4modal%) are broken and irregular shapes mainly smaller than 1mm across. Former biotite phenocrysts (3-5modal%) are chloritized and mainly 1-2mm across, and typically speckled with small leucoxene granules and common rutile needles picking up Ti released during chloritization. Common (3-5modal%) of small, altered FeTi oxides are present, and a distinctive feature of this rock is the common and relatively large zircon crystals (microphenocrysts).

Where least altered, the groundmass of this rock is a very fine-grained quartzo-feldspathic intergrowth peppered with tiny khaki biotite crystals and subordinate chlorite and sericite. There is no trace of any vitroclastic texture (e.g., shard shapes) in the groundmass.

Alteration and Veining

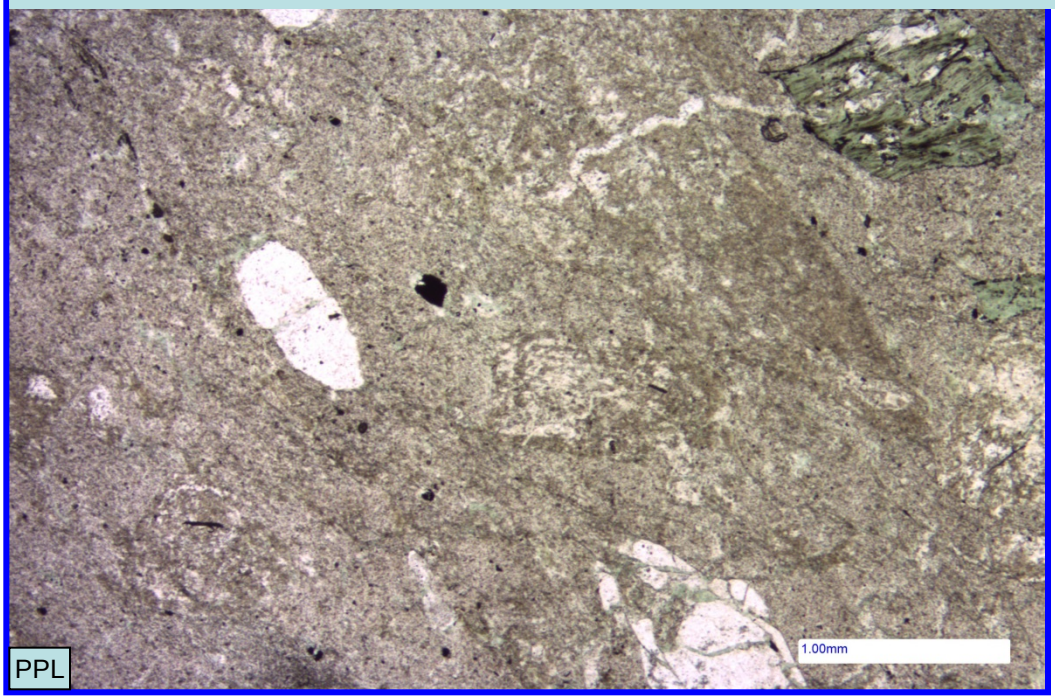
This rock contains pervasive fine-grained biotite alteration of the groundmass, and common trails of chlorite, along with variably intense but generally moderate development of disseminated, fine-grained magnetite.

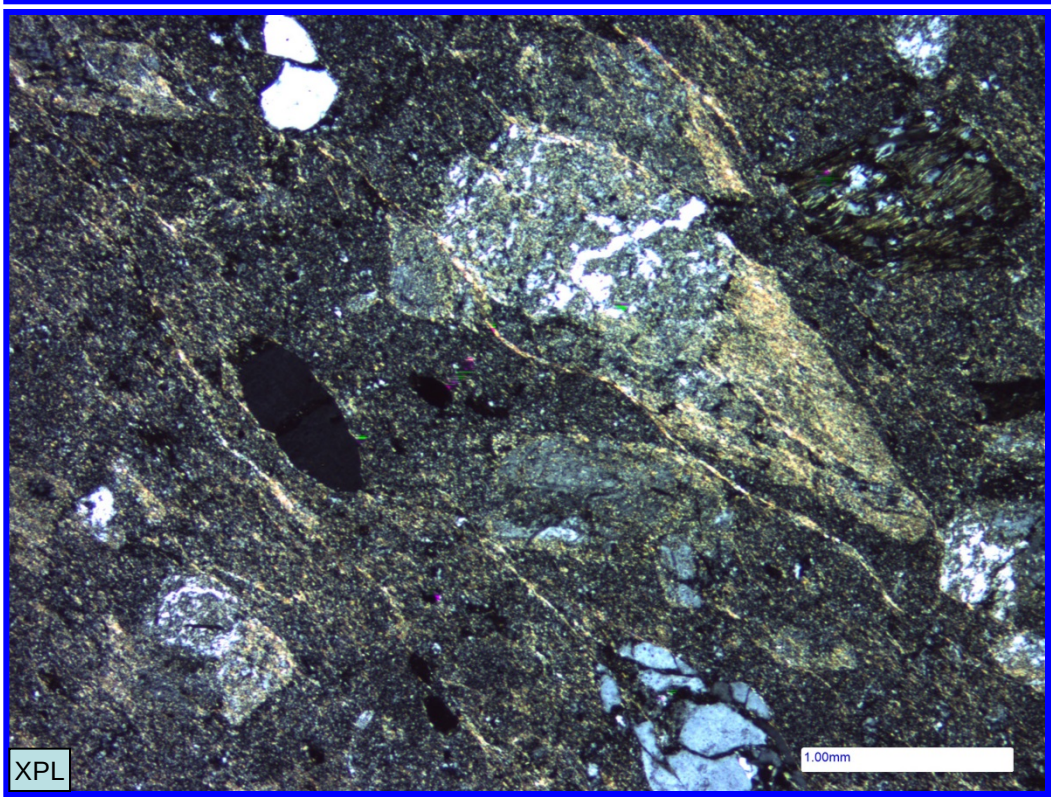
Other Comments

The relatively abundant chloritized biotite and common plagioclase in this rock contrast with the typical Tyndall Group mafic-poor rhyolites, suggesting that this is more likely to be a dacite composition. Although no vitroclastic textures are evident, the broken phenocrysts suggest that the rock may have formed from an ash flow associated with an explosive eruption. The distinctive khaki biotite-magnetite-chlorite alteration of this rock is very reminiscent of potassic alteration associated with porphyry Cu-Au deposits, although the amount of alteration-related Kspar cannot be determined without staining. An alternative origin for the widespread secondary biotite may be contact metamorphism from a significant nearby granitic body.

SAMPLE NUMBER 16310

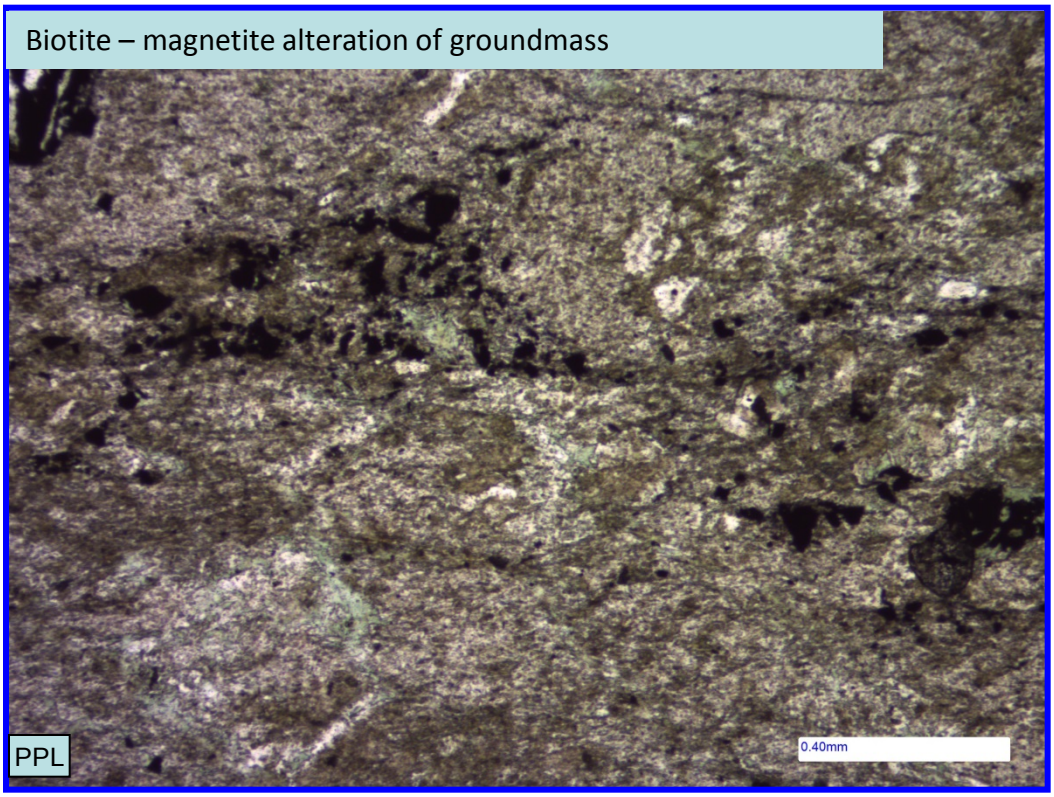
Broken and resorbed quartz and (sericitized) plagioclase phenocrysts , and chloritized biotite phenocryst (top right)





SAMPLE NUMBER 16310

Biotite – magnetite alteration of groundmass



Chloritized biotite with tiny rutile needles, and fine-grained, secondary khaki biotite in adjacent groundmass