Petrological description and comment concerning 12 samples from the Winnecke Granophyre, Northern Territory.

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INTRODUCTION.

The samples were submitted by Mr Brad Drabsch, Senior Exploration Geologist, Independence Group N.L., with a brief for general description and comment.

OVERVIEW.

The twelve rocks are all technically granite in composition, with dominant quartz and alkali feldspar. They range from (Figures 1-25), relatively coarse grained (171361) through medium grained (171380, 171381, 171404) ranging down to medium/fine (171386, 171393, 171394, 171400) and fine grained (171364, 171369, 171395, 171401). (NB. An occasional larger grain may occur in the fine grained cases – 171401). (Figures 3, 5, 17, 22). All of the granite exhibit graphic/granophyric textures (K-feldspar – quartz intergrowths) to varying degrees, ranging from minor (171361) in coarser variants to rampant in medium to fine grained examples (Figure 8). Specimen 171395 (Figures 17-19) exhibits major textural variation in a fine grained igneous rock involving granophyric rich zones in the finest components and less granophyric examples in coarser regions (a dyke/sill-fractionating is suspected).

One suspected of example of Rapakivi texture was noted (obscured by alteration, 171380) and granophyric material nucleating around both K-spar and plagioclase phenocrysts is common. Granophyric textures are well developed in the matrix component of the porphyritic rocks. The porphyritic component is rather variable (say 10-60%) and in some rocks the term seriate may be more appropriate. The porphyritic components consist of:

1. Quartz-exhibiting classic resorption textures, with rounded outlines and cracked grains (Figure 14).
2. K-feldspar – ovoid probably resorbed, finely perthitic (usually altered – sericite/clay). (Figures 12, 21).
3. Plagioclase feldspar – often euhedral but always very altered (sericitised-Figure 10).

The colours range from pink through creamy-grey to white.

The reasons for colour in granites are often obscure, but it is clear here that most of the paler colours have resulted from intense sericite and/or clay alteration (171369, 171386, and 171393). The red colourations are due to fine heamatite contained within the samples. The relationship between these three alteration styles is unclear, although a sequence heamatite (early) followed by more obvious sericite and later clay seems probable. The latter two can be related to fine veinlets in some of the rocks. (sericite – 171380, 171400, 171401, 170404 and clay – 171493, 171494).

Propylitic alteration was noted in 171361 and quartz veins in 171395, 171401.

The rocks are relatively leucocratic, although original biotite has been visually obscured via sericite/chlorite/TiO_2 alteration (Figure 6). Biotite 1-3% was suspected as an original component of most rocks, with primary muscovite suspected in 171395 and 171404 (Figure 23).

Tourmaline is present in 171395 and a trace of fluorite in 171364. The rocks are thus suspected to be quartz-feldspar biotite and quartz-feldspar biotite/muscovite granites.

Accessory minerals include zircon and apatite and possibly minor allanite? The rocks were only examined in ordinary light, but no obvious magnetite crystals were noted . The TiO_2 in the biotite has derived from ilmenite (ex-ilmentite shapes). Some random TiO_2 blebs (alteration) suggest ilmenite. Ilmenite series granites are suspected.

Textural implications.

It is well accepted that granophyric intergrowths of quartz and K-feldspar result from simultaneous growth caused by a kinetic phenomenon in the boundary layer adjacent to the interface of the growing feldspar and is promoted by undercooling (Lenharo et al, 2003, Fenn 1986).

In the situation represented by the Winnecke samples, the crystallization sequence suggests early formation of quartz, K-feldspar, and plagioclase crystals as phenocrysts. This is followed by variable crystallization of a finer matrix, involving mixtures of normal and granophyric materials. The latter seem better represented in finer grained examples and form as mantles to both the K-feldspar and plagioclase crystals, as well as isolated complex grains. The resorption style of the quartz phenocrysts suggests a significant change in conditions.

One interpretation is to suggest initial early crystallization of phenocrysts (+ melt) followed by ascent of melt + crystals with late stages of crystallization (matrix) due to pressure release and/or fluid phase separation. Variations on this theme would account for different phenocryst/matrix proportions and variable developments of granophyrite ± fine grained crystallization in the matrix (Figures 10, 16, 18, 19) components. The suspected Rapakivi texture could be explained via a similar process.

The samples contain enough similarities to suggest that they all belong to a single suite, and it could be anticipated that mapping would establish a fractionating services of intrusives, commencing with bulk areas of materials such as 171361, moving through successively smaller amounts of fine-medium grained granite, with late stage small fine grained intrusions ± sills and dykes. Many granitic suites of this style are closely (although not uniquely) genetically associated with late stage generation of tin/tungsten ore fluids, which normally cluster around the apical zones of the smaller late stage stocks. The presence of rare fluorite and tourmaline 9171395), add further evidence of magmatic specialization and the microveinlets ± dominant sericite alteration illustrate paragenetic fluid release (possibly, early quartz, through sericite to argillic infill/alteration.

The most likely mineralization styles are quartz-cassiterite±sericite, either as veins/veinlets or apical dissemination greisen styles. Both styles can generate significant alluvial concentrations, although payable hard rock concentrations are rare.

At this stage the author would support the view, that the granophyric granite suite is related genetically to the recent discovery of cassiterite (B Drabsch – pers comm.), and a new? tinfield seems probable.

REFERENCES.

Lenharo, S. L. R., Pollard, P. J., and Bom, H., 2003. Petrology and textural evaluation of granites associated with tin and rare-metals mineralisation at the Pitinga mine, Amazonus, Brazil. Lithos, v66, Issue 1-2, pp37-61.

Fenn, P.M., 1986. On the origin of graphic granite. American Mineralogist, v71, pp325-330.

APPENDIX – PETROLOGICAL DESCRIPTIONS.

Specimens.

171361
171364
171369
171380
171381
171386
171393
171394
171395
171400
171401
171404

Specimen 171361 (Figures 1-2). Coarse grained, porphyritic – granophyric granite (sericitic and propylitic alteration).

Hand specimen.

Porphyritic granite with phenocrysts at the 1.0cm scale, within a medium grained granitic matrix at the 1-3mm scale.

The porphyritic component consists of:

(a) Large ovoid K-feldspar (variably pink – white) with inclusions of sericitised (grey-green plagioclase.
(b) Large sericitised angular crystals of grey green (sericitised) plagioclase.
(c) Dark ovoid quartz grains 4-5mm scale.

Both (a) and (b) above are surrounded by narrow (1.0m) zones of graphic textured K-spar – quartz.

The matrix is composed of quartz, K-spar, (say equal proportions at 45%) and minor grey green sericite (ex-plagioclase). Minor hints of graphic texture.

Petrology.

The larger K-feldspars contain inclusions of totally clouded crystals (presumably ex-plagioclase at 500-100 microns and exhibit simple twinning. They are associated with quartz-K-feldspar intergrowths (?granophyric) around the outer rims. They range up to 1.0cm. The larger quartz grains are up to 4.0mm and exhibit numerous cracks (resorbed?). Not strained.

The matrix materials are K-spar, quartz and sericite. The quartz ranges from crystalline (100-200 micron) to small blebs associated with K-spar (graphic style).

The plagioclase is much altered (now just sericite/clay) with occasional inclusions of quartz and muscovite (20-50 micron). Some good crystal shapes at around 2.0mm scale (equant to rounded). Considerable epidote and chlorite accompany the sericite. Variations in brown/clay-like colours suggest originally zoning.

Some ex-micas are present up to 2.0mm in length. These are recognisable via their shapes, although now altered to chlorite±sericite±dark opaques (suspected TiO_2 – ex-ilmenite?). The mica was probably biotite originally (based on TiO_2 shapes/content). Trace amounts of zircon and apatite are present (50-100 micron).

The phenocryst components constitute some 40-50% of the rock. Overall rock composition is around (visual estimate).

Quartz 40-50%
K-feldspar 30-40%
Plagioclase 30-40%

Biotite? 3-4%

Numerous (100 micron) cracks contain combinations of sericite±muscovite±opaques, ?TiO_2.

Interpretation.

The large ovoid K-spars and plagioclase surrounded by graphic textured (granophyric) rims are reminiscent of Rapakivi style textures, but with an additional graphic texture. Rapakivi style textures involve large ovoid feldspars with rims of smaller feldspar crystals.

There seem to be two separate events here, involving large phenocrysts (with resorption textures) and rapid eutectic rim formation (granophyrite), followed by later medium – coarse grained matrix precipitation.

Later alteration involves both sericitic (±TiO_2) and later chlorite/epidote stages (effectively "phyllic" and "propylitic". The plagioclase and micas are totally altered.

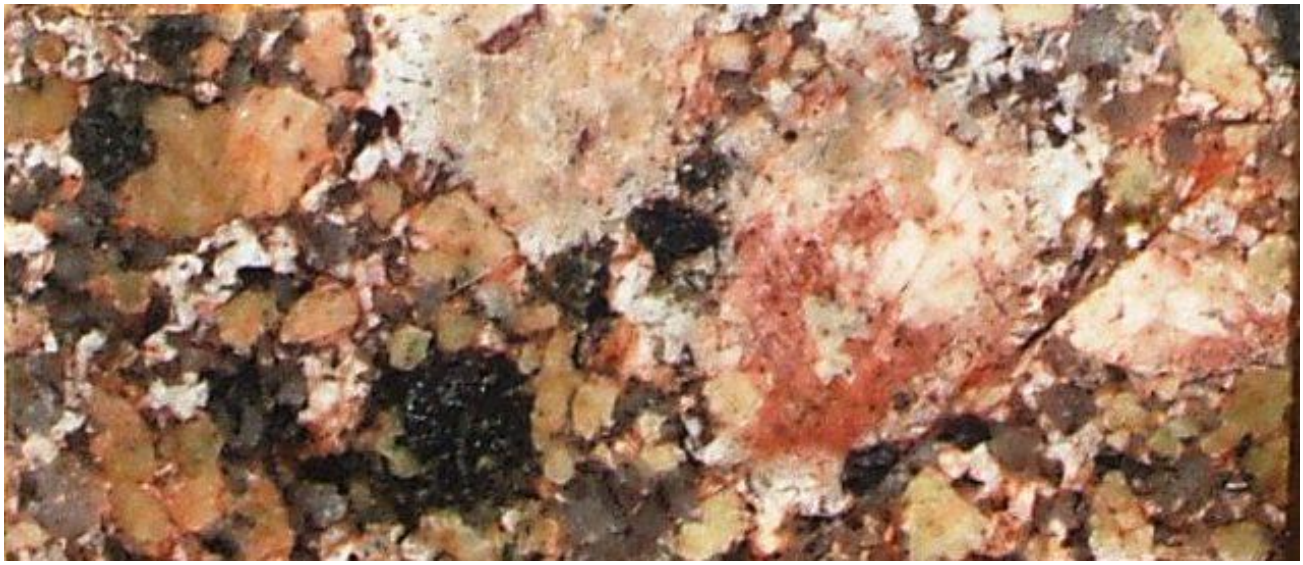

Figure 1. Specimen 171361. Coarse grained porphyritic – granophyric granite. Note- K-spar (white/red) and plagioclase (grey green) with graphic rims. Rock slab. Width of frame (WOF) c5.0cm.

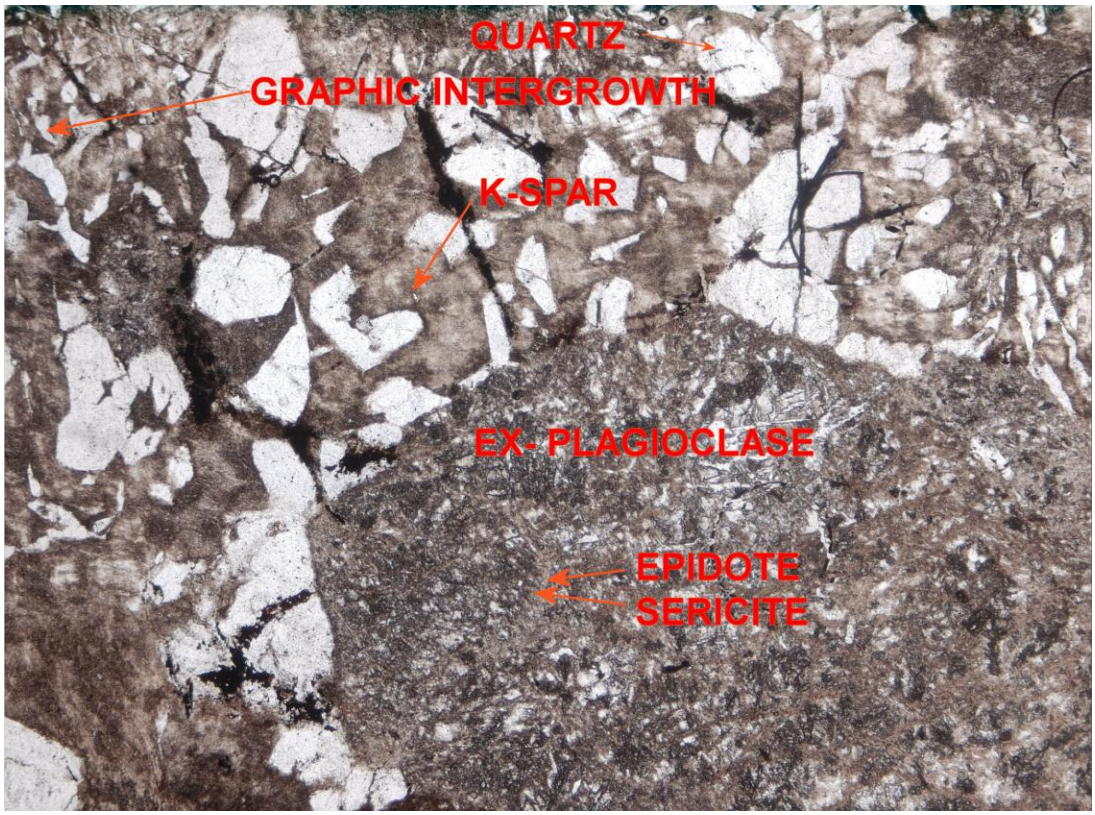

Figure 2. **Specimen 171361. Altered plagioclase phenocryst, with graphic K-spar/quartz rim. Thin section – ordinary light. WOF c5.6mm.**

Specimen 171364 (Figures 3-4). Fine grained porphyritic – slightly granophyric granite (sericite, clay altered).

Hand specimen.

Pink, leucocratic, fine grained (quartz – feldspar 1.0mm grain size) with one ovoid ?phenocryst (patch of fine graphic intergrowth 1.0cm). 2-3 quartz veins at 2.0mm width.

Petrology.

Quartz, K-feldspar, plagioclase.
Quartz – ranges from enhedral to subhedral at around 500 microns, with smaller blebs inside some K-feldspars (graphic texture).
K-feldspar – 300-600 microns, many with quartz blebs inside. Altered – cloudy ± heamatite, sericite, clay.
Plagioclase – 300 micron, good crystal shapes, very cloudy, but slightly clearer than altered K-spar.
Mica – 1.0% - 1.0m to 500 micron length±chlorite,TiO2, heamatite.

Overall composition - Quartz – 40-50%
K-feldspar – 30-40%
Plagioclase – 30-40%
Mica – 1-2% (? biotite)

Veins

Quartz – 300 micron wide ± TiO_2 ±? fluorite, ± clay.

Comment.

Similar to 171361 – but finer grained. Very altered.

Figure 3. **Specimen 171364. Fine grained, mildly porphyritic (± granophyric) granite, with quartz veins. Rock slab. WOF c5.0cm.**

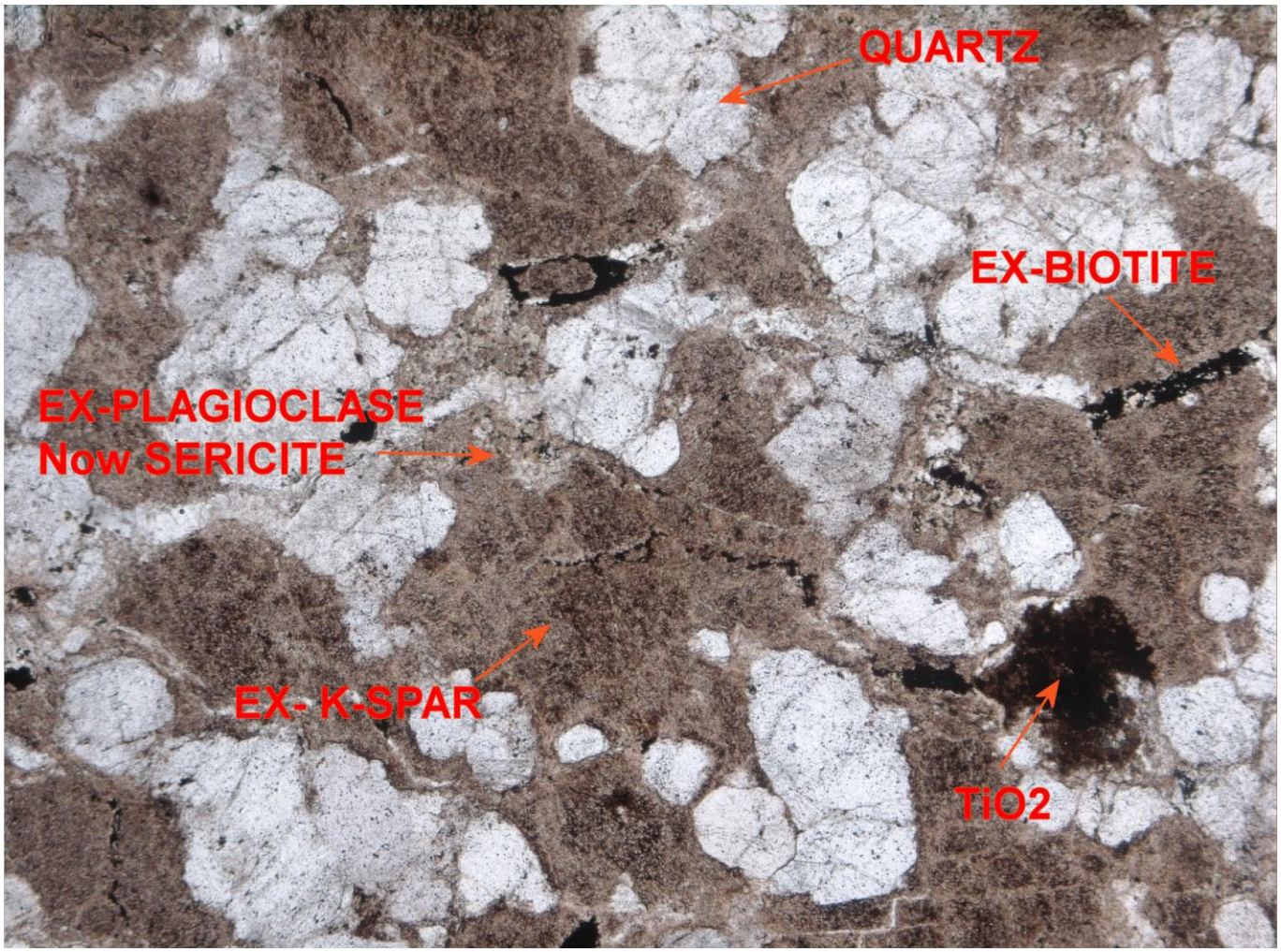

Figure 4. **Specimen 171364. Granophyric development is minor in this specimen and this slide illustrates the typical crystallisation texture. Thin section – OL – WOF c5.6mm.**

Specimen 171369 (Figures 5-6). Fine grained, slightly granophyric granite (sericite altered).

Hand specimen.

Pink to grey/pink fine grained, much altered quartz-feldspar rock (igneous) at around 1.0mm grain size. Grey zones of sericite alteration.

Petrology.

Essential similar to specimen 171364.

Quartz – 50-60%
K-spar (sericitised) 40-50%
Plagioclase (sericitised) 2-5%
Mica (sericitised ± muscovite TiO_2) – exbiotite – 5%

Figure 5. Specimen 171369. Sericitised (grey/green-left) fine grained slightly granophyric granite. Rock slab. WOF 5.0cm.

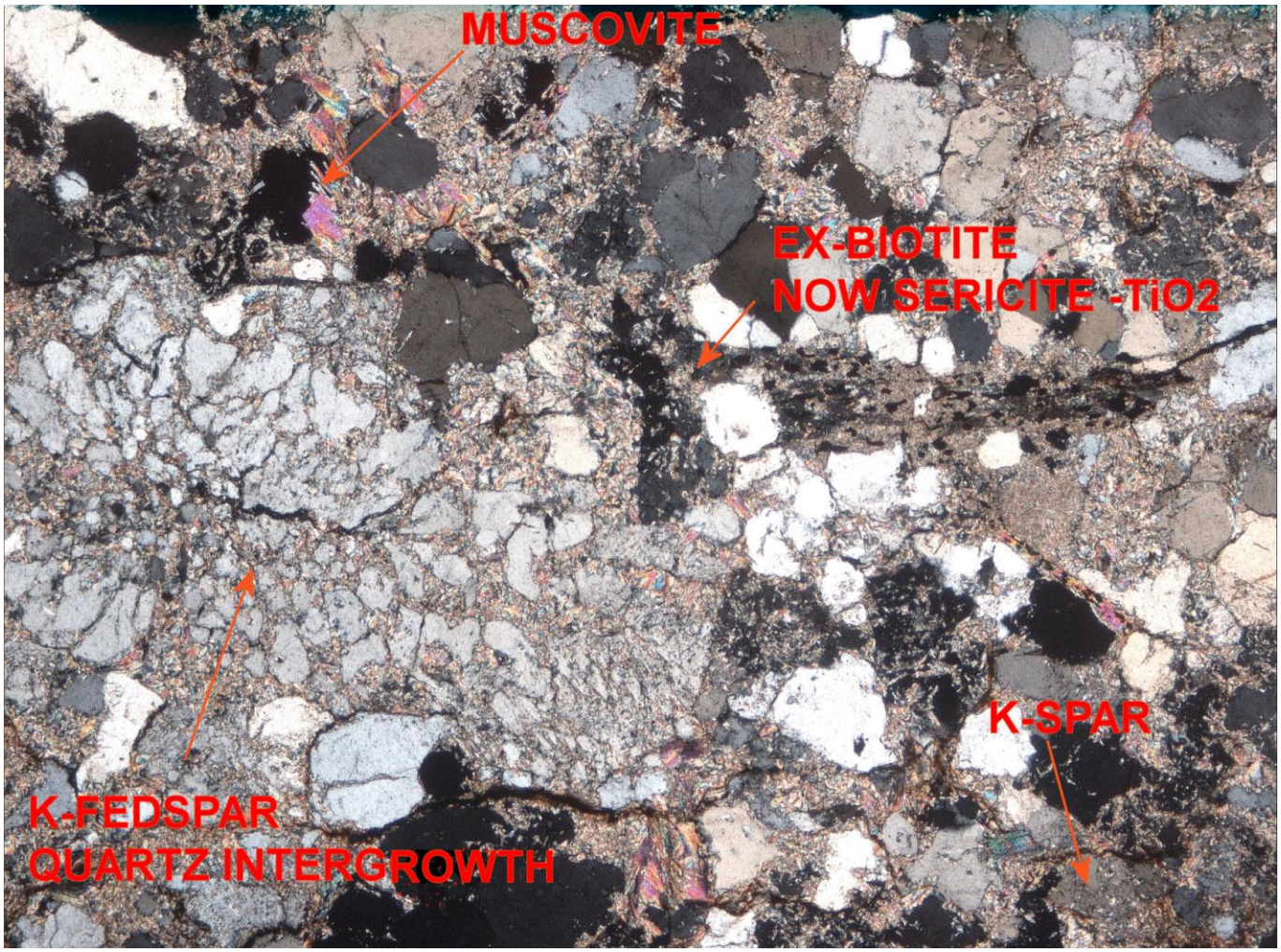

Figure 6. **Specimen 171369. Sericitised granite with graphic (granophyric) texture. Thin section crossed nicols. WOF c5.6mm.**

Specimen 171380 (Figures 7-8). Medium grained porphyritic – granophyric granite (sericite/clay altered).

Hand specimen.

Pale pink/orange/cream (altered) medium grained porphyritic (1-2mm matrix). Phenocrysts constitute some 80% of the rock (crowded porphyry) composed of dark quartz, and pink/white feldspars 2-5mm. One elongate quartz (1.0cm long x 3mm wide).

Petrology.

Phenocrysts (80% of rock)
- Quartz 45-50%
- K-feldspar 30-35%
- Plagioclase 20-30%
- Biotite 1-2%

The quartz is rounded/resorbed and up to 0.7cm long. Much of the K-feldspar exhibits graphic/granophyric texture (cloudy). Plagioclase is often well shaped (crystals) but very sericitised ± clinozoisite. One large K-spar exhibits a rim of small (sericitised)? ex-plagioclase crystals (Rapakivi texture). One large ex-plagioclase crystal has a granophyric rim. These larger grains are at the 3-5mm scale. Ex-biotite crystals, now composed of chlorite, ?TiO_2 and sericite.

The matrix (20% of rock), (0.5-1.0m scale).
- Quartz 35%
- K-spar 35% - considerable graphic texture.
- Plagioclase 30% (sericitised)

The overall composition is:
- Quartz 40-50%
- K-feldspar 35-40%
- Plagioclase 35-40%
- Biotite 1%

Veins.

Network of dark (opaque) veins – 100 micron scale. Interpreted as TiO_2 ± heamatite.

Comments.

The suspected Rapakivi texture and prominent granophyric rims all suggest special crystallization effects probably involving rapid decompression and/or interaction with a volatile rich magma.

Figure 7. **Specimen 171380. Medium grained porphyritic granophyric granite – sericite/clay altered. Quartz (dark), plagioclase (pale green), K-spar (pink). Rock slab. WOF c5.0cm.**

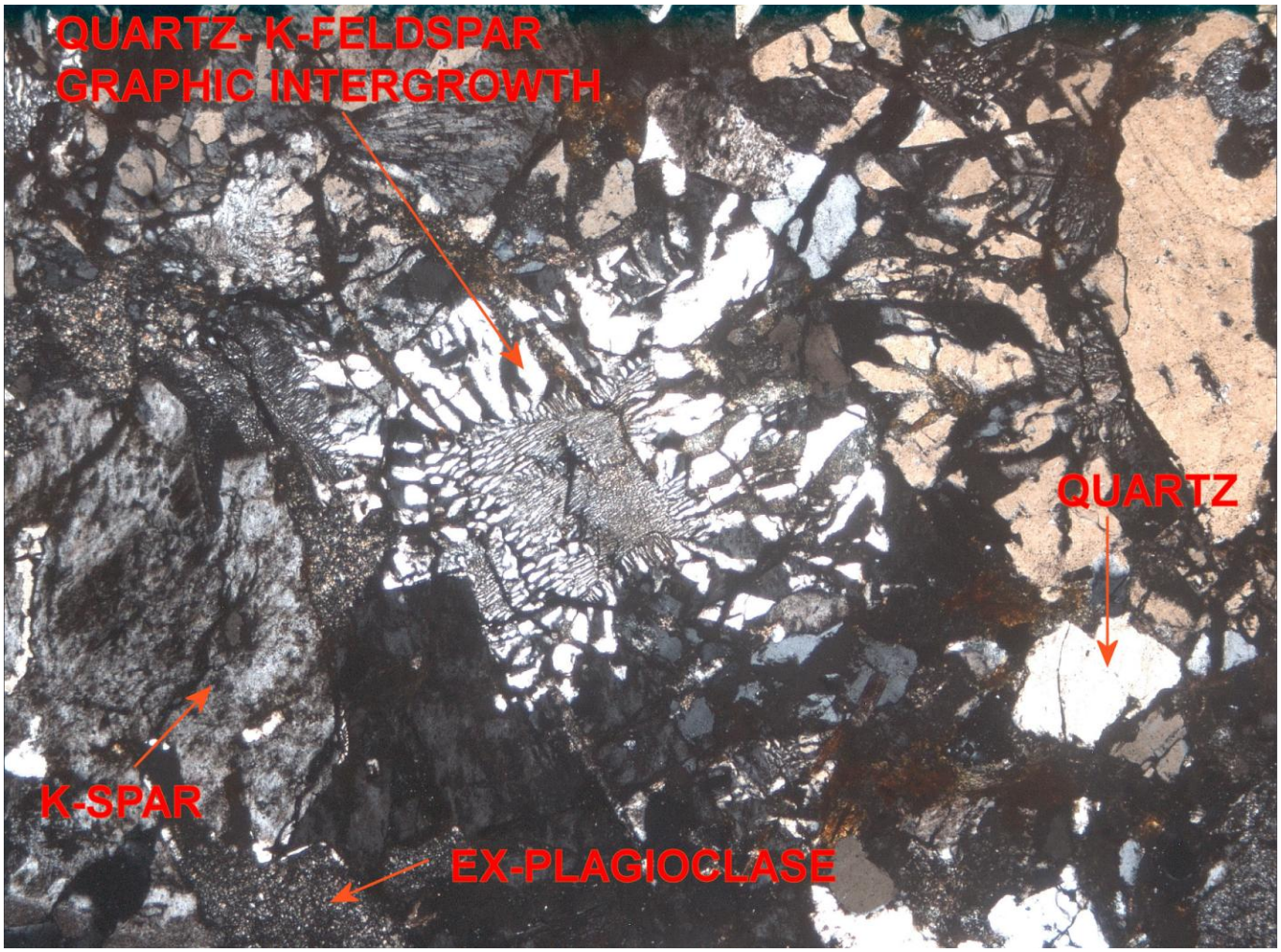

Figure 8. **Specimen 171380. Granophyric texture. Thin section. Crossed nicols. WOF c5.0mm.**

Specimen 171381 (Figure 9-10). Medium grained porphyritic – granophyric granite (sericite, heamatite, altered).

Hand specimen.

Dark maroon colour, porphyritic medium to fine grained igneous rock (granitic – quartz – feldspar). The phenocrysts are 4.0mm scale, comprised of pale white/pink rounded K-spar, and dark rounded – ovoid quartz. The feldspars appear to be rimmed by 2-3mm scale graphic intergrowths of quartz/feldspar – granophyric? Some 1-2% diffuse dark zones (?chlorite) may be ex-biotite sites. The graphic textures merge with finer grained 'granite' at the 1.0mm scale. Porphyritic proportions are some 50%.

Petrology.

The phenocrysts (say 50% of rock) are composed of:

Quartz – 30-35%
K-spar – 30-35%
Plagioclase – 30%
} 2-3mm sizes
Biotite – 2-3% - 500 micron scale

The K-spars and plagioclase grains/crystals are rimmed by granophyric (quartz-feldspar) intergrowths. Plagioclase is extremely altered, with good crystal shape (heamatite, sericite, clinozoisite? chlorite±orange ?spots. The K-spars are less altered (cloudy ± minor chlorite). Quartz grains are ovoid – resorbed – cracked. Ex-biotite ?crystal shapes are now composed of chlorite and TiO_2 (ex-ilmenite shapes) and one spot of fluorite is present. One patch of coarse (1.0mm) epidote is present. The matrix materials are some 50% quartz and 50% feldspar mostly graphic ± some patterned plagioclase (sericite).

The overall composition is interpreted as:

Quartz – 40-50%
K-spar – 40-50% (altered)
Plagioclase – 10-15% (altered)
Biotite – 3-5% (altered)

Alteration is fundamentally sericite ± TiO_2 and heamatite.

Comments.

Major development of granophyric rim textures, around K-feldspar and plagioclase "phenocrysts".

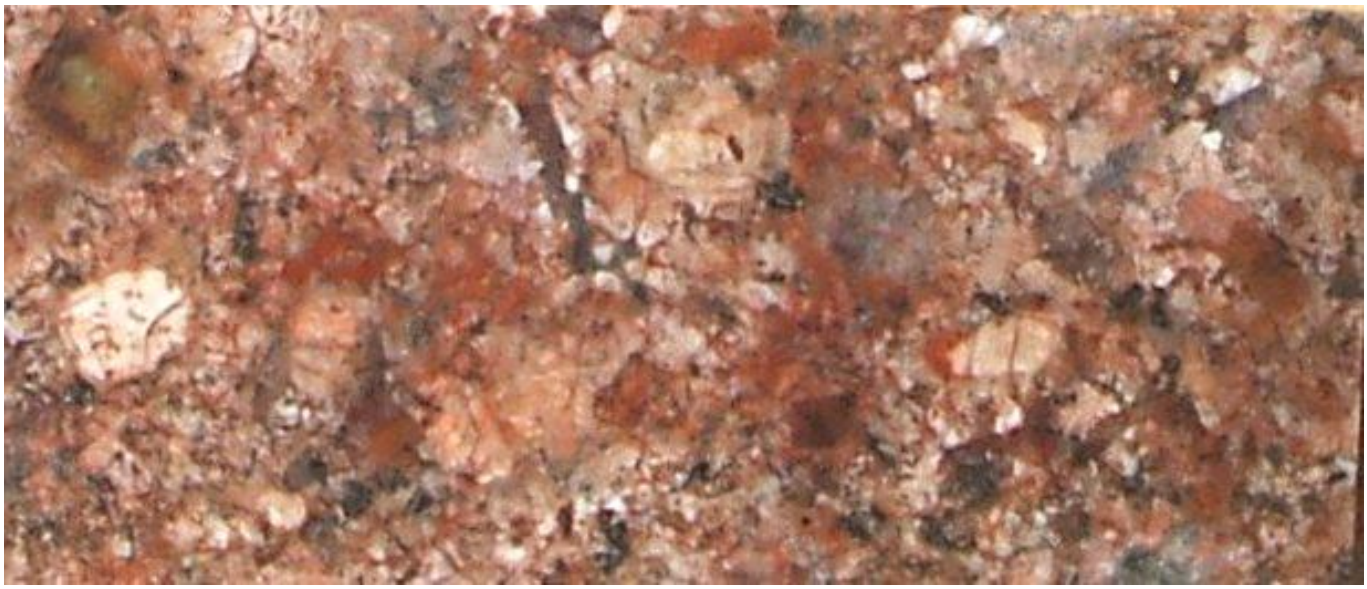

Figure 9. **Specimen 171381. Medium grained porphyritic granophyric granite. Note graphic textures in the white/pink feldspars. Rock slab. WOF c5.0cm.**

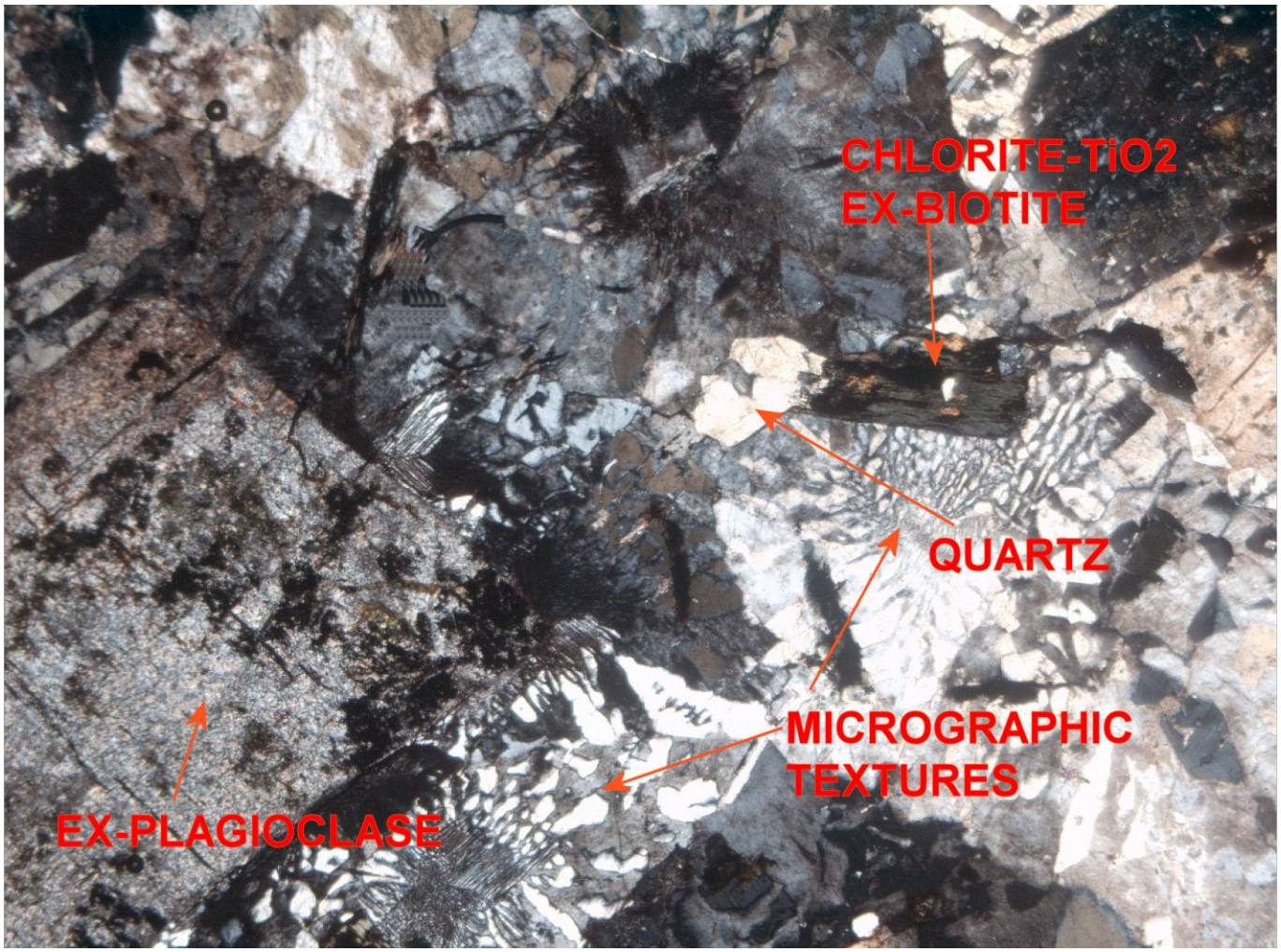

Figure 10. **Specimen 171381. Phenocryst of plagioclase and granophyric textures. Thin section. WOF c5.6mm.**

Specimen 171386 (Figures 11-12). Medium to fine grained, porphyritic – granophyric granite (sericite and clay altered).

Hand specimen.

Pale white/cream, medium to fine gained igneous rock, porphyritic to sericite composed of white feldspars (K-spar), very pale green feldspar (plagioclase) and quartz (translucent – grey) in approximately equal proportions. The larger crystals (2.0mm) constitute around 5% of the rock. The rock is leucocratic and clay/sericite altered.

Petrology.

Quartz phenocrysts and matrix, range from 3.0mm (one example) down to 200 microns and constitute 40-50% of the rock. Some are resorbed. K-feldspars, mostly 500 micron up to 2.0mm, are extremely altered – clay ± sericite, and many are associated with fringes of graphic/granophyric texture. They constitute around 30-40% of the rock.

Plagioclase feldspars are similarly completely altered (slightly paler in microscopic format – ordinary light) – now composed of variable amounts of sericite, muscovite, clinozoisite and heamatite. They constitute around 20-25% of the rock. Some larger ones are associated with granophyric fringe textures. Minor pockets of muscovite (0.5%) are present at the 100 micron scale – possibly original. There are rare patches of (0.5%) of chlorite/TiO_2 at 200 micron scales – possibly ex-biotite.

Comments.

Argillised/sericitised medium to fine grained porphyritic granophyric granite.

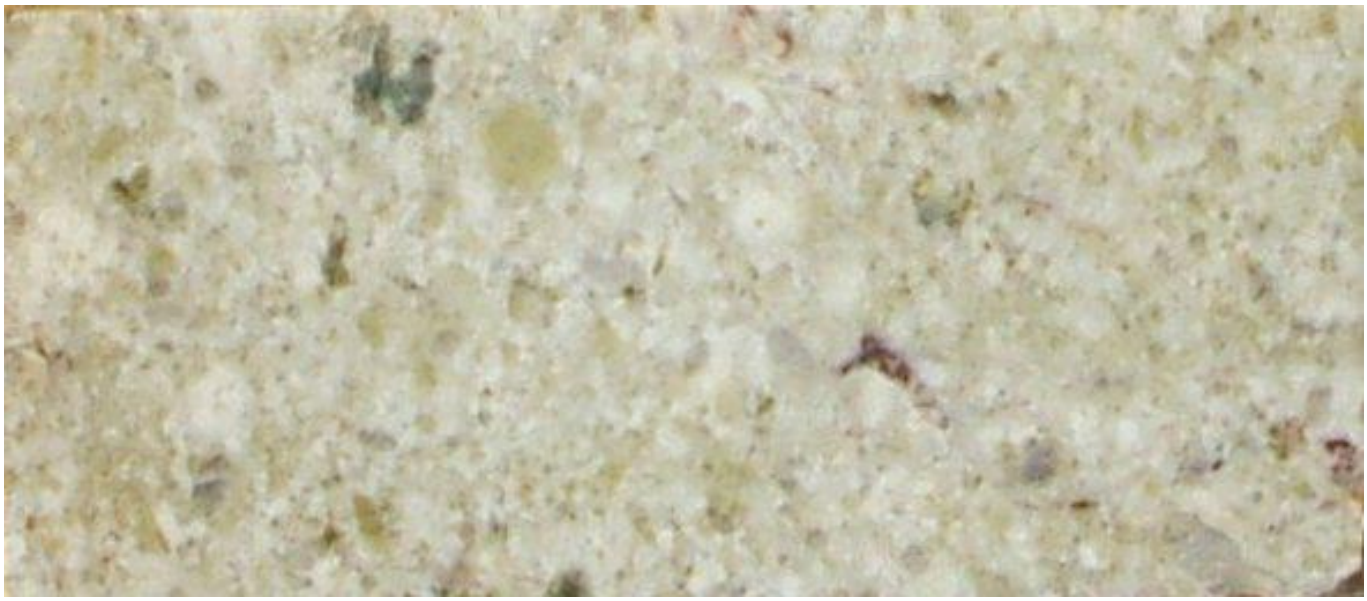

Figure 11. Specimen 171386. Clay/sericite altered medium to fine grained porphyritic granophyric granite. Rock slab. WOF c5.0cm.

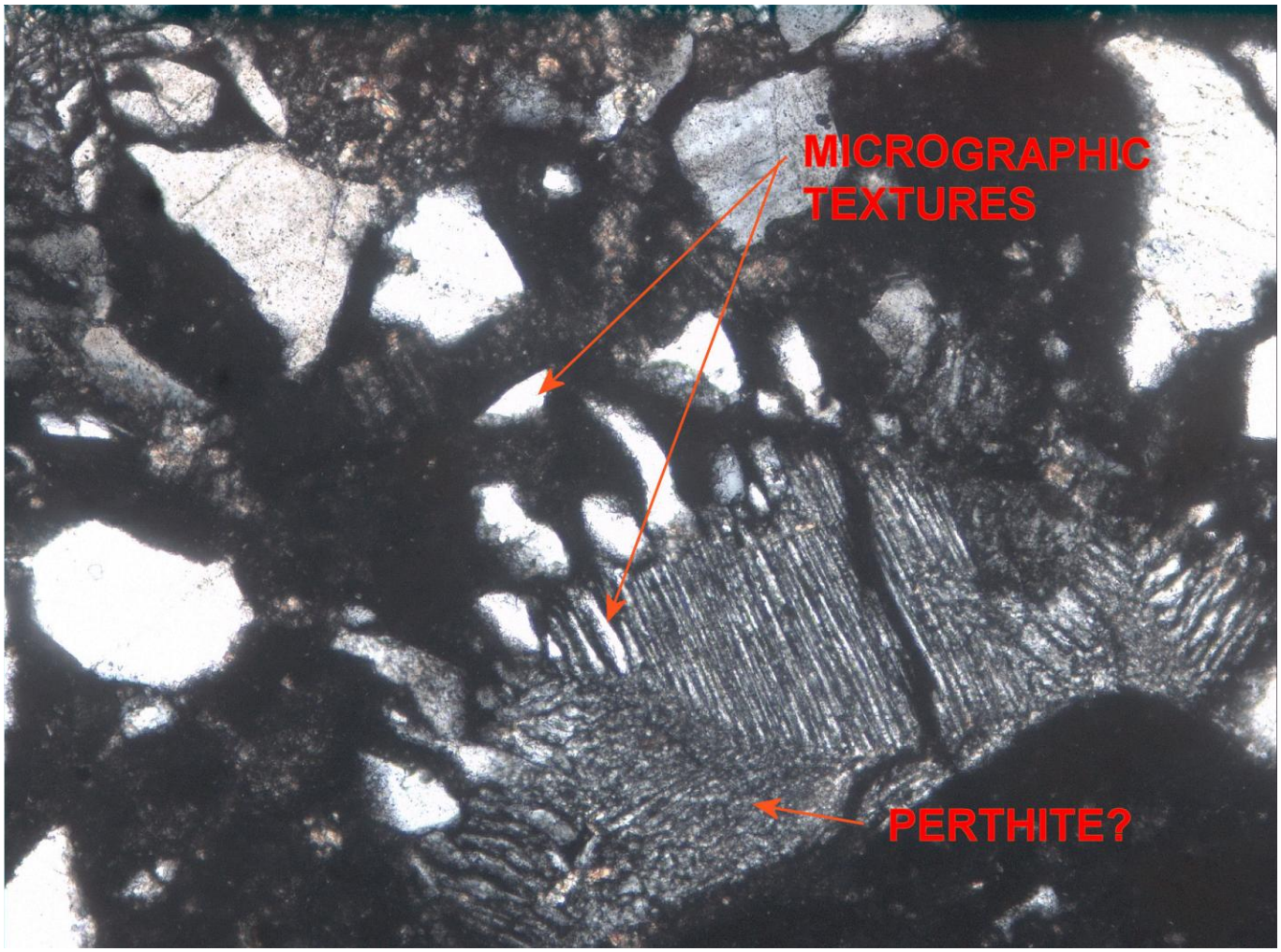

Figure 12. **Specimen 171386. Micrographic/granophyric textures. Thin section. Crossed nicols. WOF 1.6mm.**

Specimen 171393 (Figures 13-14). Medium to fine grained, porphyritic – granophyric granite (sericite – clay altered).

Hand specimen.

Pale white to pale pink medium to fine grained granite (3.0 – 0.5mm), crowded porphyritic to seriate. Phenocrysts (larger grains 2.0-3.0mm), comprise some 50% of the rock, with some 25% quartz and 25% white and pale green feldspar. The matrix is granophyric quartz-K-feldspar. The overall composition is around quartz (30-40%), white-K-feldspar ± fine granophyric quartz (40-50%) and pale green "plagioclase" (15-20%). All feldspathic components and white or white/pale green – argillic and/or sericitic alteration. Fine pale green – cream veinlets (100 micron) are present (sericite).

Petrology.

The larger quartz crystals are ovoid, cracked and resorbed, most of the larger feldspar crystals are altered (sericitised) plagioclase (pale green on rock) with thee remainder comprising altered (cloudy) K-feldspar (white on rock). The smaller 'matrix' components (1.0mm) and quartz/K-feldspar granophyric clusters, surrounding the larger quartz, K-feldspar and plagioclase grains. Some 2-3% ex-mica shapes are present (200-300 micron) now represented as chlorite and TiO_2 compounds (probably ex-biotite). The rock is traversed by a network of 100-200 micron wide clay veins.

The alteration is essentially sericitic with a probably argillic overprint.

Comment.

Major development of granophyric texture at the finer grained levels. Sericitic and argillic alteration.

Figure 13. **Specimen 171393. Medium to fine grained porphyritic granophyric granite – sericite/clay alteration. Rock slab. WOF c5.0cm.**

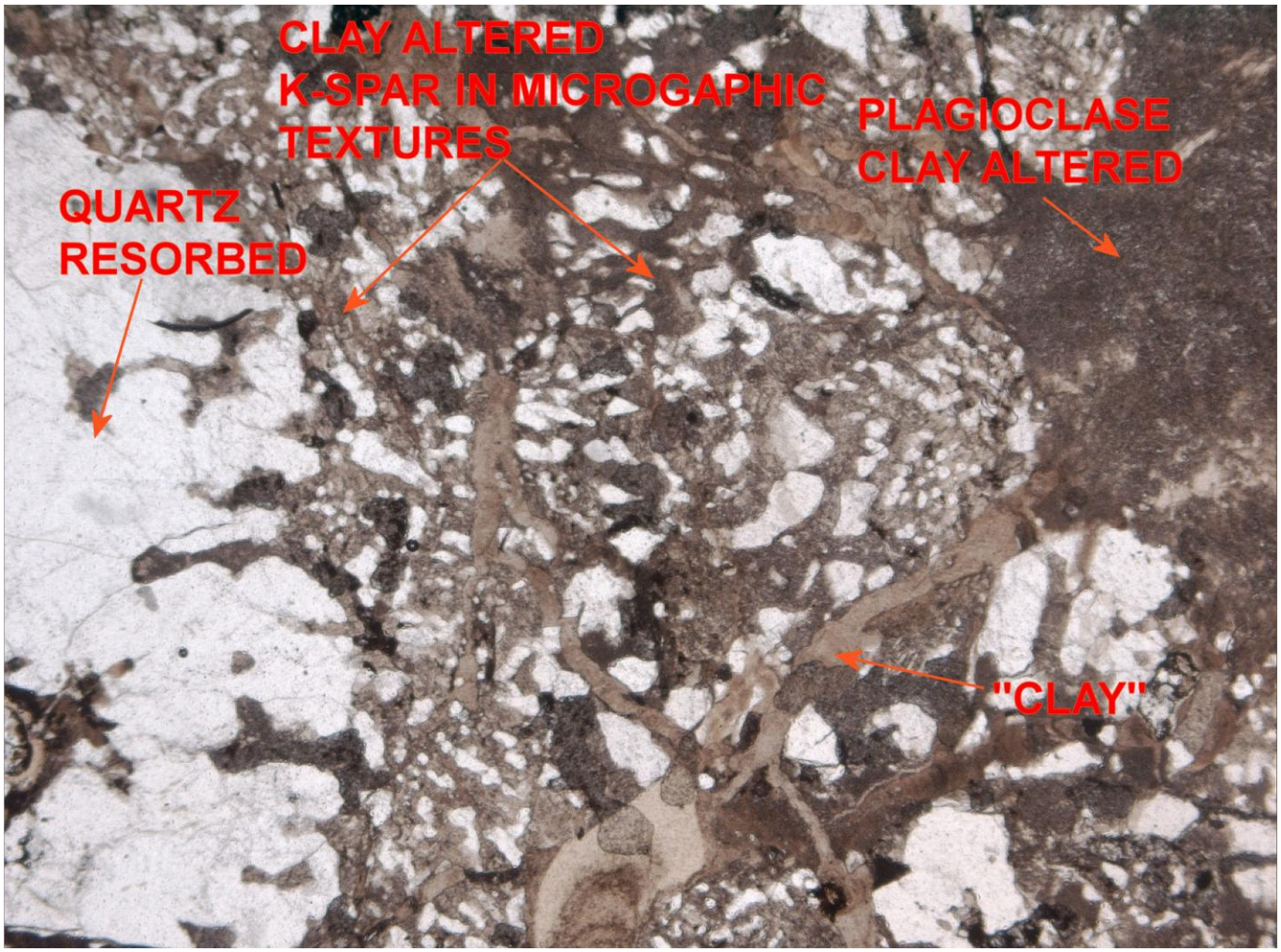

Figure 14. **Specimen 171393. Clay veins, granophyric texture and resorbed quartz phenocryst. Thin section – ordinary light. WOF c5.6mm.**

Specimen 171394 (Figures 15-16). Medium to fine grained, porphyritic – granophyric granite (sericite – clay altered).

Hand specimen.

Essentially similar to 171394, with a slightly pinker matrix. The larger crystals – phenocrysts (2-3 micron) constitute some 50-60% of the rock and are composed of quartz (grey 30%), K-spar (white 40%) and plagioclase (pale green, 30%). The remaining matrix (40% of rock) is fine grained pink K-feldspar – quartz (granophyric textured). The overall rock is around quartz (35-40%), K-spar (35-40%) and plagioclase (20-25%).

Petrology.

As per 171393.

Figure 15. Specimen 171394. Medium to fine grained porphyritic granophyric granite – sericite/clay altered. Rock slab. WOF c5.0cm.

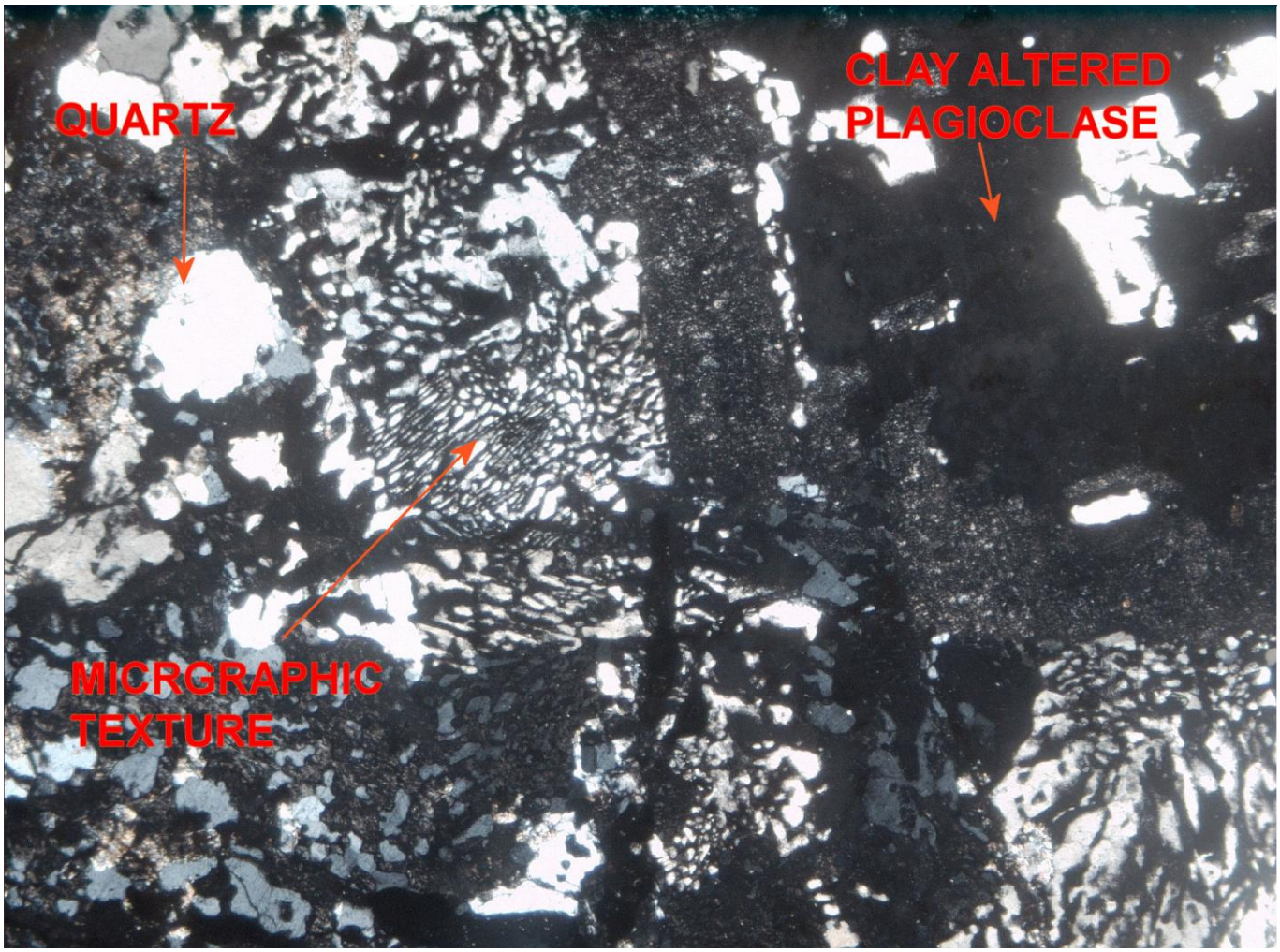

Figure 16. **Specimen 171394. Granophyric rims and fine grained matrix. Thin section – crossed nicols – c5.6mm**

Specimen 171395 (Figures 17-19). Fine grained variably textured (strongly granophyric) granite ± tourmaline.

Hand specimen.

Pale pink/white/grey fine grained igneous rock with variable grain size, composed of quartz and feldspar. The feldspar components are white (K-spar) and pale-green grey (plagioclase). The grain size variations (1.0m to 500 micron) are complex, resulting in finer and coarser zones (1.0cm scales), with hints of layered effects. The finer grained areas contain more granophyric components. Towards one end a slightly coarser layer is present (1.5mm grain size).

Petrology.

1. Fine grained zones. These comprise approximately equal amounts of K-spar, plagioclase, and quartz at around 300 microns. Prominent graphic – granophyric textures. The plagioclase is altered to clay.
2. Coarser grained zones. These are also composed of approximately equal amounts of K-spar, quartz and plagioclase, (300-500 micron scale). The K-spar has a fine perthitic texture and the plagioclase (now clay) is interstitial. Granophyric textures are minor to absent.
3. Coarse grained (end of slab) zone. This zone contains some 50% quartz, 45% K-feldspar and 5-10% plagioclase, there are also traces of tourmaline, (interstitial to quartz) at 200 micron scale and traces of muscovite. The general grain size is around 2.0-3.0mm. One altered (brown/red) - ?allanite crystal.

Figure 17. **Specimen 171395. Fine grained granophyric granite with variable grain size. The grey green colour is sericite alteration. Hints of layering? Rock slab. WOF c5.0cm.**

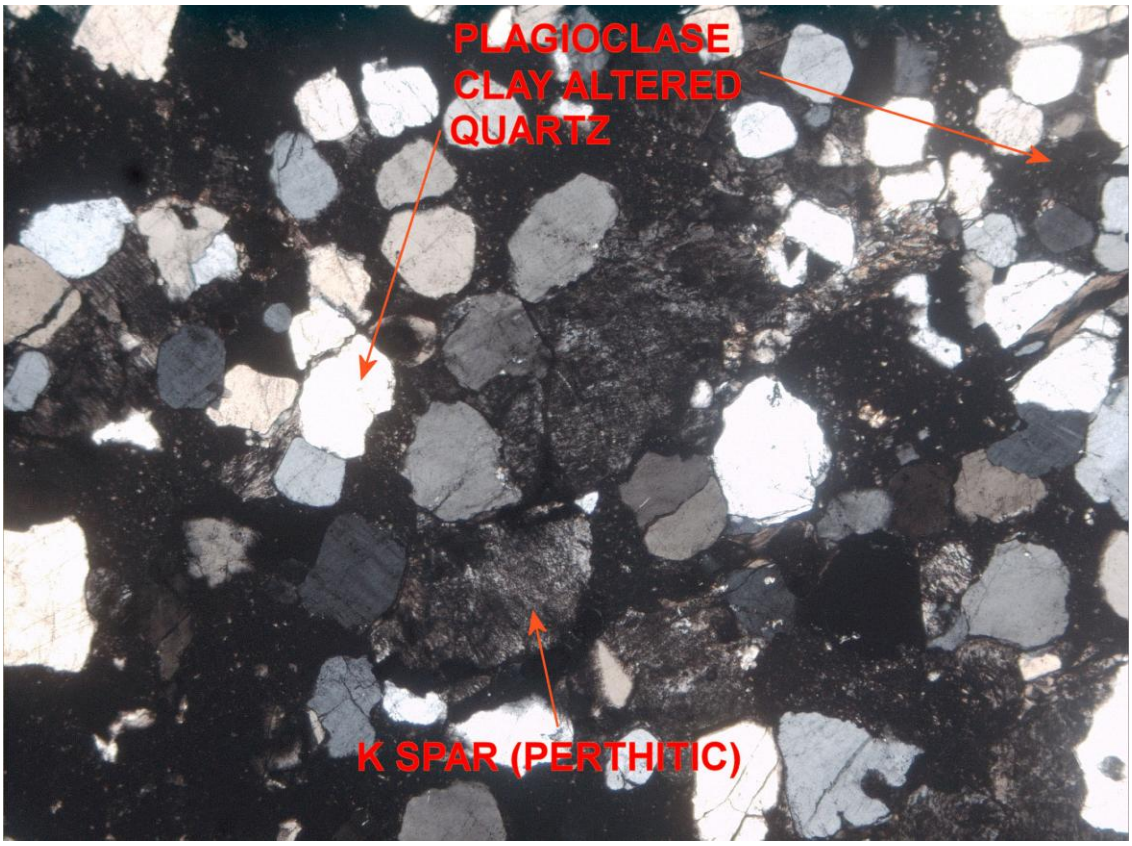

Figure 18. **Specimen 171395. Coarser grained component (see also Figure 19). Thin section – crossed nicols. WOF c1.6mm.**

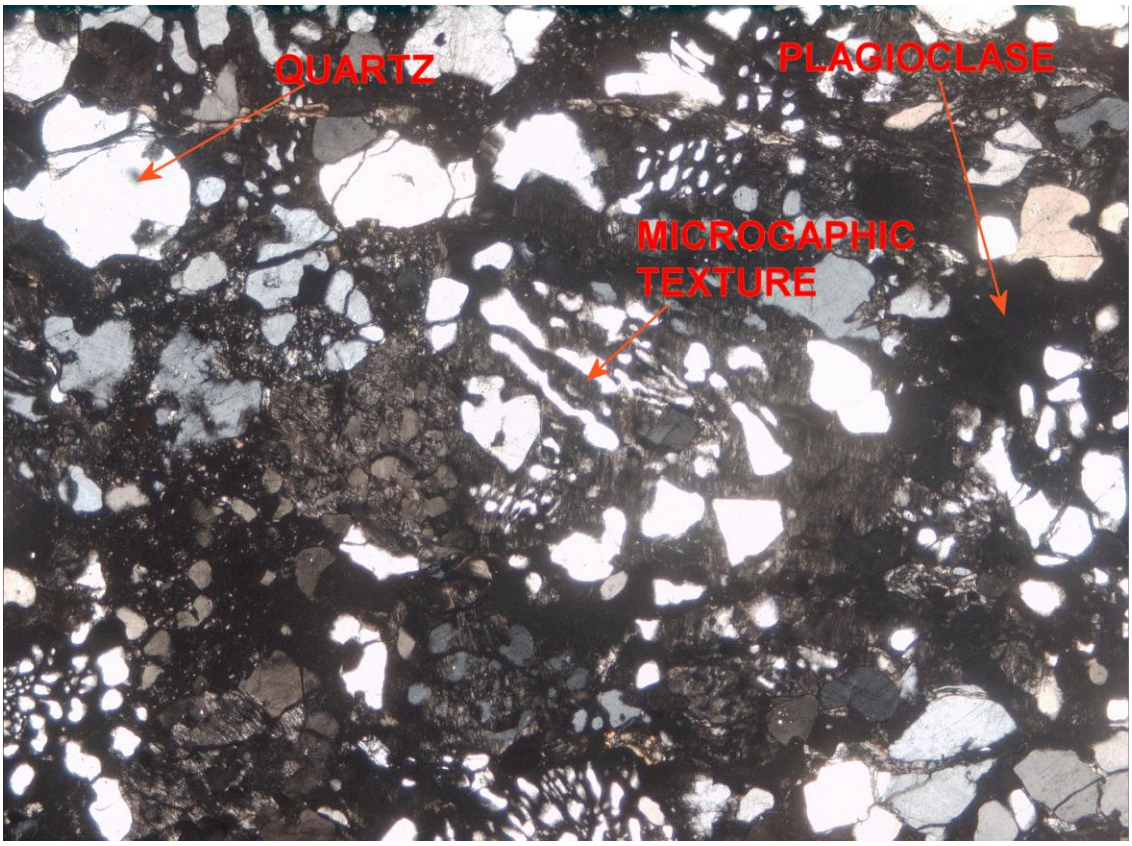

Figure 19. **Specimen 171395. Finer grained component – note granophyric texture. Thin section – crossed nicols. WOF c1.6mm.**

Specimen 171400 (Figure 20-21). Medium to fine grained, porphyritic/sericite granophyric granite (sericite-clay alteration).

Hand specimen.

Pale pink, medium to fine grained, slightly porphyritic/sericite igneous rock, with some granophyric texture at finer levels. Grain size ranges from 3.0 to 500 microns.

Petrology.

The larger phenocrysts/grains are in the 2.0-3.0mm scale, forming some 50% of the rock, the matrix (1.0mm), is strongly graphic/granophyric. Quartz phenocrysts (1-2.0mm) are ovoid, resorbed and cracked. Plagioclase phenocrysts (2-3.0mm) are well formed, contain minor fine quartz and are extensively sericitised. K-spar phenocrysts (1.5-2.0mm) exhibit good crystal shapes. Granophyric textures in the matrix (1.0mm mixed grains) and also rim (K-feldspar/quartz). One patch of muscovite with fine sericite (200 micron muscovite flakes). The overall composition is around, quartz 50%, K-spar 30-35% and plagioclase 15-20%. The K-spar is altered to sericite, clay and heamatite and the plagioclase to sericite with abundant heamatite at 10-20 microns.

The muscovite is interpreted as original (free of chlorite or TiO_2 alteration).

There are quartz veins (50-100 micron) and sericite ± muscovite veins (50-100 micron). Relative timing unclear.

Figure 20. Specimen 171400. Medium to fine grained porphyritic/sericite granophyric granite. Rock slab. WOF c5.0cm.

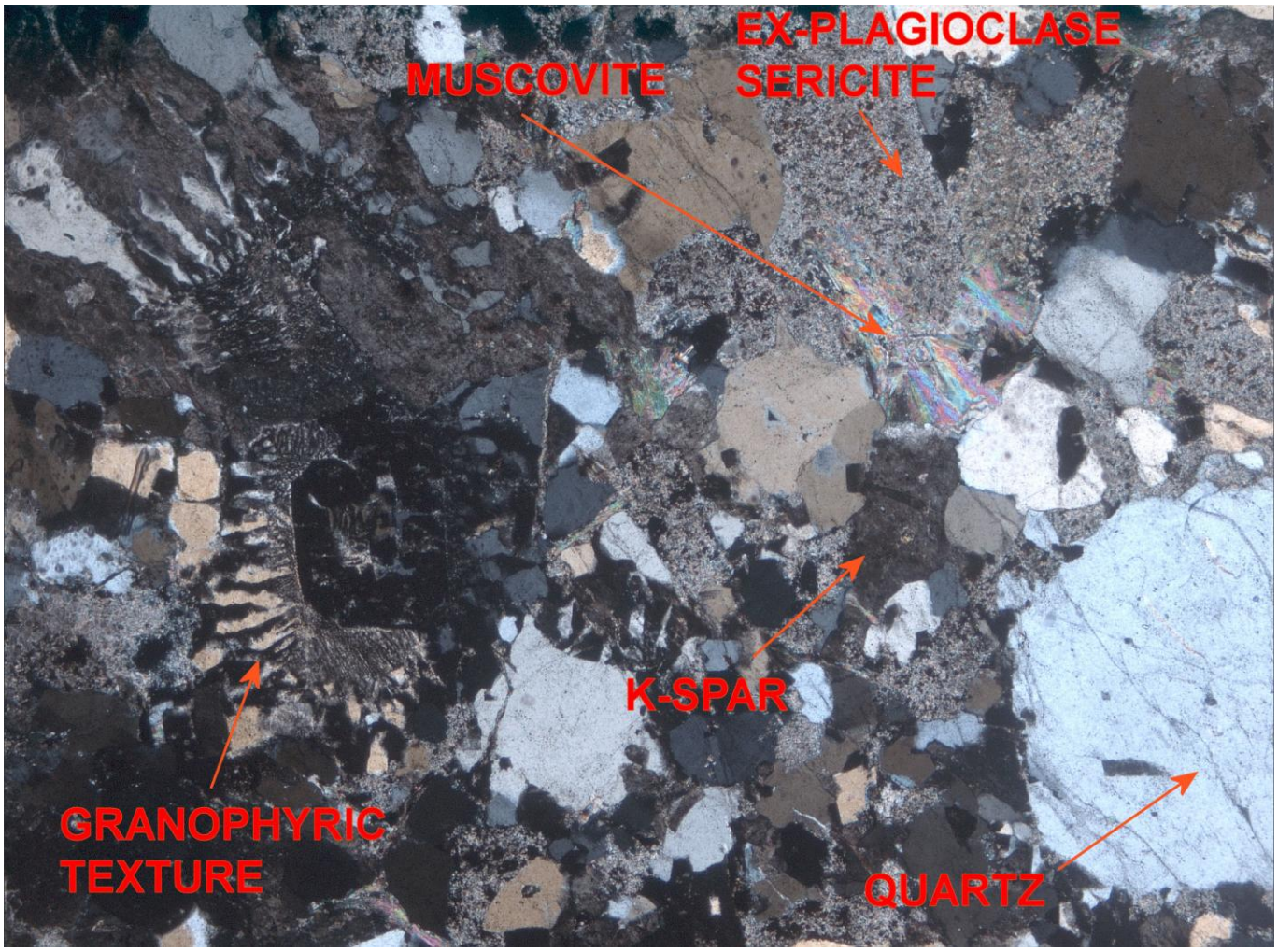

Figure 21. **Specimen 171400. Phenocrysts, granophyric rim and fine grained matrix. Thin section – crossed nicols. WOF c5.6mm.**

Specimen 171401 (Figures 22-23). Fine grained granophyric granite (sericite alteration) ± muscovite.

Hand specimen.

Pink with white flecks, fine grained (1.0mm), composed of quartz (grey) and pink (K-spar) and white (? plagioclase) feldspars. Graphic textures common in pink feldspar.

Petrology.

General grain size is 0.8-1.0mm with just a few at 1.0-1.5mm. One larger K-feldspar has a granophyric rim.

K-feldspar (45%), 20-40% granophyric.
Quartz (45%), larger grains resorbed.
Plagioclase (10%), all very sericitised.
Muscovite – trace – 200 micron – late interstitial.
Plagioclase altered to sericite ± heamatite spots (10-20 micron).

Veinlets of:

(a) Sericite (20-50 micron).
(b) Quartz – sericite ± TiO_2 (possibly quartz with sericite, TiO_2 overprint).

Figure 22. Specimen 171401. Fine grained granophyric granite. Rock slab. WOF c5.0cm.

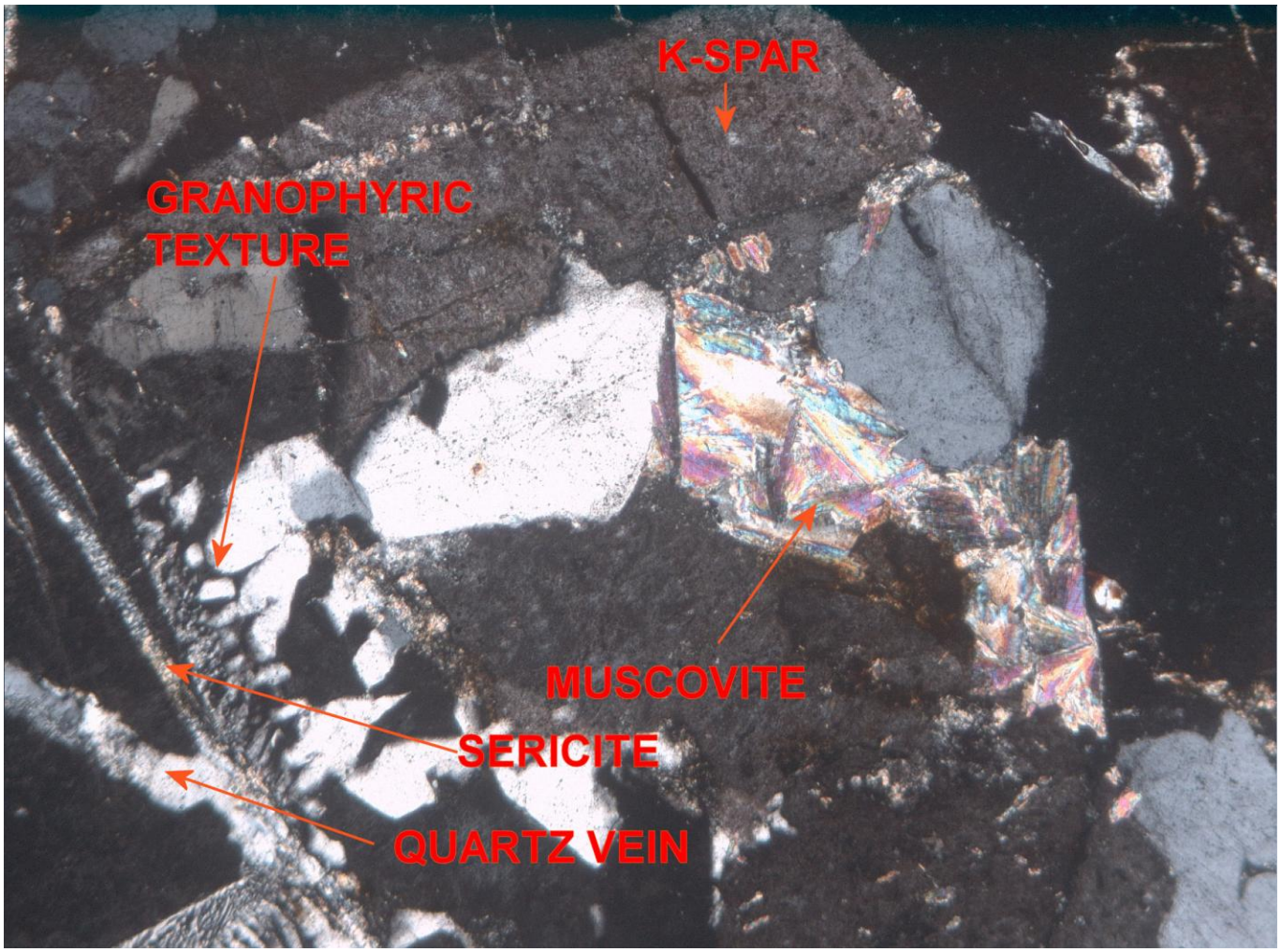

Figure 23. **Specimen 171401. Granophyric texture and muscovite cluster. Thin section – crossed nicols. WOF c1.6mm.**

Specimen 171404 (Figures 24-25). Medium grained crowded porphyritic granophyric granite (sericite – heamatite altered).

Hand specimen.

Pale pink with white flecks, medium grained (2-3mm), crowded porphyry to seriate textured. The larger grain sizes 2.5-3.0mm predominate (55-60%).

The feldspars are pink (K-spar), white (K-spar?) and pale green-grey (plagioclase) with grey (quartz).

Petrology.

The coarser (2-4mm) components constitute some 55-60% of the rock and are composed of:

Quartz (2-4mm) – rounded, cracked, resorbed.
Plagioclase (3.0mm) – all altered to fine sericite and heamatite.
K-feldspar (4.0mm), altered to sericite and heamatite.

The finer component (1.0mm) is composed of approximately equal amounts of quartz, K-spar and interstitial plagioclase (sericite altered).

There are patches of muscovite (3-5%), and also patches of ex-biotite? (now sericite, TiO_2). Minor 50-100 micron wide sericite ± TiO_2 veins.

Figure 24. **Specimen 171404. Medium grained crowded porphyritic granophyric granite. Rock slab. WOF c5.0cm.**

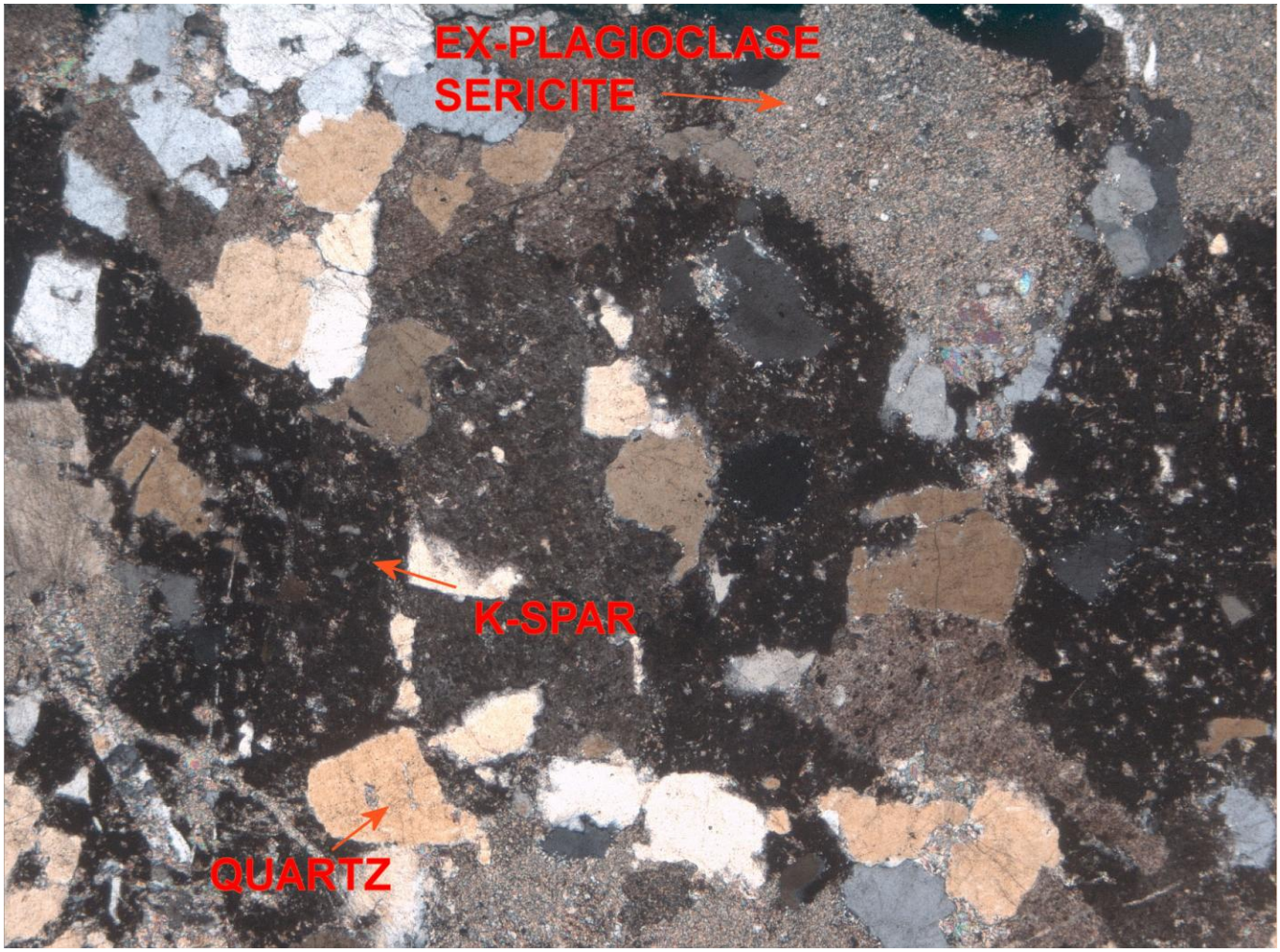

Figure 25. **Specimen 171404. General texture. Thin section – crossed nicols. WOF c5.6mm.**