

https://dspace.org/

Analysis of pre-impact and impact-induced geological structures in the northern collar of the Vredefort Dome, South Africa

Mashabela, Sello

2016

http://hdl.handle.net/10539/21696

Mashabela, Sello (2016) Analysis of pre-impact and impact induced geological structures in the northern collar of the Vredefort Dome, South Africa, University of Witwatersrand, Johannesburg, <http://wiredspace.wits.ac.za/handle/10539/21696>

Downloaded from a DSpace repository. https://dspace.org/

APPENDIX I

OUTCROP DESCRIPTIONS AND SAMPLES

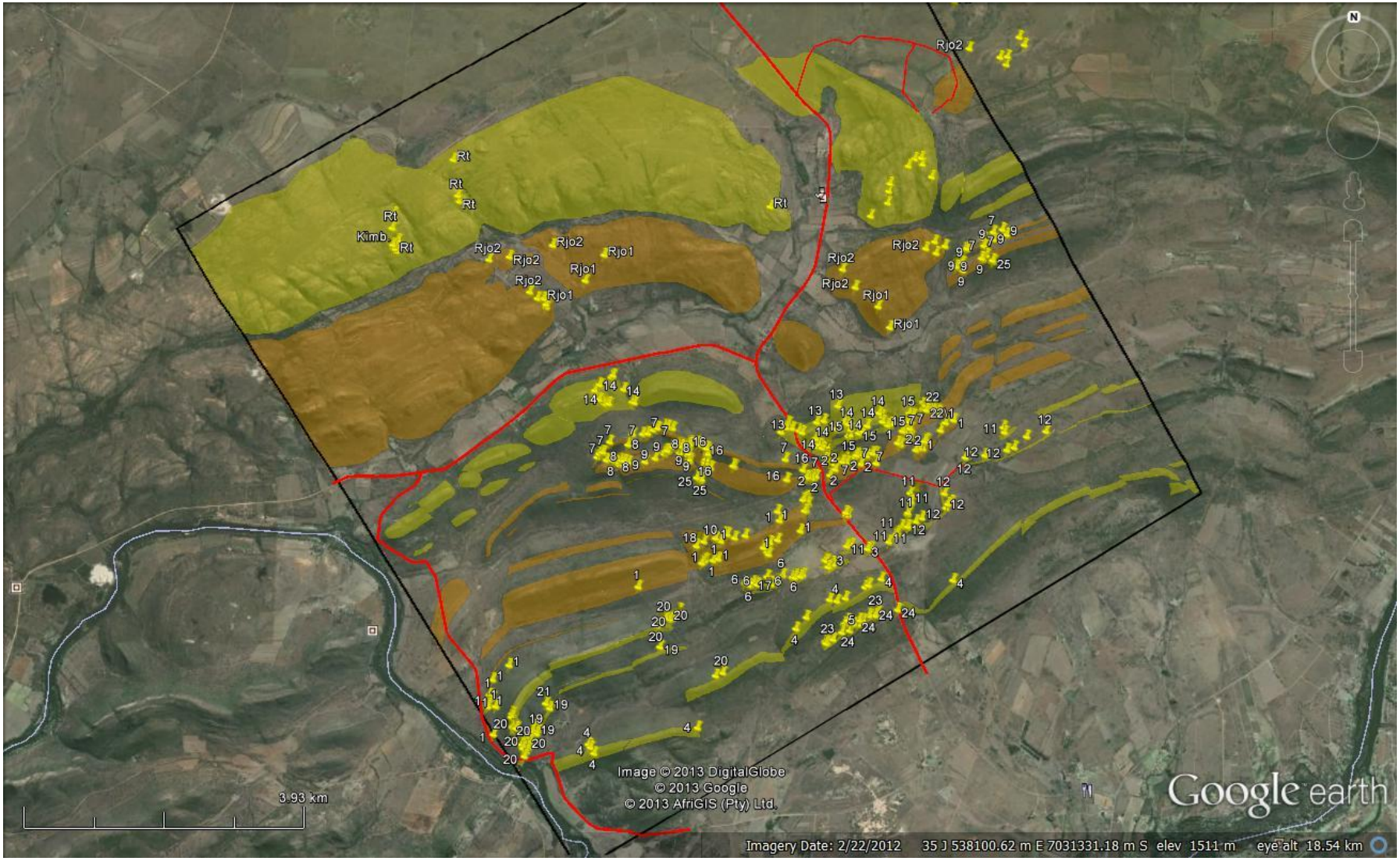


Figure 1.1. *A distribution map showing locations of quartzite units described in Table 1.1. Note that there is no particular order at which the units are numbered, and that some of the units have two different unit numbers because they were mapped at different times and locations.*

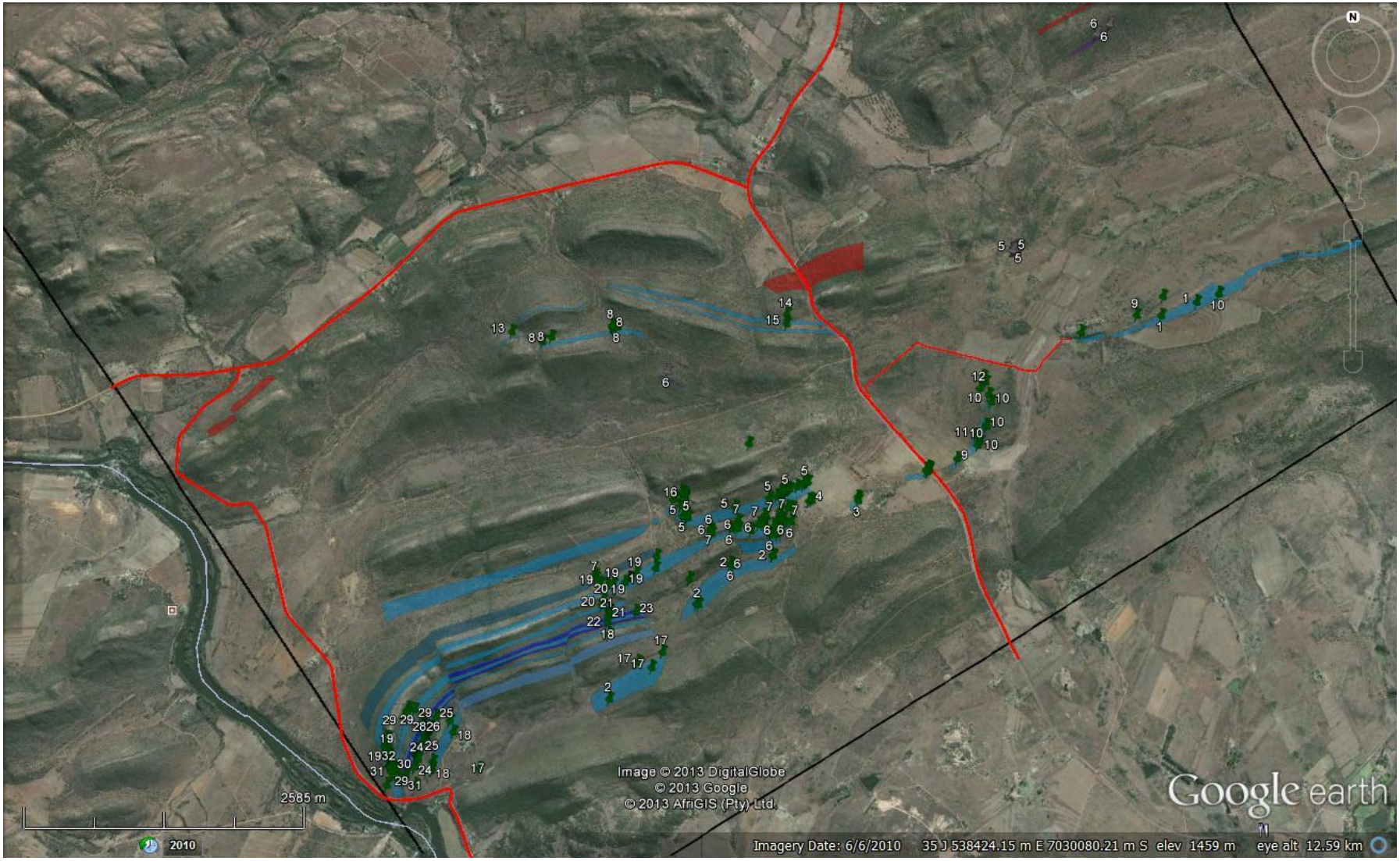


Figure 1.2. *A distribution map showing locations of pelitic units described in Table 1.1. Green markers show locations of metapelite, red for meta-shale, and grey for meta-diamictite.*

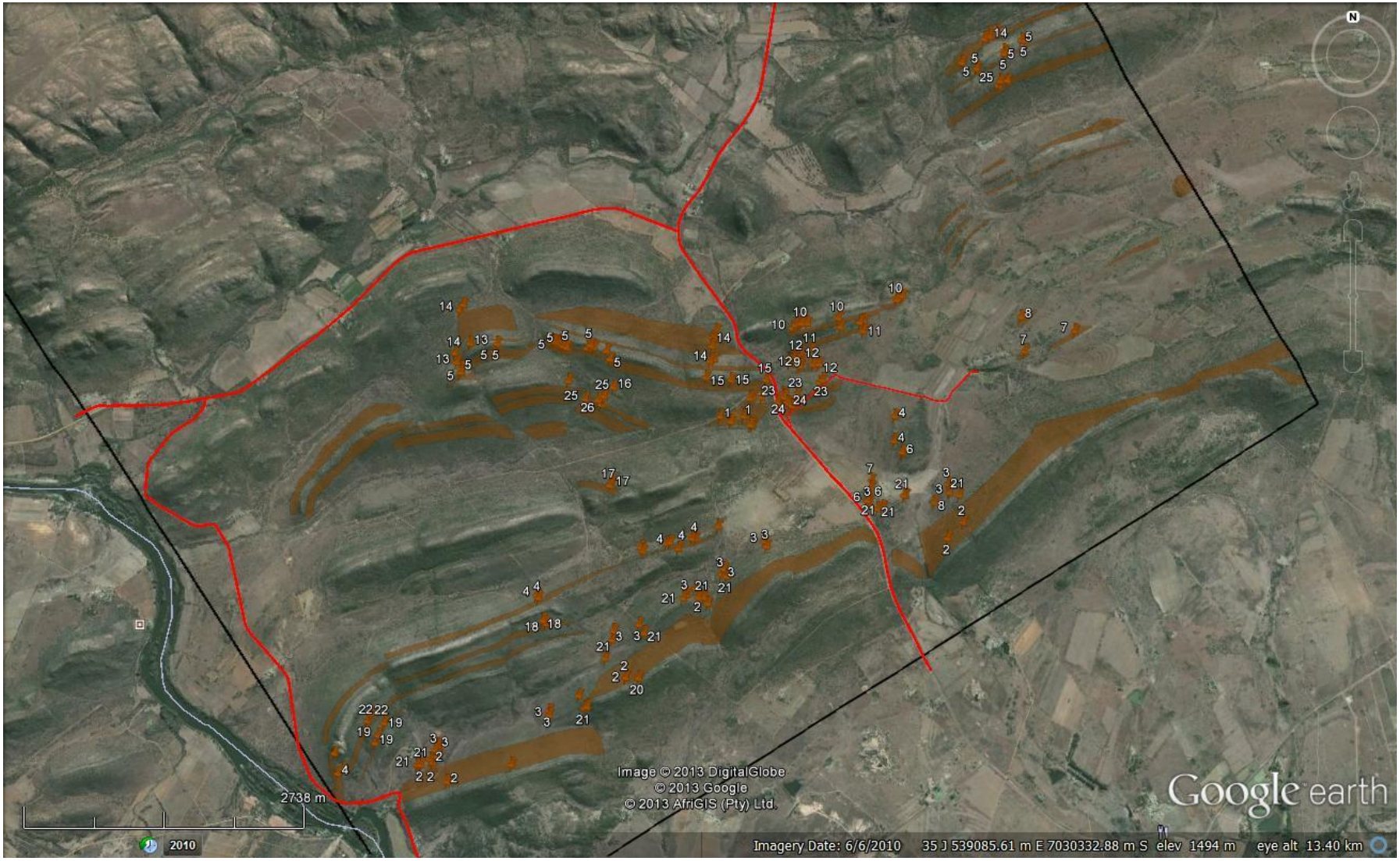


Figure 1.3. *A distribution map showing locations of meta-ironstone units described in the southern part of the study area (Table 1.1).*

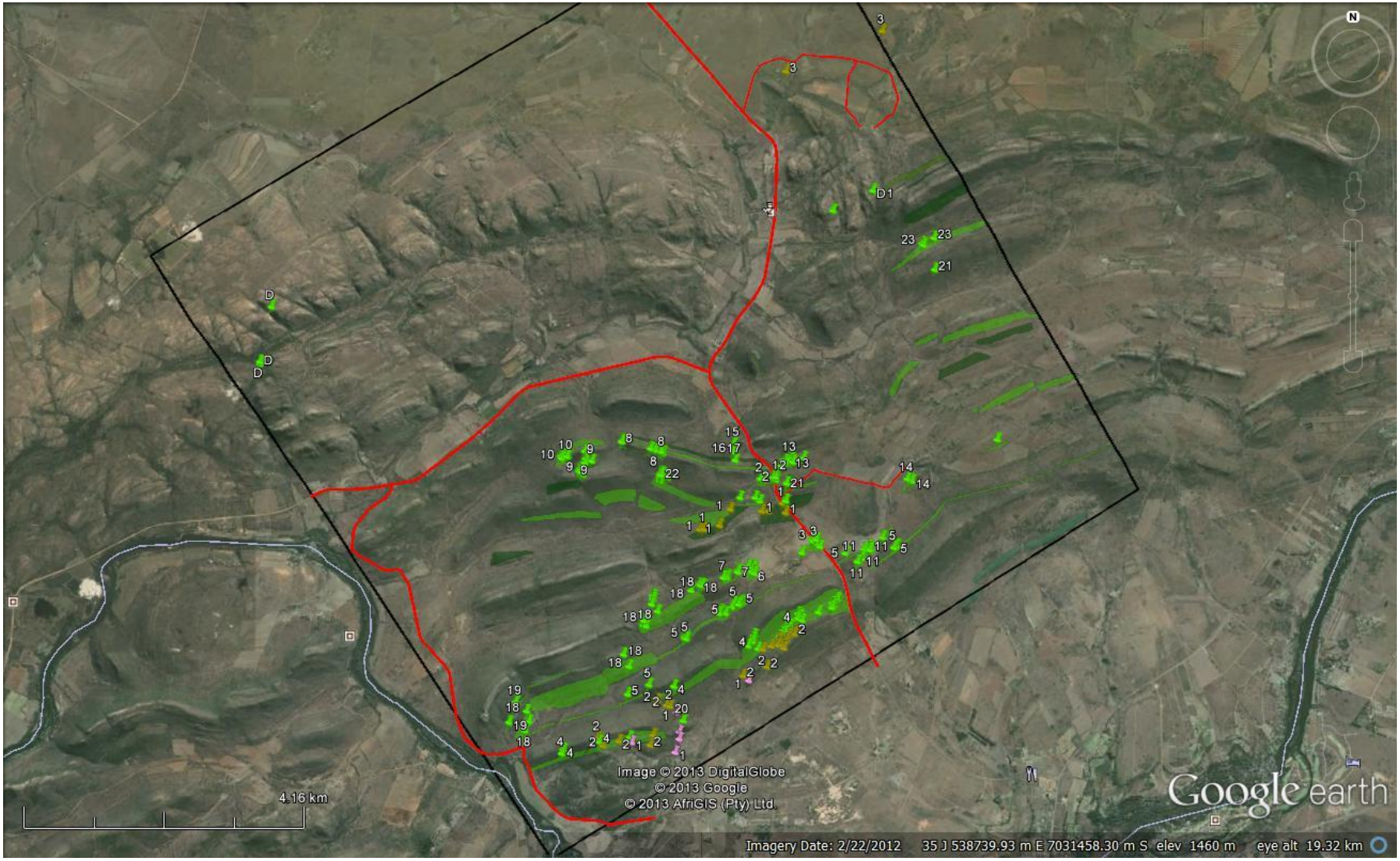


Figure 1.4. *A distribution map showing locations of igneous rocks described in the study area (Table 1.1). Light green markers show locations of meta-dolerite and dolerite sills, pink for granite, and gold for meta-basalt.*

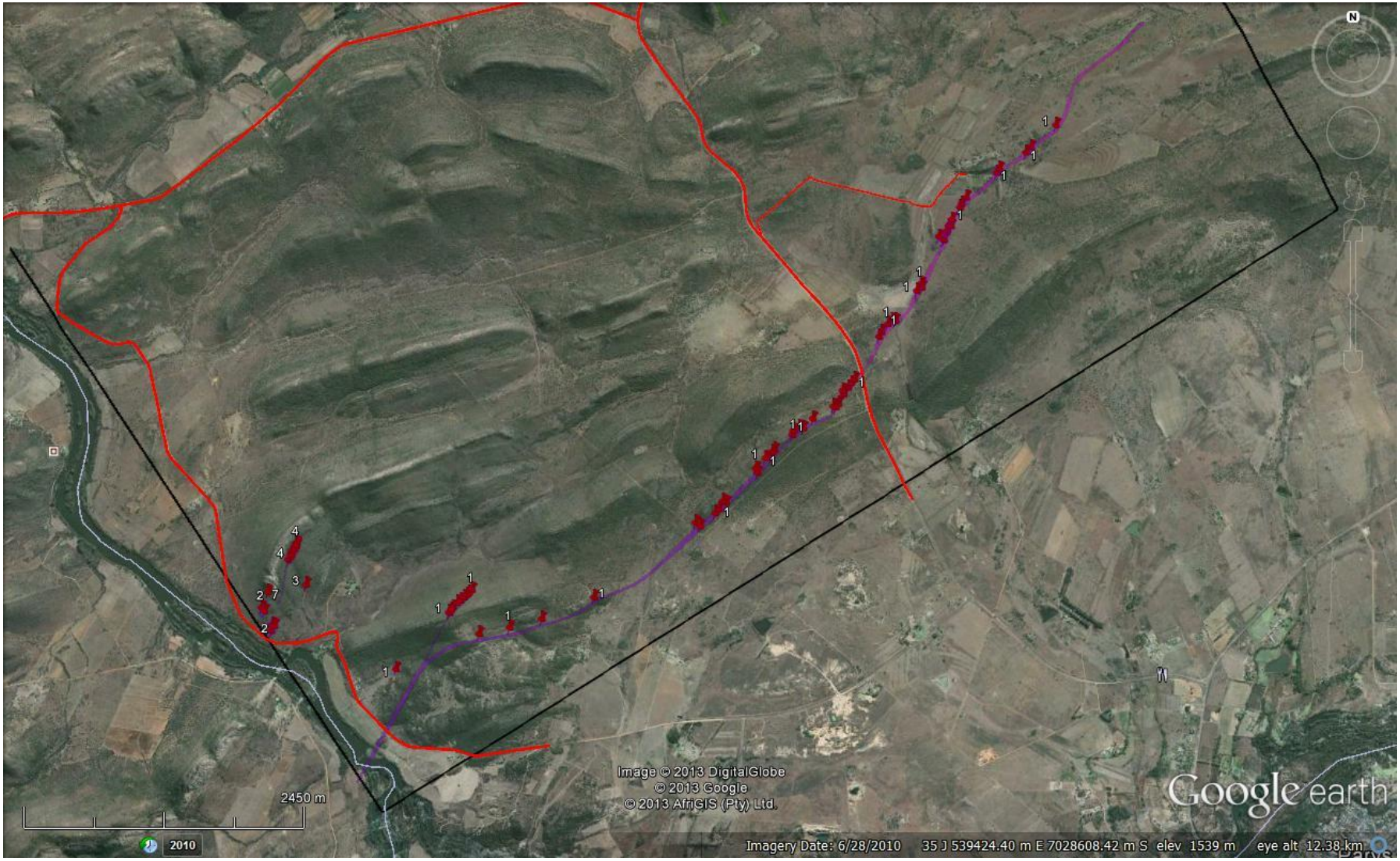


Figure 1.5. *A distribution map showing locations of the granophyre dyke described in Table 1.1. Markers that plot off the outcrop extent of granophyre represent localities of other melt rocks described in the study area.*

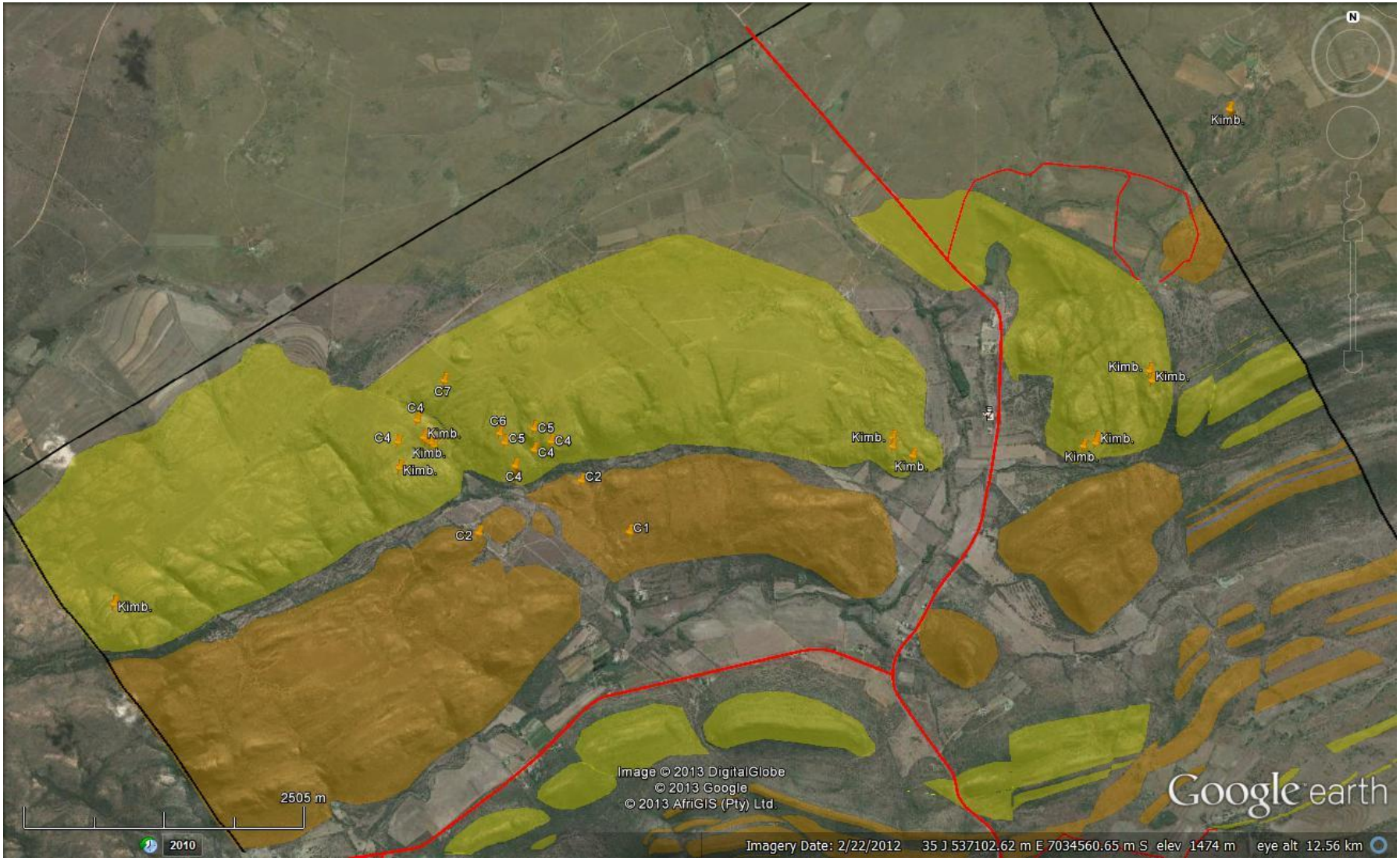


Figure 1.6. *A distribution map showing locations conglomerate units described in the Central Rand Group (Table 1.1).*

Table 1.1. Outcrop descriptions of lithologies mapped in the West Rand Group of the study area.

WEST RAND GROUP				
Unit #	**Rock Type**	**Grain size**	**Colour**	**Textures and other characteristics**
1 (Rgq3)	Quartzite	Coarse-grained (up to 4 mm).	White on a fresh surface.	Trough crossbedded (2776), indicating overturned strata. Trough X-bedding up to 1.7 m (2778), with beds >2.5 cm in thickness. Bedding planes and fracture planes have Fe staining. The quartzite unit is cleaved. A generally E-W foliation is developed slightly oblique to bedding. Planar and trough X-bedding indicate overturned strata (2821). Coarse-grained with an increase in the grain size decreases northwards (Rondekop). Quartzite weathers into slatey-slabs adjacent to the detachment zone of the Karolina Fault, due to the steep foliation. Has an isoclinally-folded quartz vein at stop 68 (Session2, Rondekop), which has a slight drag on the E-W cleavage. The cleavage is rotated by pseudotachylitic breccia-bearing faults at stop 144 (Session 2). Number 1 quartzite is crenulated in Donkervliet. The E-W S2 cleavage is oblique to bedding, whereas S3 crenulation cleavage is perpendicular to the dip of the strata.
2 (Rgq8)	Quartzite	Medium-grained (up to 2 mm)	Brownish grey on weathered surface and white on a fresh one.	Trough X-bedding indicating overturned strata at stop 22 (session 2). Unit is about 20m at stop 22, and gets thicker to the east. Has well developed planar X-trough beds. It is interbedded with fine-grained, dark grey argillaceous quartzite beds at De Waal's. Foliated and exhibits ripple marks at Stop 274 (session 2). The cleavage is orientated 082/75S, and the ripples marks have a wavelength of 7 cm and a crest 2 cm high. Ripple marks with 2.5 cm wavelength developed in Saaiman's farm. This unit is the same as #9 and #16 units.
3 (Rhq1)	Quartzite	Medium-grained	white	The #3 unit exhibits a 5 mm spaced fracture cleavage at stop 31 (Session 2). It is relatively massive and has thicker bedding planes with poorly developed trough x-beds. The trough x-beds indicate overturned strata. The unit hosts bedding-parallel and crosscutting pseudotachylitic breccia at stop 45 (Session 2). Same as the #6 and #19 quartzite units.
4 (Ro)	Quartzite	Fine- to medium-grained	White to Pinkish-white at Eldorado.	Thick beds typically 45 cm, with poor development of sedimentary structures. Fracture fabric developed at stop 35 (session 2; Rondekop). It is medium-grained at Eldorado, with poorly developed sedimentary structures. Poorly-developed trough x-beds developed at stop 8 (session 2) indicate overturned strata. Same as the #20 unit.
5 (pre-Ro)	Quartzite	Medium-grained		Thin (25 m) quartzite unit bound by meta-dolerite (Rondekop).
6 (Rhq1)	Quartzite	Medium-grained	White	Has poorly developed sedimentary structures. It is about 20 m wide. It hosts bedding-parallel pseudotachylitic breccia and a 1cm spaced fracture cleavage. It is about 30 m wide at stop 53 (session 2), and is brecciated. About 20 m wide towards the west of stop 53. Has bedding-parallel pseudotachylitic breccia at stop 138, associated with pseudotachylitic breccia offshoots. Has poorly developed trough X-bedding indicative of overturned strata.

7 (Rgq9)	Quartzite (Mooiplaas and De Waal's farms)	Medium-grained (1.5 mm). Up to 3 mm grain size at stop 133 (session 2)	White with dark-grey interbeds.	Planar and trough cross-bedded at stop 55 (session 2). Trough x-beds indicate overturned strata at stops 55, 88, and 99. It hosts ripple marks at stop 623 (session 2). Gravelly beds at 442, grain size up to 1 cm. Has a dark grey colour at 577 and 578. The dark-grey interbeds are argillaceous quartzite. Rare grain size up to 8 mm observed. Andulated bedding surfaces are developed at stop 100 (session 2). Well laminated at 615 (3010). Has well-developed trough X-beds at 130 (session 3), and a cleaved unit with cleavage orientation 100/71 S. X-laminations of oxidised heavy minerals and sandy units are hosted (picture 3800).
7 (Rgq9)	Quartzite (Saaiman's farm)	Medium-grained	White	Exhibits trough X-beds. Bedding typically <5.5 cm thick, but beds <20 cm thick at stop 17 (Session 3). Has poorly developed ripple marks. The unit hosts bedding-parallel pseudotachylitic breccia at stop 21 (session 3).
8 (Rgq8)	Quartzite	Medium-grained	White	Well-laminated quartzite unit. It hosts bedding-parallel pseudotachylitic breccia and subparallel cleavage. It is also crosscut by 1cm spaced fracture cleavage.
9 (Rgq8)	Quartzite	Fine- to coarse-grained (up to 4 mm, 464).	Grey on fresh surface, and brown on weathered surface.	Quartzite unit with well-developed laminations and trough x-beds. Quartzite becomes more pelitic towards the south. Foliated at 463. It is interbedded with well-laminated (<1 cm interlaminations) argillaceous quartzite horizons. The trough x-beds and truncation surfaces indicate overturned strata (Saaiman's farm). The unit also hosts ripple marks, with a wavelength approximately 2.5 cm.
10 (Rgq6)	Quartzite	Medium- to coarse-grained.	White	Has a fracture fabric. Southern part is medium-grained and has well-developed trough X-beds. Pic 3203. This unit is at an angle to the #1 quartzite in Rondekop. This relationship is controlled by the Karolina Fault System.
11 (Rhq3)	Quartzite	Medium-grained	White	This unit hosts pseudotachylitic breccia and the strike becomes more N-S towards the east (Dr Mounton's farm). It is dark grey at stop 78 (session 2), which could be due to the presence of pseudotachylitic breccia. Unit is about 4 m wide in Dr Mouton's. It hosts trough X-bedding, indicating westward younging. Trough X-bedding indicating northward younging at stop 80 (session 2). A 0.3-1.5 cm spaced fracture cleavage is hosted at stop 114 (session 2). This unit is intensely deformed in the immediate footwall of the Karolina Fault. Has 2 cm wide ripple marks at stop 116, and also dominated by the spaced fracture cleavage. This is the same unit as #20.
12 (Rhq1)	Quartzite	Medium-grained	White	Deformed, with unrecognisable bedding at stop 76 (session 2). The unit hosts a spaced fracture cleavage with 8 mm spacing. Ripple marks developed at stop 12 (session 2). Dip-perpendicular fractures crosscut the quartzite in stop 13. Also has planar crossbeds at stop 16. The unit is the same as #19 unit.
13 (Rjq2)	Quartzite	Medium to coarse-grained.	Reddish-brown on weathered surface.	Massive impure quartzite, with poorly developed sedimentary structures. Grain size gets up to gravel-size at stop 569 (session 2). 1.7 mm grain size at stop 36, Book 3.
14 (Rjq2)	Quartzite	Medium to coarse-grained. Up to 3 mm	Reddish-brown on weathered surface, and white on a fresh one.	Trough X-bedding indicates overturned strata at stop 87 and 94 (session 2). It has well developed X-beds and laminations. Gravelly beds up to 3 mm in grain size are hosted.

15 (Rjq1)	Quartzite	Medium to coarse-grained. (1.7 mm)	Light Brown on weathered surface. Brownish grey on a fresh surface	This unit hosts poorly developed laminations and trough x-beds.
16 (Rgq8)	Quartzite	Medium- to coarse-grained	light brown	Very well laminated, down to mm-scale lamination spacing. The unit also hosts trough and herringbone x-bedding indicative of overturned strata.
17 (Rhq3)	Quartzite	Fine-grained	Dark grey on weathered surface, and brown on a fresh one.	A thin quartzite unit about 5 m thick. It is bounded by an ~5 m wide meta-ironstone in the south, and metapelite in the north.
18 (Rgq4)	Quartzite	Coarse-grained	white	Quartzite unit with well-developed trough X-beds.
19 (Rhq1)	Quartzite	Fine to medium-grained	White	This quartzite unit has a lumpy appearance, which could be due to compositional variation or fracture patterns (stop 32; session 2). It is generally massive, with poorly developed sedimentary structures. Has a marble-like appearance.
20 (Rhq3)	Quartzite	medium-grained	White	6 m wide, 15 m long quartzite block at stop 16, most likely part of the number 20 quartzite ridge. Well bedded, with trough X-beds indicating northward younging. It has fuchsitic beds. Herringbone X-bedding exhibited at stop 19. Also has bedding-parallel pseudotachylitic breccia, associated with darker offshoots. Quartzite beds show compositional difference by the way they weather at stop 20 (in a form of planar X-bedding). Impure at stop 26, Donkervliet. The unit cutting across the Vaal River has ripples marks, with a wavelength of 2cm. It is medium to fine-grained, white, trough X-bedded, and contains fuchsitic beds.
21 (Rhq2)	Quartzite	Medium-grained.	white	This quartzite unit is lumpy and breaks off easily. It has poorly developed sedimentary structures (session 3)
22 (Rhq3)	Quartzite	coarse-grained (2.5 mm)	light brown on a weathered surface, and light grey on a fresh one (pure)	Quartzite unit located in the footwall of the Karolina (eastern De Waal's). Same as quartzite unit #1. It's well bedded, but with poorly developed sedimentary structures. It's pretty continuous, meaning there is no major displacement towards the east. It has an ~10m wide zone of finer (medium-grained), greenish-grey and sheared quartzite unit. (session 3)
23 (pre-Ro)	Quartzite	Medium-grained	White	A 45 m wide quartzite unit south of the Ro unit. It is separated from the #24 quartzite by the Dominion Group meta-basalt and the granophyre dyke.
24 (pre-Ro)	Quartzite	Medium-grained	White	22 m wide quartzite unit. It is similar to #23 quartzite, with poorly developed sedimentary structures.
25 (Rgq7)	Quartzite	Medium grained	White	And approximately 15 m wide quartzite outcrop adjacent to the #6 meta-diamictite unit (Saaiman's farm)

1 (Rhs4)	Metapelite		Darker-brown to dark grey on weathered surface.	A cordierite-andalusite metapelite, which hosts andalusite porphyroblasts up to 5 cm. X-cut by irregular pseudotachylitic breccia veins at stop 120, with a significant block rotation (session 2). This is the same unit as #6 and #18 metapelite units.
2 (Rhs4)	Metapelite		Dark grey on a fresh surface.	Cordierite-garnet bearing metapelite that is poorly laminated, with cordierite and garnet up to 1.2 cm and 2 mm large respectively. Matrix has a vitreous lustre. It is relatively poorly bedded, and the cordierite porphyroblasts are randomly orientated.
3 (Rhs5)	Metapelite		Dark grey on a fresh surface.	A cordierite-andalusite metapelite with a porphyroblast size up to 1.3 cm and 2 cm respectively.
4 (Rgs1)	Metapelite		Dark grey on a fresh surface.	Well bedded cordierite metapelite, with cordierite porphyroblasts up to 5 mm large.
5 (Rgs2)	Metapelite		Dark grey on a fresh surface.	A planar-bedded metapelite, without any visible cordierite/andalusite porphyroblasts. There are rounded holes <1 mm wide, which could be eroded cordierite. The metapelite is magnetic. It is dominated by a 1.2 cm spaced fracture fabric trending ~352 at stop 49. It has quartzite lenses that are boudinaged. The quartzite lenses are typically 1.5 cm or less. The quartzite intercalations show a dextral micro-displacement of magnitude 7 cm. The orientation of the micro-fault is not attainable because of strong magnetism (425).
6 (Rhs4 and Rhs5)	Metapelite		Bluish-grey on weathered surface.	Cordierite-andalusite metapelite with cordierite porphyroblasts up to 1.5 cm at stop 51 (session 2). Andalusite porphyroblasts up to 2 cm long at 497. Better laminated and bedded than the n#2 metapelite (496). Andalusite porphyroblasts increase in size towards the north, from 6 mm (496) to 2.7 cm (498, session 2). There is more cordierite than andalusite (at the ridge bottom), and andalusite gets up to 3 cm long at stop 137 located towards the north. The unit is well bedded, with andalusite grains up to 3 cm long at stop 139 (also x-cut by pseudotachylitic breccia). Has andalusite and cordierite porphyroblasts 8 mm and 3mm respectively at 218 (session 2). The unit is characterised by ~2 cm thick quartzite lenses separated by muddy beds 3 cm thick.
7 (Rgs1)	Metapelite		Dark grey with white spots.	Andalusite-rich metapelite. It is poorly bedded, and hosts andalusite porphyroblasts up to 3.5 cm long in a black matrix. Andalusite grows around smaller, black blades of biotite. At some locations, andalusite makes up about 30% of the rock at outcrop scale. The unit has thinner quartzite lenses than the #6 metapelite. Andalusite porphyroblasts are up to 5 cm long at stop 141, Rondekop (session 2). The unit is better bedded and more quartz rich to the north in Donkervliet, stop 24. Cordierite reappears on the northern-most part of this unit (Donkervliet farm).
8 (Rgq8)	Metapelite		Greenish grey	See argillaceous quartzite in unit Rgq8. It weathers into curved surfaces.
9 (Rgs1)	Metapelite		Dark grey on a fresh surface.	A well-laminated metapelite with ~5 mm thick quartzite lenses. It weathers into a reddish-brown colour, maybe due to the presence of meta-ironstone to its north.
10 (Rhs5)	Metapelite		Dark grey on a fresh surface.	A well-bedded cordierite-andalusite metapelite. It contains cordierite and andalusite porphyroblasts up to 1.8 cm and 3 mm respectively at stop 548 (session 2).

11 (Rhs5)	Metapelite		Dark grey on a fresh surface.	This unit has a darker with vitreous lustre, bearing predominantly cordierite porphyroblasts up to 5 mm large. Has poorly developed beds and no quartzite lenses. It is slightly magnetic. Andalusite porphyroblasts up 2.5 cm where exhibited, and are displaced by a conjugate set of micro-faults (stop 79). This is the same unit as #9 metapelite.
12 (Rgs1)	Metapelite		Dark grey on a fresh surface.	Andalusite-rich, with grains up to 2.5 cm. This is the same unit as #7 metapelite.
13 (Rgs10)	Metapelite	Fine-grained	Grey	A pelitic unit about 6 m wide. It is interbedded with meta-ironstone, similar to pelitic units #14 and #15.
14 (Rgs10)	Metapelite	Fine-grained	Grey	Well laminated, without any visible porphyroblasts.
15 (Rgs10)	Metapelite	Fine-grained	Grey	Well laminated, but more quartz rich than the #14 unit.
16 (Rgs2)	Metapelite		Grey	This unit has no visible porphyroblasts. Comprises intercalated quartzite and pelitic horizons.
17 (Rhs4)	Metapelite		Dark grey on a fresh surface.	Cordierite-andalusite metapelite. Andalusite up to 1 cm and cordierite typically 2 mm at stop 35 (session 2). It hosts upward-fining Bouma sequences typically 5 cm thick, which indicate that the strata have been overturned. Quartzite intercalations are as thin as 5 mm. The thin quartzite intercalations are folded, indicative of soft sediment deformation.
18 (Rhs4)	Metapelite		Dark grey on a fresh surface.	Cordierite-andalusite metapelite with cordierite and andalusite porphyroblasts up to 5 mm and 2 cm respectively. Sandy beds are up to 15 cm thick at stop 33 (session 2). These quartzite beds show trough x-bedding, which indicates northward younging (overturned strata). 8 mm spaced fracture fabric is developed across the quartzite beds only. Cordierite 8 mm and andalusite 2.7 cm near its northern contact with quartzite (005), where quartzite beds are thicker as well (26 cm).Some cordierite porphyroblasts are hosted along troughs cross-bedding at 004 (session 2)
19 (Rgs1)	Metapelite		Dark grey on a fresh surface.	Cordierite (~80%) and andalusite (~20%) bearing, up to 1.3 cm and 1.8 cm respectively. It is well bedded, with a mafic mineral that is probably biotite. X-cut by irregular pseudotachylitic breccia at stop 17. Cordierite (70%) up to 1.5 cm wide, and andalusite (~30%) up to 5 mm long at stop 21.
21 (Rhs5)	Metapelite		Dark grey on a fresh surface.	The northern part is characterised by 2 mm wide cordierite pits. It's interlaminated, with typically 1 mm thick sandy and muddy laminations. The sandy laminations are up to 3.5 cm thick. The southern part is a Meta-slump, consisting of quartzite lenses that are folded and boudinaged.
22 (Rhs5)	Metapelite		Dark grey on a fresh surface.	Cordierite and andalusite bearing metapelite, with andalusite porphyroblasts up to 8 mm long.
23 (Rhs5)	Metapelite		Dark grey on a fresh surface.	Metapelite with quartzite 'balls' (rolled quartzite clasts). Very magnetic and cleaved, hosts a green platy mineral that is probably muscovite/chlorite. It also hosts folded and boudinaged quartzite intercalations. See meta-slump #32
24 (Rhs5)	Metapelite		Dark grey on a fresh surface.	Cordierite-andalusite metapelite with Cordierite (90%) typically 3 mm, and andalusite up to 1 cm long. Intercalated quartzite is typically 8 cm thick. Has very dark laminations, and characterised by a light-coloured and vitreous mineral that is probably muscovite.

25 (Rhs5)	Meta-slump		Dark grey on a fresh surface.	Cordierite metapelite. Characterised by its discontinuous, typically 2.5 cm wide quartzite beds. The quartzite is both boudinaged and folded. The unit is magnetic, similar to #23 metapelite.
26 (Rhs5)	Metapelite		Dark grey on a fresh surface.	Cordierite-biotite-andalusite metapelite. It's distinguished by its closely spaced sandy/muddy intercalations, and the significant amount of typically 1.2 mm long needles of biotite. Cordierite is typically 9 mm, but up to 2.3 cm; whereas the few andalusite exhibited are up to 2.4 cm long. Typically 3.5 cm thick fining upward sequences are exhibited (bouma sequence). A sharp shale-to-quartzite contact exists on the south-east part of the outcrop, which grades to a cordierite-rich muddy unit towards the north-west; thus northward younging.
27 (Rhs5)	Meta-slump		Dark grey on a fresh surface.	This unit is better bedded than #25 meta-slump. It still has boudinaged and folded quartzite units, and it's still magnetic.
28 (Rhs5)	Metapelite		Dark grey on a fresh surface.	Cordierite metapelite, with an average porphyroblasts size of 3 mm . It has very thin quartzite laminations, not greater than 4 mm.
29 (Rhs5)	Metapelite		Dark grey on a fresh surface.	Cordierite metapelite, with cordierite porphyroblasts up to 5 mm grain size. Quartzite intercalations not greater than 2.5 cm in thickness. Quartzite intercalations up to 5 cm thick at stop 52, with spacing less than 2 cm (session 3). Cordierite is typically 5 mm here, and the unit is x-cut by pseudotachylitic breccia. Both the #28 and #29 metapelites are poor in andalusite=same unit.
30 (Rhs5)	Metapelite		Dark grey on a fresh surface.	Poorly-bedded cordierite-andalusite metapelite with porphyroblasts that are typically 1.2 cm large.
31 (Rgs1)	Metapelite		Dark grey on a fresh surface.	Cordierite-andalusite metapelite. Cordierite typically 8 mm, and andalusite porphyroblasts up to 3 mm long. These are the smallest andalusite porphyroblasts recorded. It is poorly bedded, and has rare quartzite beds up to 3 cm thick, with ~25 cm spacing. Similar to metapelite unit #19.
32 (Rgs1)	Meta-slump		Dark grey on a fresh surface.	Highly magnetic, and looks like the meta-slump between the Rhq1 and Rhq3 quartzite ridges (Donkervliet farm).
1 (Rgs7+ Rgs8)	Meta-ironstone	Fine-grained	Brown	The meta-ironstone unit is intercalated with slatey units at 582 (session 2). It is also tightly folded, forming isoclinal folds. Magnetic.
2 (Rhs2/3)	Meta-ironstone	Fine-grained, with porphyroblast up to 1 cm.	Brown	Magnetic, and well bedded at stop 18 (session 2). It is generally not banded, but is more banded towards the north to form the #21 BIF. It hosts subrounded garnet porphyroblasts typically 1 mm.
3 (Rhc)	BIF	Fine-grained	Brown	BIF with chert bands. The unit exhibits Z-shaped isoclinal folds, whose axial planes trend ~010. BIF very magnetic.
4 (Rgs1)	Meta-ironstone	Fine-grained	Brown	Magnetic and not banded at Donkervliet, stop 23 (session 2). The meta-ironstone is well bedded, with poor outcrop. It is folded at 143, Rondekop (session 2).
5 (Rgs9)	Meta-ironstone	Fine-grained	Reddish brown	Magnetic meta-ironstone which hosts a cleaved. At stop 101 (session 2), the northern part of the unit has meta-ironstone interbedded with slate causing it not to be magnetic. The slate intercalations are up to 4.5 cm thick in Saaiman's farm. The southern part has no slate, and is magnetic. The magnetic part is more resistant, forming a small hill (626). Gets more pelitic and less magnetic

				towards the north.
6 (Rhc)	Meta-ironstone	Fine-grained	Reddish brown	Brecciated and magnetic. Fractures trend 322.
7 (Rgs1)	Meta-ironstone	Fine-grained	Reddish brown	Not magnetic.
8 (Rhc)	Meta-ironstone	Fine-grained	Reddish brown	Magnetic.
9 (Rgs10)	Meta-ironstone	Fine-grained	Reddish brown	Magnetic.
10 (Rjs1)	Meta-ironstone	Fine-grained	Reddish brown	Magnetic.
11 (Rgs10)	Meta-ironstone	Fine-grained	Reddish brown	Magnetic.
12 (Rgs10)	Meta-ironstone	Fine-grained	Reddish brown	It's brecciated and part of the #14 meta-ironstone. The unit is magnetic.
13 (Rgs10)	Meta-ironstone	Fine-grained	Reddish brown	Magnetic.
14 (Rgs10)	Meta-ironstone	Fine-grained	Brown	Magnetic and x-cut by pseudotachylitic breccia. Forms a small hill at stop 127 (session 2)
15 (Rgs9)	Meta-ironstone	Fine-grained	Brown	Magnetic.
16	Meta-ironstone	Fine-grained	Brown	Magnetic.
17 (Rgs5)	Meta-ironstone	Fine-grained	Brown	Magnetic and has a lumpy appearance.
18 (Rhs5)	Meta-ironstone	Fine-grained	Greenish brown	Magnetic and has a lumpy appearance.
19 (Rhs5)	Meta-ironstone	Fine-grained	Brown	Meta-ironstone is magnetic, and contains cordierite porphyroblasts typically 1.3 cm. It has meta-slump unit interbeds.
20 (Rhs1)	Meta-ironstone	Fine-grained	Brown	This meta-ironstone hosts hexagonal porphyroblasts of garnet, typically 3 mm. The unit is slightly magnetic.
21 (Rhc)	BIF	Fine-grained	Brown	Slightly magnetic, with typically 2 cm thick silicate bands. Bands are both folded and boudinaged (3712/13). The unit hosts Z-shaped folds, with subvertical fold axis trending about 010. Page 7 (Field book #3).
22 (Rhs5)	Meta-ironstone	Fine-grained	Brown	Magnetic, and has poorly developed sedimentary layering.
23 (Rgs8)	Meta-ironstone	Fine-grained	Reddish brown	Magnetic
24 (Rgs7)	Meta-ironstone	Fine-grained	Reddish brown	Magnetic

25 (Rgs8)	Meta-ironstone	Fine-grained	Reddish brown	Highly magnetic.
25	Meta-ironstone	Fine-grained	Reddish brown	Not magnetic in Saaiman's farm.
26 (Rgs7)	Meta-ironstone	Fine-grained	Reddish brown	Magnetic
1 (Rjs2)	Shale	Fine-grained	Red weathering	Shale with poorly-developed bedding. The outcrop highly fractured, as a result shale has a 'flaky' texture.
1 (Re)	Meta-basalt	Fine- to medium-grained	Dark grey	Parts of the rock are magnetic, rotating the campus needle by 180°. It does host any porphyroblasts on outcrop scale in Rondekop farm. It is too fine-grained to be classified as a meta-dolerite/dolerite.
2 (Re)	Meta-dolerite	Amphibole needles up to 3 mm	Greenish grey	
3	Meta-dolerite	Medium-grained (up to 1.5 mm)	Light grey on fresh surface.	The sill is foliated at stop 30 (session 2), and hosts a 1 cm wide quartz veins.
4	Meta-dolerite	Gets coarser down-slope (to the south)	Grey	Meta-dolerite is coarse-grained, typically 2 mm in size. It constitutes about 30% plagioclase, which is higher than in all the observed meta-dolerite sills. Grain size gets up to 2.5 cm in stop 14, Book 3.
4	Meta-dolerite	coarse-grained (2.5 mm)	Greenish grey	It has the highest plagioclase content compared to the rest of the meta-dolerites. The plagioclase content is up to 45%.
5	Meta-dolerite	medium-grained	Greenish grey	The unit hosts skeletal amphibole typically 2 mm long.
6	Meta-dolerite	Medium-grained (typically 1mm)	Greenish grey	It hosts skeletal amphibole up to 1 cm long at stop 389 (session 2).
7	Dolerite	medium-grained	Greenish grey	X-cut by pseudotachylitic breccia at 406. Pseudo. Breccia also at 416.
8	Dolerite	Medium-grained (1.5 mm)	Greenish grey	No amphibole.
9	Dolerite	Medium-grained	Grey on fresh surface.	Increases in grain size towards the south. It's X-cut by pseudotachylitic breccia. This meta-dolerite might be intruded in the bedding parallel fault and sinistral fault, or dragged along it if it was impact induced.
10	Dolerite	Medium-grained	Grey with white spots (plag.), on fresh surface.	

11	Meta-dolerite	Coarse-grained	Grey on fresh surface.	The meta-dolerite has depressions like cordierite metapelite (3965). It hosts typically 3 mm long amphibole needles.
12	Dolerite	Medium-grained	Grey with white spots (plag), on fresh surface.	No amphibole.
13	Dolerite	Medium-grained	Grey with white spots (plag), on fresh surface.	No amphibole.
14	Meta-dolerite	Medium-grained	Grey on a fresh surface.	Hosts skeletal amphibole up to 2 mm.
15	Dolerite	Medium-grained	Grey with white spots (plag), on fresh surface.	A dolerite sill approximately 4 m wide.
16	Dolerite	Medium-grained	Grey with white spots (plag), on fresh surface.	Dolerite is cross-cut by irregular networks of pseudotachylitic breccia.
17	Dolerite	Medium-grained	Grey with white spots (plag), on fresh surface.	No amphibole hosted on outcrop-scale.
18	Meta-dolerite	Medium-grained, up to 1.5 mm	Greenish grey (weathered). Light greenish grey with white spots (fresh).	This meta-dolerite sill is composed of mostly amphibole (greenish grey) and plagioclase (white). It's crosscut by quartz veins. It hosts amphibole blades up to 2.5 cm long at stop 13. Amphibole blades get longer towards the north at stop 16. Amphibole blades up to 7 mm at stop 34.
19	Meta-dolerite	Medium to coarse-grained	Greenish grey	Mostly medium grained, but coarsens to 2 mm towards the north-west. Contains grey and lighter coloured minerals that are most likely amphibole and plagioclase respectively (3648/49).
20	Meta-dolerite	Medium to coarse-grained	Greenish grey on fresh surface.	A dyke in the granite, but doesn't cut across the granophyre.
22	Meta-dolerite	Medium to coarse-grained	greenish grey on weathered surface	Hosts skeletal amphibole up to 3 mm.

23	Dolerite	Medium-grained	Brown on a weathered surface, and dark grey on a fresh one.	Looks like it contains small clasts. No bedding. It's X-cut by irregular pseudotachylitic breccia.
1	Granite	Coarse-grained, up to 6 mm.	Brown on weathered surface.	The granite is composed of about 51% quartz, 41% K-feldspar, and about 8% minor biotite. Granite is cross-cut by quartz veins, irregular pseudotachylitic breccia, and the granophyre dyke.
2	Dominion Group meta-basalt	Fine-grained	Black on weathered surface, Greenish grey on fresh surface.	Meta-basalt hosts quartz amygdales that are up to 1 cm large. Amygdales are subrounded and ellipsoidal. The meta-basalt is crosscut by quartz veins up to 7 cm thick, which are sinistrally displaced by microfaults. It is shinny/vitreous. Amygdales get up to 2.5 cm in Donkervliet.
3	Klipriviersberg Group meta-basalt	Fine-grained	Greenish grey on a weathered surface, and dark grey on a fresh one.	The unit hosts quartz amygdales that are typically 1.5 cm in diameter.
1	Granophyre	Fine-grained matrix with clasts.	Light Brown on weathered surface. Bluish grey on Fresh surface	The granophyre hosts a variety of clasts, with different shapes in a significant range of sizes. The dyke is ~35 m wide at stop 75 (session 2), and ~30 m wide at stop 111 (session 2), with predominantly quartzite clasts. The quartzite clasts are up to 13 cm large. The granophyre also hosts rounded wholes which are probably due to erosion of less resistant clasts (e.g. granite). The dyke is about 10 m wide at stop 115 (Session 2). The clasts are up to 22 cm long in stop 11 (Session 3). Quartzite and granite clasts form high relief and depressions respectively. The dyke 'holds up' the granite koppie at stop 11 (Session 3). So far quartzite and granite have been identified in the clasts populations.
2	Melt Rock	Fine-grained	Dark grey.	Hosts quartzite and dolerite clasts. The rock is slightly magnetic.
3	Melt Rock	Fine-grained	Black	Looks like pseudotachylitic breccia, which contains quartzite and meta-dolerite clasts.
4	Melt Rock	Fine-grained	Black	It is melt dominated, with a few clasts. Has quartz clasts and darker, unidentified ones (3764-66). Unit is about 15 m wide. Quartzite clasts are up to 30 cm large,. The melt rock forms a sill within metapelite.
5	Meta-diamictite	Fine-grained matrix with clasts.	Dark brown on weathered surface, and dark grey on a fresh one.	Clast size is typically a few mm, but you get quartzite clasts up to 1.3 cm. It's ~20 m wide, and it is at the approximate position of the major sinistral listric fault.
6	Meta-diamictite	Fine-grained matrix with clasts.	Dark grey of a fresh surface.	The meta-diamictite unit has clasts up to 3 cm in size. It's similar to that described at Reikies's and Saaiman's farms.

Table 1.2. Outcrop descriptions of lithologies mapped in the Central Rand Group of the study area.

CENTRAL RAND GROUP				
Unit #	**Rock Type**	**Grain size**	**Colour**	**Textures and other characteristics**
Rjo1	Quartzite	Medium-to coarse-grained. Up to 3 mm sized grains.	Light brown on a fresh surface.	This unit consists of quartzite units thicker than those in the West Rand Group. The quartzite unit has poorly-developed trough X-bedding, which indicates a northward younging direction. The unit coarsens towards the north. More pure than the northern Rjo2. It has trough laminations, pic 2544. Stop 5 (session 4) shows a 50 cm wide conglomerate bed hosted along the unit. The conglomerate is matrix-supported with clasts typically 8 mm large.
Rjo2	Quartzite	Medium-grained. Coarsens to 4 mm towards the north.	Brown on a weathered surface, and light brown on a fresh one.	The quartzite unit is interbedded with more brown impure units, which appear to be coarser-grained. The larger grain size is due to the presence of kyanite/andalusite porphyroblasts Poorly developed trough crossbedding indicates a northward younging direction. The unit contains quartz pebbles up to 1.5 cm large. The impure interbeds get up to 8 cm thick, and are cleaved, which reduced grain size to medium-grained at some locations. The quartzite unit hosts a number of conglomerate units. The quartzite is pebbly around these conglomerate units.
Rt3/4/5	Quartzite	Generally Coarse-grained		Pebbly coarse-grained quartzite at the southern contact, with subrounded and angular clasts up to 1.5 cm large. The unit is more medium-grained north of the C4 conglomerate (upward fining). The grain size coarsens up to 4 mm to the north of the C6 conglomerate unit.
C1	Conglomerate	Clasts 0.6-6.5 cm	Bedding: 034/36S	Conglomerate unit about 60 cm thick. It is clast-supported and hosts oval and sub-rounded clasts Has an average clast size of 2 cm, but up to 3 cm large in a coarse-grained matrix.
C2	Conglomerate (at least 5 units)	0.5-3 cm	Bedding: 034/36S	1.2 m thick, and matrix supported. Hosts oval to subrounded clasts. The conglomerate is in a coarse-grained quartzite, about 3 mm -sized grains. 5 conglomerate units counted. The conglomerate is only 30 cm thick west of Berakah farm, with clasts up to 6 cm, but typically 2 cm. Still matrix-supported, clasts in a coarse-grained matrix typically 2 mm. 5 units hosted here. There are thinner, more matrix-supported beds towards the south.
C3	Conglomerate (3 units)	Very coarse-grained	Bedding: 072/36S	Clast-supported 1 m thick conglomerate layer. Clasts are up to 4 cm large, in a coarse-grained quartzite matrix typically 4 mm. Average clast size ~1.4 cm.
C4	Conglomerate	Very coarse-grained	Bedding: 068/42S	Average clast size of 1.5 cm, but with clasts up to 3.7 cm. Has 2 populations of clasts, quartz and siltstone clasts that are subrounded in a medium-grained matrix. Grain size decreases to a reddish medium-grained quartzite north of the C4 clast-supported conglomerate. Has poorly sorted clasts. The one in Morala has clasts up to 3.5 cm, with an average of 1.7 cm. Siltstone clasts form depressions whereas quartz clasts stand out. Grain size north of it gets up to 6 mm, very coarse-grained quartzite. The C4 conglomerate is also hosted in Domain 9 (Berakah farm). It pinches out (lenses), and has clasts up to 3 cm with an average of 1.3 cm. Has a coarse-grained matrix. It has quartz, siltstone, and shale clasts. The conglomerate is also hosted adjacent to the eastern boundary of Domain 7, along andulated bedding with clasts up to 5.5 cm.
C5	Conglomerate	Very coarse-grained	Bedding: 061/30S	Matrix-supported conglomerate. It is bedded unlike the others, and has clasts up to 2 cm, at an average of 1.2 cm. only quartz clasts are observed.
C6	Conglomerate (3 units at least).	Very coarse-grained	Bedding: 054/30S	Clast-supported and divided into 3 units. Average clast size of 1.3 cm, but up to 2.8 cm.

C7	Conglomeritic	Very coarse-grained		A 10 m wide unit. It is matrix-supported, with clasts ranging from 0.8 cm to 12 cm, in a very coarse-grained matrix with minimum grain size of 4 mm. Clast populations are quartz, quartzite, and chert/smokey quartz.
Rt1	Quartzite	Medium- to coarse-grained		This unit is medium-grained at its southern contact, but becomes coarse-grained towards the north. It has a few centimetre thick meta-gravel bed with a typical grain size of 5 mm. It is composed of coarse-grained quartzite in the northern contact of the gravel bed.
Rt2	Kimberley Reefs conglomerates	Very coarse-grained		The southern-most conglomerate (oldest) is clast supported , with clasts up to 7 cm large, averaging 2.5 cm. the clasts are subrounded and moderately sorted. Clast composition is quartz only. There are about 11 conglomerate units counted, but 6 main units could be classified.
	K1	Very coarse-grained		This unit is clast supported , with clasts up to 7 cm large, averaging 2.5 cm. the clasts are subrounded and moderately sorted. Clast composition is quartz only.
	K2	Very coarse-grained		90 cm thick matrix-supported conglomerate. Clasts up to 1.5 cm, but typically 1 cm in a coarse-grained matrix about 3 mm in size. The unit hosts trough X-beds, indicative of overturned strata.
	K4	Very coarse-grained		20 cm thick clast-supported conglomerate that hosts up to 2 cm clasts, which are typically 1.2 cm. It is separated from K3 by a pebbly quartzite.
	K5	Very coarse-grained		35 cm matrix-supported conglomerate. Clast size up to 3 cm.
	K6	Very coarse-grained		80 cm thick matrix-supported conglomerate. Clast size up to 3 cm.
D	Dyke	Fine-grained	Greenish grey	About 10 m wide. It is crosscut by pseudotachylitic breccia (3867/68). Trends 320 at stop 1 (Session 3)

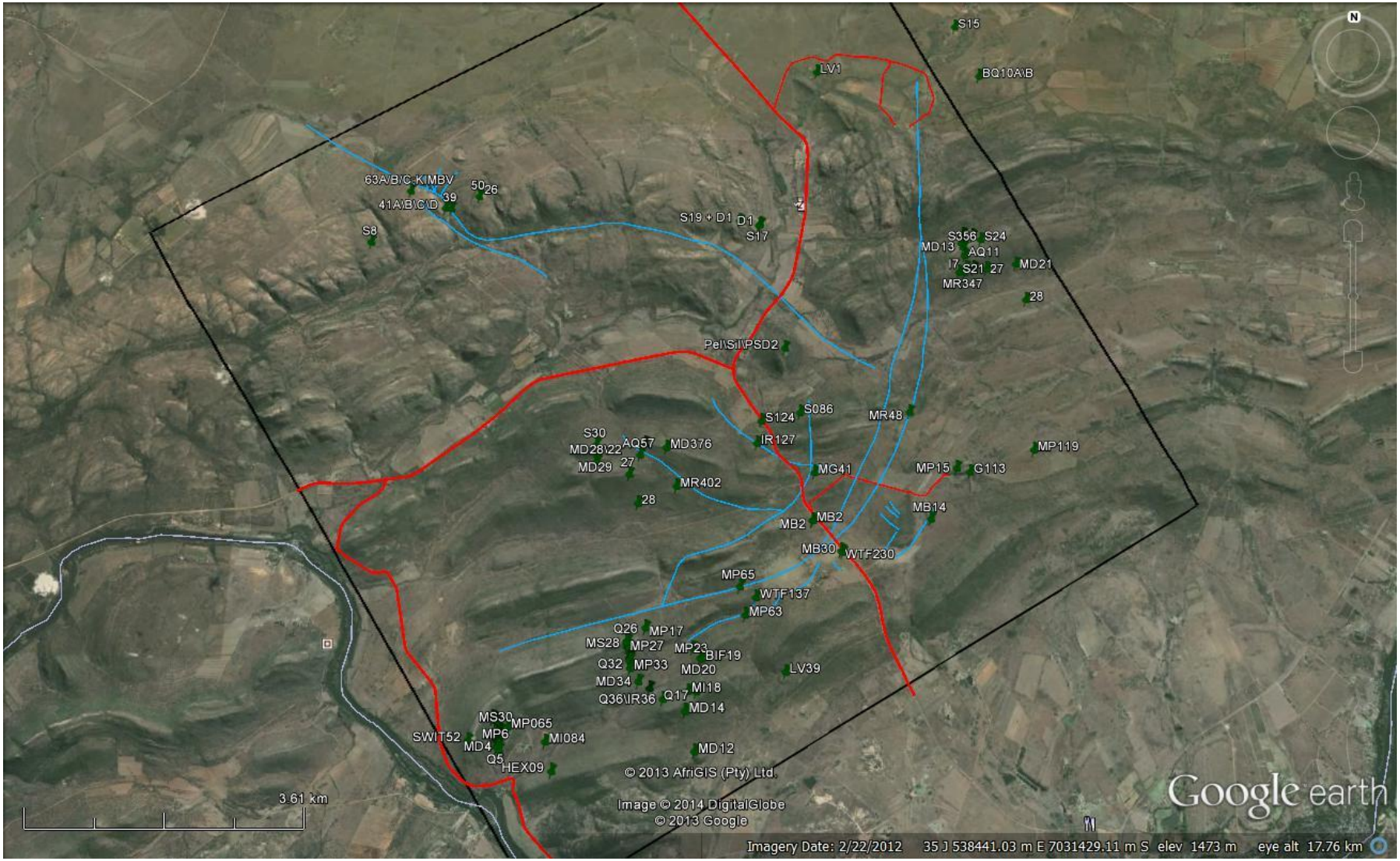


Figure 1.7. *The distribution of lithology samples collected from the study area (blue lines=pre-impact faults, red lines=road).*

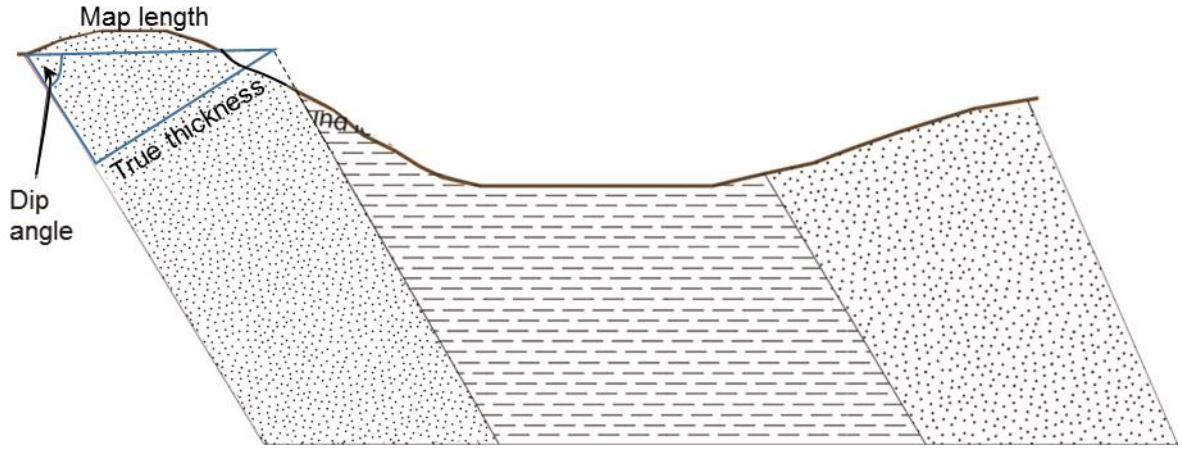


Figure 1.8. *Sketch illustrating calculation of the true thicknesses of lithological units.*

Unit Name	Sub-units	Strike	Dip Angle	Dip Direction	Distance from top contact		Calculated length (m)	Illustrator thickness
					Map Length (m)	Ground Length (m)		
Rjo2	C1	34	36	S	644.17	644.34	378.63	12.70
	C2	34	36	S	106.32	107.66	62.49	2.10
Rt (lengths measured from the bottom contact)	C3	72	36	S	47.65	47.88	28.01	0.94
	C4	68	42	S	164.14	167.28	109.83	3.68
	C5	61	30	S	392.83	406.17	196.42	6.59
	C6	54	30	S	486.17	498.89	243.09	8.15

Table 1.3. Table showing calculated thicknesses of lithologies using Google Earth.

		Unit Name	Sub-units	Strike	Dip Angle	Dip Direction	Surface width		Calculated True Thickness (m)	Illustrator thickne
							Map Length (m)	Ground Length (m)		
West Rand Group	Hospital Hill Subgroup	Rd		78	59		252.87	254.17	216.75	7.27
		Re		78	59		148.47	150.5	127.26	4.27
		Ro		178	59	S	125.7	125.84	107.75	3.61
		Rhs2\3		80	61	S	244.25	249.39	213.63	7.16
		Rhc		75	62	S	188.74	189.73	166.65	5.59
		Rhs4		71	58	S	277.82	280.53	235.60	7.90
		Re			58	S	241.45	246.49	204.76	6.87
		Rhq1		65	59	S	76.35	76.41	65.44	2.19
		Rhs5	MP	66	59	S	31.88	31.9	27.33	0.92
			IR	66	59	S	14.9	14.91	12.77	0.43
			MS	66	59	S	22.9	23.11	19.63	0.66
			MP	66	59	S	25.96	26.25	22.25	0.75
			MS	66	59	S	33.46	34.15	28.68	0.96
			MP	66	59	S	12.27	12.79	10.52	0.35
			IR	66	59	S	54.5	57.01	46.72	1.57
			MP	66	59	S	46.08	48.5	39.50	1.32
		Rhq3		66	60	S	103.24	105.12	89.41	3.00
	Government Subgroup	Rgs1		72	67	S	170.44	173.72	156.89	5.26
		Alluvium			67		221.53	222	203.92	6.84
		Rgs2		72	67	S	110.1	111.58	101.35	3.40
		Rgq3		73	66	S	519.61	520.06	474.69	15.92
		Alluvium			64		198.7	208.85	178.59	5.99
		Rgq6		75	62	S	106.44	108.58	93.98	3.15
		Alluvium			60		358.72	358.84	310.66	10.42
		Re			59		161.86	162.92	138.74	4.65

		Rgs6		97	57	S	105.77	106.67	88.71	2.97
		Rgq7		98	58	S	23.47	23.67	19.90	0.67
		Melt Rock			58		13.09	13.19	11.10	0.37
		Rgs7		90	57	S	66.48	66.67	55.75	1.87
		Re			60		129.91	130.76	112.51	3.77
		Rgq8		114	62	S	236.71	242.04	209.00	7.01
		Rgs9		120	60	S	63.73	64.14	55.19	1.85
		Rgq9		126	58	S	80.47	80.66	68.24	2.29
		Rgs10	Re	115	70	S	31.63	32.18	29.72	1.00
			IR	115	70	S	25.98	26.42	24.41	0.82
			MP	115	70	S	21.2	21.51	19.92	0.67
			Vdi	115	70	S	50.81	51.61	47.75	1.60
			MP	115	70	S	31.2	31.7	29.32	0.98
			IR	115	70	S	218.21	221.86	205.05	6.88
	Jeppestown Subgroup	Alluvium			68		161.71	162.75	149.93	5.03
		Rjq2		96	66	S	420.08	422.02	383.76	12.87
		Alluvium			62		1248.53	1248.93	1102.39	36.97
Central Rand Group	**Johannesburg Subgroup**	Rjo1		85	58	N	590.36	591.9	500.65	16.79
		Rjo2		34	36	S	727.64	727.86	427.70	14.34
		Alluvium			35		106.46	106.82	61.06	2.05
	Turffontein Subgroup	Rt3		52	33	S	636.25	644.6	346.53	11.62
		Rt5		97	26	S	1100.49	1100.75	482.42	16.18
		Alluvium		97	26		495.27	496.02	217.11	7.28

Ventersdorp Supergroup	Rk (V.Dorp)			35		707.14	707.79	405.60	13.60

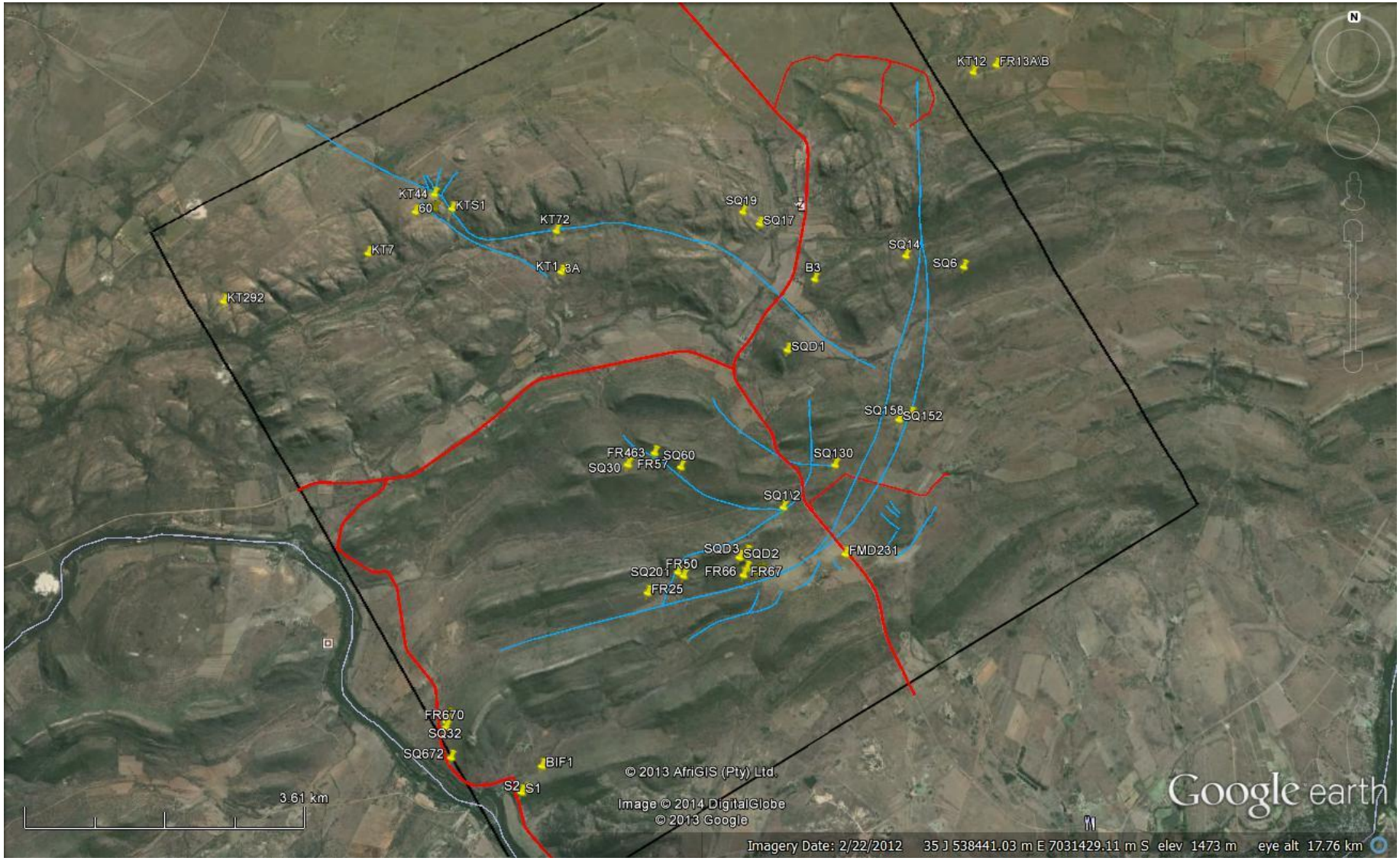


Figure 1.9. *The distribution of samples from sheared horizons relative to pre-impact faults (blue lines).*

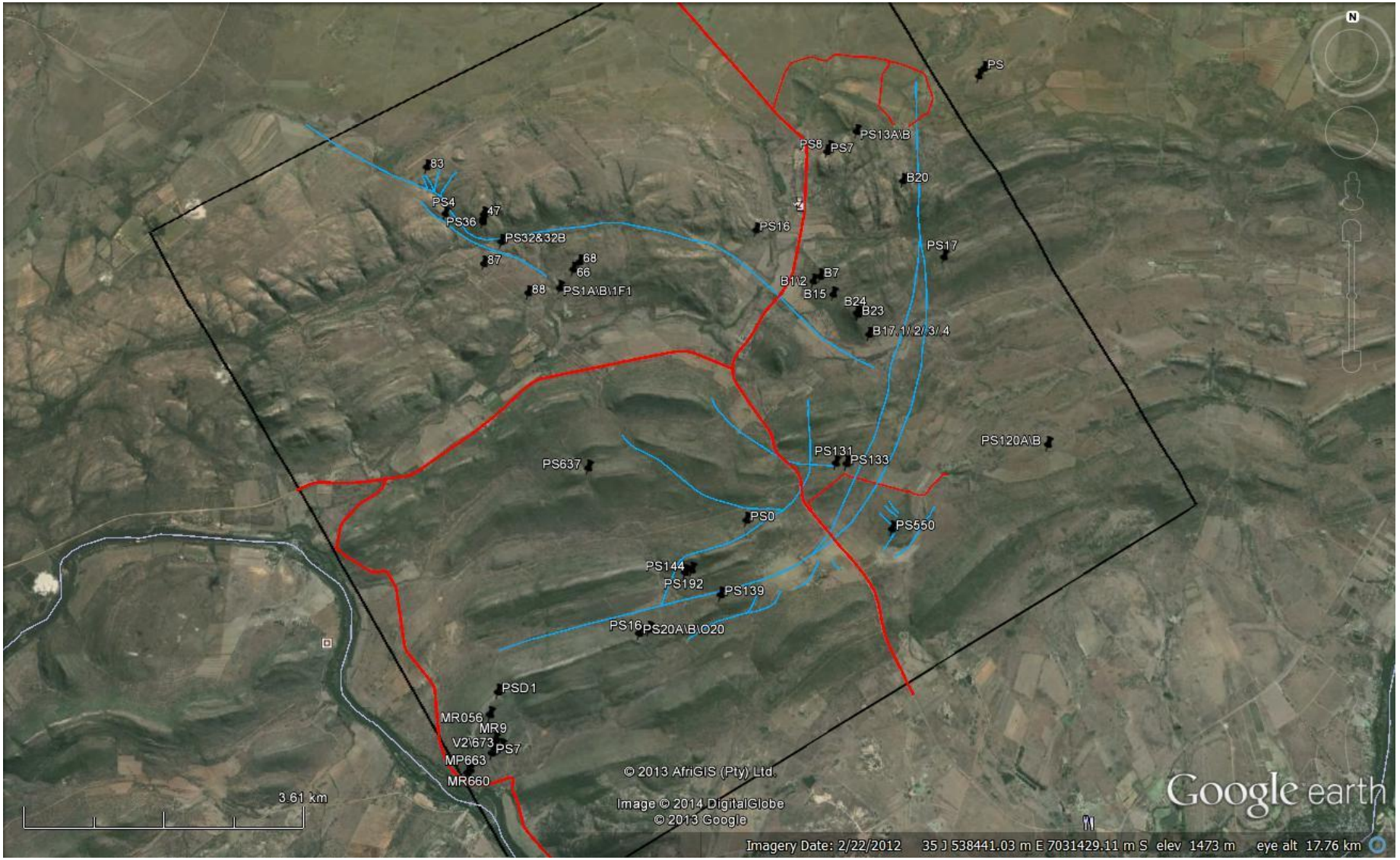


Figure 1.10. *The distribution of pseudotachylitic breccia samples.*

Table 1.4. Samples collected from the northern collar of the Vredefort Dome during the 1st mapping session.

SESSION 1 (09-25 May 2012)					
Locality	**X-Coordinate**	**Y-Coordinate**	**Sample #**	**Pictures**	**Description**
1	7033312	536387	PS1A	2073	2 cm wide, 360°-trending pseudotachylitic breccia vein.
1	7033312	536387	1B	2064,2059	3 cm wide, 104°-trending pseudotachylitic breccia vein.
1	7033312	536387	1F2	2058, 2063	4 cm wide, 330° and 310°-trending pseudotachylitic breccia veins.
32	7033963	535536	PS32	2236, 2237, 2238	Up to 40 cm wide pseudotachylitic breccia composed of a sub-horizontal breccia that is associated with vertical veins trending 084 and 350.
32	7033963	535536	PS32B		
37	7034228	535268	PS37	2268-2274	Poorly described, but pseudo veins are irregular, and up to 7 cm with large quartzite clasts
3	7033543	536383	3A	2078	8cm thick cleaved knotted quartzite horizon. It hosts skeletal chloritoid.
4	7033573	536446	KT1	2088	Knotted Quartzite. No cleavage seen on outcrop scale.
44	7034601	534557	KT44	2322	Knotted Quartzite. Poorly developed cleavage
41	7034413	534725	41A	2303-2312	A siltstone unit (41A, and maybe B) which is crosscut by pseudotachylitic breccia. They are both fine-grain and have a similar colour, sample 41C exhibits both of them, with the pseudotachylitic breccia being darker one. Sample 41D hosts quartz veins.
	7034413	534725	41B		
	7034413	534725	41C		
	7034413	534725	41D		
72	7034136	536290	KT72		A cleaved quartzite unit. Cleavage is well developed, and the sample is composed of skeletal chloritoid and muscovite minerals
60	7034319	534316	60	2411, 2412	A Mylonitic Zone. Cleavage well developed and crenulated
68	7033681	536658	68	2442, 2443	Pseudotachylitic breccia.
26	7034678	535220	26	2218	Fe-rich siltstone.
39	7034411	534806	39	2283	Elongate andalusite-bearing quartzite sample.
47	7034327	535279	47	2342-44	110-trending pseudotachylitic breccia vein sample.
50	7034578	535204	50		Medium-grained quartzite with shatter cones.
87	7033629	535310	87		Pseudotachylitic breccia sample
88	7033227	535951	88	2541	15 cm wide, 090-trending pseudotachylitic breccia vein.
83	7034988	534444	83	2525, 2526	Pseudotachylitic breccia. Contains large quartzite clasts.
36	7034266	535270	PS36	2263-66	Irregular pseudotachylitic breccia sample.
63	7034623	534242	63A, B	2422, 2423	Meta-diamictite sample.
	7034623	534242	KIMBV, 63C	2425, 2426	Pseudotachylitic breccia sample
1	7033483	539941	B1	2598	Irregular pseudotachylitic breccia up to 21 cm wide.
4	7033513	539943	B3		Knotted quartzite sample. It hosts a poorly-developed cleavage.
7	7033546	540035	B7	2615, 2616	7.5 cm wide, 069-trending pseudotachylitic breccia.
15	7033294	540218	B15	2633-2637	4 cm wide, 335 and 124-trending pseudotachylitic breccia sample
17	7032736	540720	B17.1	2642	6.5 cm wide, 066/66 S dipping pseudotachylitic breccia.
	7032736	540720	B17.2		4 cm wide, 006-trending subvertical pseudotachylitic breccia.
	7032736	540720	B17.3	2639,46,47	12 cm wide, 074/56 S dipping pseudotachylitic breccia.
	7032736	540720	B17.4	2649	A sample of a layered and subhorizontal pseudotachylitic breccia.
23	7033000	540560	B23	2673, 74	5 cm thick pseudotachylitic breccia developed along bedding.

					038/32 SE
24	7033019	540540	B24	2677,78,79	11 cm thick pseudotachylitic breccia hosted along a bedding plane. 352/26 E

Table 1.5. Samples collected from the northern collar of the Vredefort Dome during the 2nd mapping session.

SESSION 2 (09-Aug to 05-Sept 2012)					
Locality	**X-Coordinate**	**Y-Coordinate**	**Sample #**	**Pictures**	**Description**
1	7036603	539953	LV1	3099-3105	Amygdaloidal meta-basalt sample (Ventersdorp lava)
13	7035673	540531	PS13A	3157-61	Bedding-parallel pseudotachylitic breccia, orientated 010/32E.
	7035673	540531	PS13B	3164/65	Subvertical pseudotachylitic breccia veins. They Up to 30 cm wide, with a general trend of 109.
7	7035376	540114	PS7	3128-30	2cm wide pseudotachylitic breccia vein orientated 359/62E (bedding subparallel)
8	7035440	540147	PS8	3137	Pseudotachylitic breccia with dark-grey margins and a grey core. It looks it has chill margins.
2	7027087	535903	V2 & V673	3231	Brown veins Crosscutting quartzite in a 066° trend. Yellowish brown on weathered surface, with what appears to be quartz vesicles/clasts <1 mm. The vein doesn't look like the typical pseudotachylitic breccia.
	7027315	535141	FR670	3358-67	A sample of crenulation cleavage developed in the Rgq2 quartzite unit. S2 is subparallel to bedding (348/90), and S3 is perpendicular to dip. Sample orientated 354/36W.
	7026931	535230	SQ672		Cleaved quartzite sample from an outcrop exposed in a roadcut (Just north of the Donkervliet entrance. It should be the same unit as where FR670wa collected. This unit is probably the same as the sheared quartzite ridge in Rondekop.
	7026786	535509	MR660	3350-54	Melt rock that contains quartz, meta-dolerite, and meta-ironstone clasts. It is possibly related to the sinistral fault displacing Rhq3 quartzite unit.
	7028644	537794	PS16	3351/52	Pseudotachylitic breccia with clasts of metapelite and quartzite. The breccia is hosted in metapelite, and is irregular. The sample wasn't labelled, PS16 is the best bet.
20	7028589	537665	PS20A	3277	Pseudotachylitic breccia developed along bedding (117/66S). The breccia is divided into two zones, a middle one that is darker and glassier, bound by a 'cataclastic' zone of quartzite. The bedding-parallel vein has offshoots that never cut across it.
	7028589	537665	PS20B	3266-80	Bedding-parallel pseudotachylitic breccia sample. Same as PS20A, but thicker and bigger quartzite clasts. The offshoots have an elliptical flow texture (3274-76).
	7028589	537665	PSO20	3278	A sample of the offshoots. They are darker than the main vein, perhaps there is a compositional variation.
17	7028670	537738	MP17	3256	Cordierite-Andalusite bearing metapelite. Andalusite up to 2cm

					long.
36	7027754	537995	Q36		Ro quartzite unit sample.
	7027754	537995	IR36		A sample of the Rhs2/3 meta-ironstone.
35	7027887	537814	MP35	3342-44	A sample of cordierite-andalusite bearing metapelite. Andalusite up to 1cm long, and cordierite 2mm.
9	7026801	536563	HEX09	3245/46	A sample of the Rhs1 meta-ironstone, which hosts subidioblastic garnet porphyroblasts. It is developed in-between Ro quartzite unit.
32	7028242	537541	Q32	3327-29	Rhq1 quartzite unit sample.
31	7028273	537538	MP31		A sample of the Rhs5 cordierite-andalusite bearing metapelite. Andalusite up to 8mm long.
29	7028376	537553	MP29	3313-15	Cordierite metapelite. Cordierite up to 2mm, with sandy beds up to 305cm.
30	7028335	537549	MP30	3316-24	Rhs5 Meta-slump sample. It hosts quartzite lenses that are folded and boudinaged.
27	7028474	537492	MP27	3305-3309	A sample of the Rhs5 cordierite-andalusite bearing metapelite. Andalusite forms <5% of the porphyroblast.
34	7027971	537663	MD34	3339/40	Meta-dolerite sample with amphibole needles up to 7mm long.
33	7028139	537552	MP33	3331-3333	A sample of the Rhs5 cordierite -andalusite bearing metapelite. Cordierite porphyroblasts up to 1cm, and andalusite up to 1.8cm long. Quartzite beds up to 15cm thick.
28	7028419	537502	MS28	3310/11	Meta-ironstone sample with a lumpy, poorly bedded appearance. It is magnetic.
26	7028496	537504	Q26	3302-3304	Fine to medium-grained sample of the Rhq3 quartzite.
104	7030770	536903	PS637	3034-3039	A sample of irregular pseudotachylitic breccia crosscutting meta-dolerite.
113	7030851	542073	G113	3062-65	Granophyre dyke sample.
119	7031169	542940	MP119	3070/71	A sample of the Rhs4 cordierite-andalusite bearing metapelite. Andalusite up to 1cm long.
120	7031244	543145	PS120A	3072-75	A sample of irregular pseudotachylitic breccia that crosscuts metapelite. It hosts what appears to be meta-dolerite clasts.
120	7031244	543145	PS120B	3075-80	A sample of irregular pseudotachylitic breccia hosted in metapelite.
68	7029681	539060	FQ68	2948-50	Cleaved Rgq3 quartzite sample. Cleavage is orientated 055/80 S, which is subparallel to the bedding that strikes 055-072. Strike difference <20. The cleavage is dragged by Z-shaped isoclinal folds.
57	7031000	537780	FR57	2915/16	Cleaved quartzite sample. Cleavage orientated 140/50S, Subparallel to bedding.
53	7029436	539199	FR437	2904/05	A sample of the foliated Rgs2 metapelite.
30	7029727	540350	MB30	2834/35	Cleaved meta-dolerite sample.
67	7029475	539059	FR67		Cleaved Rgs2 metapelite unit.
57	7030828	537425	FR463	2924	Cleaved quartzite sample. The cleavage is orientated 078/42S.
79	7030049	541027	PS550	2972/73	A sample of pseudotachylitic breccia vein that crosscuts cordierite-andalusite metapelite.

66	7029385	539019	FR66		A sample of the foliated Rgs2 metapelite. The cleavage trends 084 and is subvertical. Has subhorizontal lineations. Sample orientated 10 on 268.
63	7028867	539057	MP63	2934	A sample of Rhs4 cordierite-andalusite metapelite (field description). Cordierite porphyroblasts are typically 1.5 cm.
65	7029238	538979	MP65	2937	A sample of the Rgs1 andalusite metapelite. Andalusite up to 2.5 cm.
39	7028142	539605	LV39	2854-58	Dominion Group meta-basalt sample.
9	7030301	539541	SQ1	2801-2804	A sample of a subvertical cleavage developed in quartzite, subparallel to bedding. Cleavage orientated 056/75S.
			SQ2	2801-2805	Cleaved quartzite sample.
124	7031491	539234	S124	3081-84	Meta-shale sample.
127	7031174	539177	IR127	3085	A sample of pseudotachylitic breccia hosted in meta-ironstone.
15	7030901	541896	MP15	2814-17	A sample of the Rhs4 andalusite-rich metapelite. Andalusite porphyroblasts up to 5cm.
139	7029120	538737	PS139	3190	A sample of pseudotachylitic breccia that crosscuts metapelite.
144	7029437	538341	PS144	3199-3201	A sample of cleaved quartzite, with pseudotachylitic breccia. The breccia is subparallel to bedding.
2	7030142	539944	MB2	2783-85	Meta-basalt/basalt sample.

Table 1.6. Samples collected from the northern collar of the Vredefort Dome during the 3rd mapping session.

SESSION 3 (15-Oct to 02-Nov 2012)					
Locality	**X-Coordinate**	**Y-Coordinate**	**Sample #**	**Pictures**	**Description**
3	7034398	534576	SQ3	3897-902	Cleaved quartzite sample. Cleavage is subparallel to bedding, but dips shallower. Cleavage orientated 064/17 S. The cleavage doesn't look to cut across the porphyroblasts of the knotted quartzite. From Google Earth images, this cleaved unit is displaced by later impact-induced faults, making this shearing pre-impact.
4	7034332	534733	PS4	3919-21	A sample of a 50 cm wide pseudotachylitic breccia.
12	7033997	542021	S356		Meta-shale sample
17	7033858	541761	PS17	4002-007	A sample of an 8 cm wide, bedding parallel pseudotachylitic breccia. The breccia is orientated 082/68S. It is black and glassy, and has a sharp contact with the quartzite.
14	7033864	541212	SQ14	3997-3999	Cleaved quartzite sample. The sample is reddish grey on fresh surface, and is medium to coarse-grained. Cleavage is subhorizontal, trending 035. This is oblique to bedding, which is orientated 067/64S.
7	7033640	542029	MR347	3976-80	Meta-diamictite sample. It is composed of a black matrix, with quartz clasts typically 4 mm, but up to 2 cm large. The melt rock is clast supported, unlike the granophyre in the south. Melt rock is a sill along meta-ironstone.

11	7033882	542031	AQ11	3984-87	Argillaceous quartzite sample. It is well laminated, with lamination spacing <1 cm.
6	7033718	542016	SQ6		Cleaved quartzite sample. The quartzite is fine-grained, with the cleavage parallel to bedding. Quartzite beds are orientated 058/66 S.
13	7034059	541992	MD13	3993-96	Dolerite sample. The sill is medium-grained, and seems to contain a few clasts. (3995/96)
7	7033712	542047	I7		Meta-ironstone sample. This sample is not magnetic.
19	7034200	542016	I19		Meta-ironstone sample. The unit is slightly magnetic.
24	7034112	542256	S24		Slate sample. It has sandy intercalations similar to those seen in some metapelites.
20	7034168	542145	MD20	4022-25	Dolerite sample. It has a grain size typically 1 mm. the sill is x-cut by pseudotachylitic breccia less than 2 cm wide. Same as MD13
1	7032950	531759	KT292	3891	Knotted quartzite sample from the Turffontein Subgroup. The cleaved zone is about 10 m wide. Porphyroblasts are typically 1.8 cm.
39	7034411	534806	KTS1		A bedding surface with andalusite porphyroblasts.
48	7031654	541258	MR48	3833	A sample of meta-diamictite with quartz clasts up to 1.3 cm large, but are typically a few mm large. It's dark brown on weathered surface, and dark grey on a fresh one. It is about 10 m wide.
49	7031624	541270	SQ158	3834/5	Cleaved quartzite sample. It is greenish brown on weathered surface, and greenish grey on a fresh one. Cleavage is bedding-parallel (070), and steeply south-dipping (75).
27	7027286	535873	MI27A&B	3732	Meta-ironstone sample. It's magnetic, and layered.
30	7027316	535831	MS30	3745-50	Meta-Slump sample. It's magnetic, and contains cordierite. It hosts folded and boudinaged quartzite intercalations within the dominant pelitic mass.
32	7027456	535766	MI32		Meta-ironstone sample. It's magnetic, but poorly bedded.
29	7027266	535820	MP29	3735-37	A sample of the Rhs5 cordierite-andalusite metapelite. It has closely spaced sandy/muddy intercalations, and a significant amount of typically 1.5 mm long biotite needles. Cordierite typically 9 mm, but up to 2.3 cm. A few andalusite porphyroblasts up to 2.4 cm.
31	7027415	535804	MP31	3751	A sample of the Rgs1 cordierite metapelite. Has cordierite typically 3 mm large. Fine-grained biotite rims the cordierite
43	7030896	540236	SQ130	3794-99	Sheared, grey quartzite sample. This is probably a more argillaceous horizon in the quartzite. Cleavage orientated approximately 100/71 S.
50	7029357	538218	FR50		A sample of the Rgs2 metapelite. Trends 004, subvertical. Sample trends 356. This unit is displaced by the later impact-induced faults. It hosts pink, subidioblastic garnet porphyroblasts.
51	7029700	540382	FMD231		Cleaved meta-dolerite sample.
51	7029405	538142	SQ201	3843/44	Cleaved quartzite sample. It's greenish grey on fresh surface, and is crenulated. The main cleavage trends 048, the second set trends at ~095; all subvertical.

8	7027215	535856	MI08		Meta-ironstone sample.
36	7031614	539760	S086	3781	Meta-shale sample.
41	7030789	539962	MG41		Argillaceous quartzite sample. The unit is well bedded, and dark grey on fresh surface, and has well developed trough X-laminations.
5	7027084	535834	Q5	3656-58	Medium-grained quartzite sample.
23	7028418	538372	MP23	3721-3730	Rhs4 cordierite-garnet metapelite sample. Poorly bedded, and hosts cordierite and garnet porphyroblasts. Cordierite is up to 2.4 cm large, with garnet typically 2 mm.
35	7027170	536465	MI084	3779/80	Meta-ironstone sample. It is garnet bearing.
34	7027492	535734	MR056	3764-74	Melt Rock sample. It hosts a few clasts. Has up to 2.4 cm large quartz clasts, and smaller darker clasts typically 5 mm. Clasts get up to 30 cm (3772). The unit is up to 15 m wide, within a metapelite unit.
33	7027467	535756	MP33	3752-57	A sample of the Rhs5 cordierite metapelite. Cordierite is typically 5 mm large, and quartzite intercalations are not more than 2.5 cm.
34	7027480	535705	MP065		Metapelite sample.
10	7027174	535818	MS10	3671-82	Meta-slump sample. Quite a heavy sample, and is magnetic. It's characterised by discontinuous, 2.5 cm wide quartzite beds. The beds are both folded and boudinaged, making this unit chaotic.
12	7027093	538425	MD12	3688	A sample of the medium- to coarse-grained meta-dolerite dyke X-cutting granite. It does not cut across the granophyre to the south.
14	7027607	538292	MD14		A sample of a coarse-grained meta-dolerite (2.5 mm).
17	7027861	538430	Q17	3696-701	Medium-grained quartzite sample.
18	7027865	538320	MI18	3706-708	A sample of a well-bedded meta-ironstone.
6	7027100	535820	PS6	3659	A sample of a bedding-parallel pseudotachylitic breccia (018/56E).
7	7027003	535780	PS7	3663	A sample of a 5.5 cm thick pseudotachylitic breccia trending 122, subvertical. This rock is different because it contains more than one type of clasts, composed of meta-ironstone and quartzite.
20	7028299	538473	MD20		Coarse-grained meta-dolerite (2 mm). Bluish grey, and is dominated by greenish platy mineral, most probably muscovite.
19	7028282	538492	BIF19	3712-14	Banded Iron Formation. Magnetic and has silicate bands typically 2 cm.
6	7027100	535820	MP6	3653-55	Cordierite-andalusite metapelite. Cordierite typically 3 mm, and andalusite up to 1 cm long. Well-bedded, with quartzite intercalations typically 8 cm thick.
9	7027163	535811	MR9	3665-70	Pseudotachylitic breccia with quartzite and meta-dolerite clasts.
43	7030918	540408	PS133	3812	A sample of an irregular pseudotachylitic breccia.
45	7031540	541108	SQ152	3824-32	Cleaved quartzite sample. Main cleavage is orientated 003/52E. There looks to be a second set of cleavage orientated subparallel to bedding (3824/25). As a result, the main cleavage shows small-scale crenulations.

50	7029402	538254	PS192	3836-39	A sample of a 30 cm wide pseudotachylitic breccia, trending 024. It's associated with bedding rotation, and is characterized by flow textures. It has a heterogeneous clast composition: depressions that look to be meta-dolerite, and harder clasts that are most likely quartzite, but could also be andalusite.
43	7030922	540263	PS131	3801-810	A sample of Irregular pseudotachylitic breccia.
	7027050	535862	MD4	3646-50	A sample of a medium- to fine-grained meta-dolerite. It is crosscut by pseudotachylitic breccia.
60	7030816	538143	SQ60		Cleaved quartzite sample. Cleavage is orientated 120/60 S.
60	7030562	538096	MR402	4047-51	Meta-diamictite sample. The unit hosts quartzite clasts that are not greater than 3 cm. It is clast-supported and it is host along meta-ironstone. This rock is very similar to Sample MR347 in Saaiman's farm.
59	7031079	531079	MD376	4043	Medium-grained Meta-dolerite sample. X-cut by irregular pseudotachylitic breccia.
56	7031133	537653	I56		Meta-ironstone.
57	7030971	537590	AQ57	4036-39	Argillaceous quartzite sample. Characterised by mm-spaced muddy laminations.

Table 1.7. Samples collected from the northern collar of the Vredefort Dome during the 4th mapping session.

SESSION 4 (18-25 May 2013)					
Locality	**X-Coordinate**	**Y-Coordinate**	**Sample #**	**Pictures**	**Description**
2	7027477	535162	CR1	71-75	A sample of crenulated cleavage developed along a plane orientated 088/40 S. The crenulation is seen in a section along the strike. Crenulation cleavage is orientated 38 on 168, different from previous stops where lineation is along strike, not dip. The crenulated cleavage trends at about 074. the crenulating cleavage is subvertical and trends 172, along the trend of the pen (75)
23	7029458	539262	FR23	165/66	A sample of the foliated Rgs2 metapelite. It has a subhorizontal crenulation lineation trending 05 on 264. The main cleavage is orientated 068/78 S, and is crenulated by cleavage trending about 075/8-15 N. This crenulation orientation is similar to that in Donkervliet, and the foliated rock has garnet porphyroblasts <1 mm.
24	7029428	539186	FR24	167-69	A sample of the Rgs2 metapelite. The intersection lineation on this sample is steeply dipping, orientated at about 68 towards the western strike (250). There seems to also be a weak subhorizontal one.
25	7029121	537746	FR25		A sample of the foliated Rgs 2 metapelite, which trends 048.
28	7030867	537012	MD28	179	Meta-dolerite sample from the southern margin in contact with Rgq8 argillaceous quartzite. This rock is not supposed to be metamorphosed according to Bisschoff's map. Medium-grained, about 1 mm, and appears to have poorly developed skeletal texture.

29	7030945	537002	MD29		A sample of a fine-grained meta-dolerite from the northern margin of the MD28 sill. It still has that poorly developed skeletal mineral, probably amphibole.
30	7031095	536991	S30		Meta-shale sample.
30	7030827	537424	SQ30		Cleaved quartzite sample, orientated 067/38S. The cleavage is slightly oblique to bedding
32	7027384	535141	SQ32		Crenulated quartzite sample. Main cleavage is orientated 333/82 E. The crenulating cleavage is orientated 320/28 W. Crenulation intersection lineation is orientated 26 on 180 and 28 on 175. Bedding is orientated 352/76E. Greenish grey colour.
10	7036568	542279	BQ10A		Brecciated quartzite samples collected from Surrel's farm.
	7036568	542279	BQ10B		Brecciated quartzite samples collected from Surrel's farm.
12	7036630	542195	KT12		Cleaved knotted quartzite sample.
13	7036750	542525	FR13A		Fault rock sample. It hosts a 045-trending subvertical cleavage.
	7036750	542525	FR13B		fault rock trends ~040, dips 60 E.
15	7037325	541941	S15		A sample of the meta-shale unit associated with the Kimberley Reefs.
16	7034214	539127	PS16	134/135	A sample of a 25 cm thick pseudotachylitic breccia developed oblique to bedding.
16	7034284	539156	S17		A sample of an Immature, pelitic unit associated with the Kimberley Reefs.
17	7034302	539157	SQ17		A sample of a cleaved quartzite unit, with cleavage orientated oblique to bedding.
19	7034450	538918	SQ19	138/139	A sample of a bedding-oblique cleavage that is X-cut by pseudotachylitic breccia, and is also kinked by 025 and 360 SV fractures.
20	7034939	541183	B20		A sample of a 60 cm wide breccia trending 326. Contains only quartzite clasts.
21	7033787	542754	MD21		Sample from the southern contact of a medium-grained meta-dolerite. It has a typical grain size of about 1.5 mm.
21	7033644	541952	S21		A sample of meta-shale.

Table 1.8. Samples collected from the northern collar of the Vredefort Dome during the 5th mapping session.

SESSION 5 (31-Aug to 04-Sept 2013)					
Locality	**X-Coordinate**	**Y-Coordinate**	**Sample #**	**Pictures**	**Description**
	7032511	539541	Pelite		A sample of a 'pelitic' unit adjacent to the dolerite dyke hosted in Rjo1 quartzite unit (De Waal's).
			Sill		A sample of the dolerite dyke that divides the Rjo1 koppie into two. The ridge looks folded as a result.
			PSD2		A sample of pseudotachylitic breccia hosted in the quartzite.
	7032482	539572	SQD1		A sample of quartzite with a poorly-developed cleavage. Sample is orientated 020/62E.

	7027788	535838	PSD1		A sample of bedding-parallel pseudotachylitic breccia with two populations of clasts; quartzite and dark-grey clasts.
	7026857	536432	BIF1		A sample of a cleaved, garnet-bearing meta-ironstone horizon. Garnet is typically 1 mm large. The sample is along bedding and orientated 080/46S.
	7026519	536176	S1		Cleaved metapelite sample. Cleaved horizon trends 045, with the cleavage orientated 011/70E.
	7026553	536248	S2		Cleaved metapelite sample.
	7029614	538959	SQD2		Cleaved Rgq3 quartzite sample. Cleavage is orientated 050/70S.
	7029682	539056	SQD3		Cleaved quartzite sample.

APPENDIX II

STRUCTURAL MEASUREMENTS

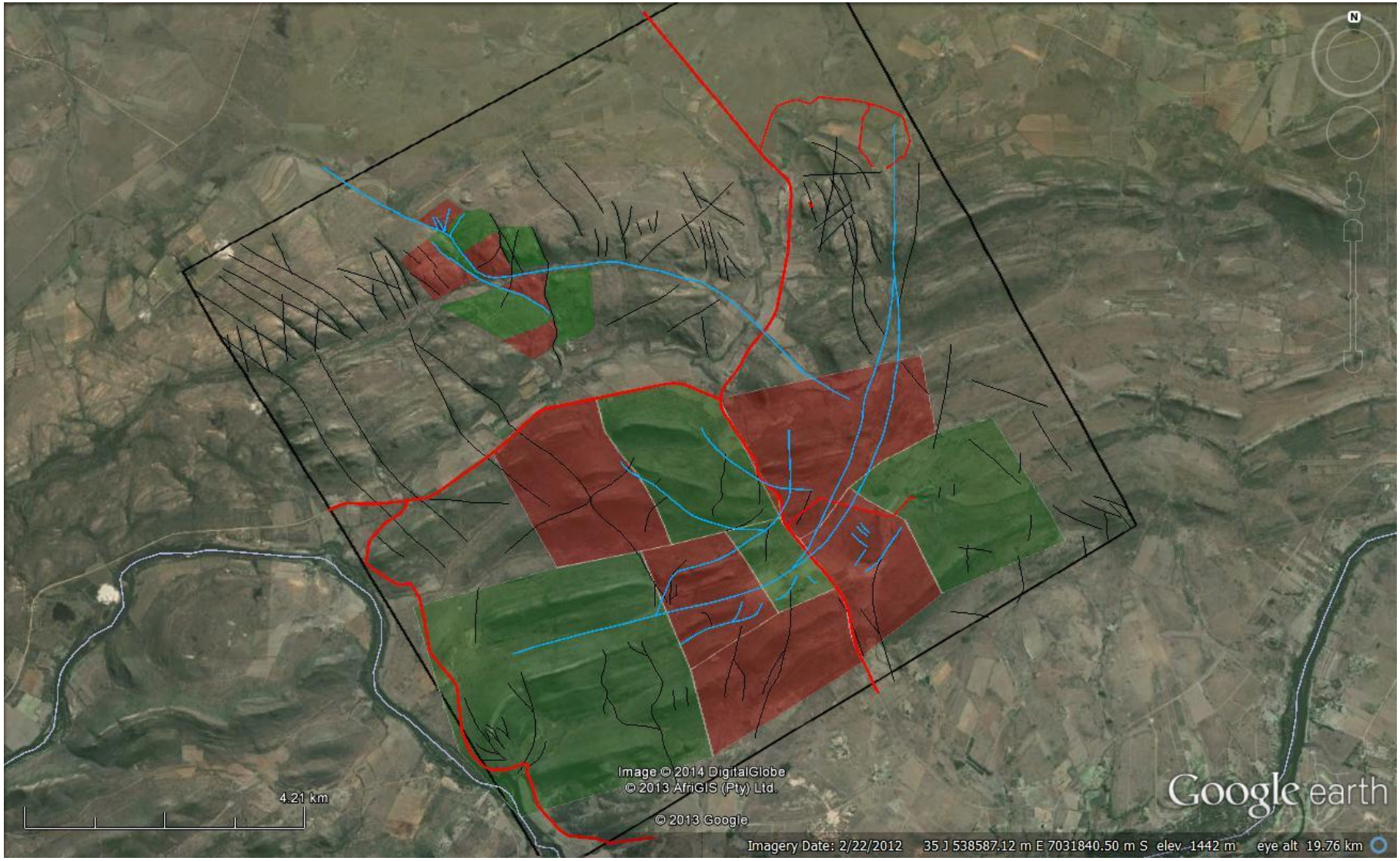


Figure 2.1. *Parts of the study area divided into structural domains. The boundaries of the domains are controlled by fault rotations and farm boundaries*.

Table 2.1. Bedding measurements.

X-Coordinate	Y-Coordinate	Strike (degrees)	Dip angle (degrees)	Dip direction
7034020	534685	78	36	S
7034020	534685	60	39	S
7034055	534666	62	40	S
7034095	534505	62	40	S
7034095	534505	60	36	S
7034176	534304	48	35	S
7034176	534304	63	33	S
7034176	534304	48	32	S
7034176	534304	61	32	S
7034498	534305	56	34	S
7034498	534305	58	28	S
7033668	533720	49	60	S
7033668	533720	50	60	S
7034097	533659	57	46	S
7034097	533659	50	39	S
7034097	533659	58	42	S
7033670	535655	48	42	S
7033670	535655	38	40	S
7033670	535655	47	32	S
7033711	535248	25	38	S
7033711	535248	46	34	S
7033720	535564	52	30	S
7033720	535564	51	34	S
7033720	535564	47	37	S
7033723	535157	28	38	S
7033582	535023	68	80	S
7033696	535116	35	80	S
7033014	535857	86	58	N
7033014	535857	107	50	N
7033582	535023	67	84	N
7033723	535157	43	26	S
7033014	535857	104	62	N
7033154	535816	86	58	N
7033154	535816	113	57	N
7033305	535882	62	70	S
7033305	535882	61	72	S
7033312	536387	107	76	N
7033389	536240	77	86	N
7033389	536240	78	89	N
7032952	535845	94	60	N
7032952	535845	99	56	N
7032952	535845	82	55	N
7032983	535801	93	60	N
7032983	535801	102	67	N
7033140	535606	64	80	N
7033140	535606	60	78	N
7034378	534804	80	22	S
7034378	534804	65	24	S
7034378	534804	86	24	S
7034378	534804	70	28	S
7034461	534665	64	22	S
7034461	534665	75	23	S
7034513	534644	65	30	S
7034513	534644	64	26	S
7034884	534360	100	24	N
7034923	534433	334	50	NE
7034923	534433	348	54	NE
7034923	534433	343	50	NE
7034601	534557	54	34	S

7034601	534557	62	37	S
7034411	534806	73	35	S
7034411	534806	92	32	S
7034884	534360	100	24	N
7034923	534433	334	50	NE
7034923	534433	348	54	NE
7034923	534433	343	50	NE
7034946	534520	86	30	N
7034957	534595	62	22	N
7034968	534460	165	45	E
7034968	534460	165	42	E
7034971	534518	92	32	N
7034971	534518	105	28	N
7035000	534603	4	28	W
7035000	534603	2	22	W
7034985	534597	344	24	W
7034985	534597	353	22	W
7034879	535108	90	24	S
7034879	535108	82	26	S
7034879	535108	107	30	S
7034943	535041	80	24	S
7034958	534742	105	28	S
7034958	534742	108	32	S
7034993	534967	114	26	S
7034993	534967	110	24	S
7034993	534967	116	24	S
7034994	534800	87	20	S
7034994	534800	72	20	S
7034071	535405	68	45	S
7034071	535405	64	32	S
7034074	535378	72	36	S
7034074	535378	73	38	S
7034131	535383	77	43	S
7034131	535383	68	38	S
7034140	535339	67	46	S
7034140	535339	75	44	S
7034180	535371	68	46	S
7034180	535371	68	38	S
7034180	535371	76	34	S
7034180	535371	77	40	S
7034238	535350	80	52	S
7034238	535350	84	50	S
7034323	535261	30	22	S
7034323	535261	24	20	S
7034323	535261	47	22	S
7034327	535279	29	24	S
7034327	535279	22	17	S
7034346	535515	70	22	S
7034346	535515	80	20	S
7034479	535242	54	16	S
7034479	535242	44	20	S
7034578	535204	26	32	S
7034578	535204	20	30	S
7034601	535230	58	33	S
7034601	535230	60	40	S
7034641	535443	53	36	S
7034678	535220	65	22	S
7034678	535220	48	24	S
7033543	536383	80	62	S
7033543	536383	70	82	S
7033573	536446	97	77	S
7033590	536459	75	51	S
7033590	536459	100	44	S
7033926	536184	82	60	S
7033959	535798	110	68	S
7033960	535671	99	72	S

7033980	535789	90	60	S
7033981	536076	99	72	S
7033986	535761	112	74	S
7033986	535761	100	78	S
7033995	535833	90	62	S
7034010	536071	108	70	S
7034047	535850	117	72	S
7034055	536031	101	72	S
7034058	536062	114	60	S
7034058	536062	110	58	S
7034064	535870	110	62	S
7034071	535941	110	68	S
7034071	535941	110	64	S
7034071	535941	94	66	S
7034098	536381	95	46	S
7034098	536381	93	53	S
7034152	536324	90	48	S
7034152	536324	72	60	S
7034402	535703	343	16	NE
7034402	535703	14	7	E
7034409	535654	357	5	E
7034409	535654	9	4	E
7034413	535674	13	8	E
7034413	535674	18	7	E
7034433	535717	3	10	E
7033926	536184	82	60	S
7034152	536324	90	48	S
7034152	536324	72	60	S
7034098	536381	95	46	S
7034098	536381	93	53	S
7033543	536383	80	62	S
7033543	536383	70	82	S
7033573	536446	97	77	S

7033590	536459	75	51	S
7033590	536459	100	44	S
7032799	540689	64	58	S
7032799	540689	74	52	S
7032832	540748	64	52	S
7032854	540668	58	50	S
7032854	540668	58	52	S
7032906	540633	60	52	S
7032906	540633	57	52	S
7032923	540610	60	52	S
7032923	540610	50	46	S
7032923	540610	66	42	S
7032970	540582	43	44	SE
7032970	540582	55	46	SE
7033019	540540	34	36	S
7033019	540540	24	37	S
7033294	540218	50	42	S
7033294	540218	54	30	S
7033353	540041	58	38	S
7033353	540041	64	40	S
7033353	540041	57	36	S
7033384	540229	66	32	S
7033384	540229	52	33	S
7033408	540230	60	38	S
7033408	540230	57	38	S
7033483	539941	52	31	S
7033483	539941	54	30	S
7033493	539948	110	20	S
7033493	539948	90	22	S
7033497	539976	56	26	S
7033497	539976	57	21	S
7033517	539961	75	32	S
7033517	539961	72	32	S

7033552	539995	62	30	S
7033552	539995	70	28	S
7033552	539995	87	24	S
7036718	541789	40	25	S
7036718	541789	43	20	S
7036718	541789	46	22	S
7036503	542319	62	24	S
7036480	542197	44	46	E
7036480	542197	46	40	E
7036480	542197	45	48	E
7036603	542233	41	22	E
7036603	542233	44	20	E
7036603	542233	50	24	E
7036630	542195	62	20	S
7036630	542195	50	22	S
7036746	542157	64	22	S
7036746	542157	57	24	S
7036708	542355	81	38	S
7036708	542355	80	37	S
7036708	542355	91	42	S
7036663	542462	63	22	S
7036663	542462	62	25	S
7036790	542576	78	44	S
7036790	542576	79	45	S
7036790	542576	78	46	S
7036898	542504	91	22	S
7036898	542504	85	21	S
7036898	542504	94	20	S
7037385	541568	110	28	N
7037457	541884	330	42	W
7037344	541956	22	55	W
7034274	539286	323	52	S
7034274	539286	321	52	S

7034274	539286	324	58	S
7034209	539126	117	70	S
7034302	539157	113	50	S
7034302	539157	104	55	S
7034302	539157	110	56	S
7034421	538995	95	60	S
7034421	538995	102	64	S
7034421	538995	96	54	S
7034450	538918	87	54	S
7034450	538918	91	48	S
7034450	538918	92	50	S
7034349	538836	89	67	S
7034349	538836	91	74	S
7034349	538836	97	63	S
7034262	539025	97	45	S
7034262	539025	98	48	S
7036473	539843	312	72	N
7036473	539843	321	72	N
7036473	539843	314	65	N
7036473	539843	307	74	N
7036473	539843	326	72	N
7035770	540561	356	32	E
7035770	540561	338	28	N
7035770	540561	340	33	N
7035919	540468	332	44	N
7035919	540468	338	39	N
7035926	540378	346	45	E
7035926	540378	347	43	E
7035926	540378	347	58	E
7035790	540466	8	34	E
7035790	540466	9	32	E
7035845	540456	328	34	E
7035845	540456	332	34	E

7035915	540385	340	46	E
7035915	540385	343	42	E
7036096	540306	314	80	N
7036096	540306	307	88	N
7036096	540306	300	80	N
7036089	540363	336	52	E
7036089	540363	329	54	E
7036049	540452	339	56	E
7036049	540452	339	53	E
7036049	540452	336	63	E
7035957	540559	345	50	E
7035957	540559	344	44	E
7035475	539976	33	62	S
7035475	539976	42	54	S
7035475	539976	35	66	S
7035371	540041	4	56	E
7035371	540041	360	54	E
7035371	540041	2	54	E
7035440	540147	48	52	S
7035440	540147	43	56	S
7035440	540147	49	57	S
7035371	540134	43	40	S
7035371	540134	54	40	S
7035371	540134	53	38	S
7035356	540258	49	47	S
7035356	540258	48	50	S
7035356	540258	43	48	S
7035455	540357	38	58	S
7035455	540357	34	47	S
7035455	540357	22	44	E
7035628	540395	20	30	E
7035628	540395	19	34	E
7035628	540395	22	38	E

7035673	540531	12	32	E
7035673	540531	9	40	E
7035673	540531	10	42	E
7035770	540561	19	27	E
7035699	540594	18	42	E
7035699	540594	12	40	E
7031281	537556	112	66	S
7031281	537556	109	58	S
7031281	537556	107	68	S
7031276	537595	120	61	S
7031276	537595	119	67	S
7031276	537595	117	68	S
7031253	537663	127	56	S
7031253	537663	123	58	S
7031253	537663	128	60	S
7031023	537761	100	54	S
7031023	537761	103	56	S
7031002	537797	98	54	S
7031002	537797	102	58	S
7031002	537797	95	60	S
7030930	537609	75	75	S
7030930	537609	86	66	S
7030892	537551	62	72	S
7030892	537551	60	69	S
7030828	537425	84	52	S
7030828	537425	83	60	S
7030778	537282	83	72	S
7030778	537282	84	74	S
7030778	537282	90	65	S
7030769	537046	76	50	S
7030769	537046	71	54	S
7030769	537046	80	50	S
7030784	536991	20	59	S

7030791	536947	76	66	S
7030791	536947	70	62	S
7030734	536908	65	60	S
7030734	536908	59	54	S
7030769	536866	82	56	S
7030769	536866	94	57	S
7030791	536818	83	62	S
7030791	536818	88	54	S
7030791	536735	78	64	S
7030902	536685	70	58	S
7030902	536685	50	47	S
7030902	536685	79	52	S
7030902	536685	72	50	S
7031049	536778	75	54	S
7031049	536778	67	50	S
7031226	537391	56	52	S
7031226	537391	60	54	S
7031226	537391	65	45	S
7031177	537315	60	46	S
7031177	537315	56	56	S
7031167	537241	86	54	S
7031167	537241	80	56	S
7031164	537099	81	55	S
7031164	537099	89	66	S
7031115	537056	92	66	S
7031115	537056	89	65	S
7031025	537024	82	56	S
7031025	537024	90	58	S
7030898	536670	63	48	S
7030898	536670	66	58	S
7030898	536670	62	52	S
7031792	536961	104	64	S
7031792	536961	102	62	S

7031254	539452	107	74	S
7031254	539452	106	72	S
7031491	539234	92	71	S
7031491	539234	82	70	S
7031491	539234	84	69	S
7031283	539353	92	54	S
7031283	539353	100	61	S
7031228	539196	100	64	S
7031228	539196	99	76	S
7031228	539196	107	76	S
7030845	539261	90	56	S
7030845	539261	93	62	S
7030845	539261	90	64	S
7030845	539261	96	58	S
7030702	539513	93	86	S
7030702	539513	92	82	S
7030562	539285	102	77	S
7030562	539285	100	64	S
7031374	539697	70	78	S
7031374	539697	67	78	S
7031254	539452	76	77	S
7031254	539452	79	79	S
7031060	539745	70	82	S
7031060	539745	66	82	S
7031060	539745	73	87	S
7031051	539655	85	73	S
7031051	539655	81	70	S
7030859	539826	82	76	S
7030859	539826	100	68	S
7030859	539826	98	64	S
7030805	539919	65	60	S
7030719	539967	81	64	S
7030875	539915	102	77	S

7030875	539915	90	68	S
7030875	539915	100	67	S
7031398	539798	76	80	S
7031398	539798	70	80	S
7031398	539798	72	78	S
7031609	539991	75	60	S
7031609	539991	75	56	S
7031609	539991	77	65	S
7031389	540078	76	76	S
7031389	540078	78	76	S
7031357	540135	83	70	S
7031357	540135	84	84	S
7031274	540163	84	82	S
7031274	540163	84	88	S
7030854	540004	77	68	S
7030854	540004	70	64	S
7030871	539907	100	66	S
7029220	539427	89	76	S
7029220	539427	90	80	S
7029220	539427	94	68	S
7029215	539500	83	70	S
7029215	539500	88	64	S
7029215	539500	80	64	S
7029066	539101	87	54	S
7029066	539101	88	48	S
7029547	539021	80	80	S
7029547	539021	76	72	S
7029547	539021	73	72	S
7029609	538970	70	78	S
7029609	538970	64	76	S
7029681	539060	55	69	S
7029681	539060	52	72	S
7029681	539060	58	64	S
7029681	539060	60	70	S
7029681	539060	70	60	S
7029681	539060	67	66	S
7029681	539060	64	64	S
7029681	539060	63	68	S
7029773	538712	79	52	S
7029773	538712	81	59	S
7029737	538564	67	56	S
7029737	538564	72	58	S
7029687	538372	65	58	S
7029687	538372	78	62	S
7029794	538424	115	72	S
7029794	538424	116	68	S
7029794	538424	113	62	S
7029106	539004	118	66	S
7029106	539004	106	64	S
7029106	539004	112	68	S
7029075	538792	94	70	S
7029075	538792	92	71	S
7029105	538726	42	60	S
7029105	538726	56	52	S
7029105	538726	53	52	S
7029105	538726	57	56	S
7029437	538341	128	80	N
7029437	538341	128	68	N
7029437	538341	135	72	N
7029610	538031	88	48	S
7029610	538031	72	58	S
7029610	538031	71	56	S
7029706	538047	112	60	S
7029706	538047	122	58	S
7029706	538047	108	72	S
7029706	538047	117	72	S

7029989	539187	60	46	S
7030115	539161	78	76	S
7030115	539161	68	62	S
7030373	539270	94	85	S
7030082	540128	94	54	S
7030082	540128	78	52	S
7030082	540128	85	60	S
7030082	540128	87	60	S
7030136	539557	118	28	S
7030132	539538	100	30	S
7030132	539538	102	32	S
7030235	539588	84	30	S
7030235	539588	81	23	S
7030284	539516	58	52	S
7030284	539516	57	47	S
7030606	539595	80	78	S
7030606	539595	90	74	S
7030606	539595	92	75	S
7030590	539639	74	64	S
7030615	539699	80	64	S
7029612	540444	75	48	S
7029612	540444	80	52	S
7029390	539951	67	48	S
7029390	539951	55	51	S
7029390	539951	68	44	S
7029390	539951	68	40	S
7029359	539898	44	50	S
7029359	539898	55	46	S
7029436	539859	70	70	S
7029450	539840	86	52	S
7029450	539840	87	46	S
7030408	541518	15	82	W
7030408	541518	3	82	W
7030408	541518	3	78	W
7030408	541518	2	84	W
7030260	541567	70	62	S
7030260	541567	76	64	S
7030260	541567	76	63	S
7030260	541567	86	60	S
7030260	541567	79	60	S
7030008	541116	72	60	S
7030008	541116	68	72	S
7030008	541116	62	68	S
7029935	540918	33	41	S
7029935	540918	30	45	S
7030013	540962	2	75	W
7030013	540962	4	72	W
7030459	541113	85	88	N
7030459	541113	99	80	N
7030459	541113	90	80	N
7030459	541113	90	78	N
7030285	541040	170	83	E
7030285	541040	168	84	E
7030205	541541	85	66	S
7030205	541541	64	62	S
7030205	541541	71	68	S
7031135	541223	52	40	S
7031031	541203	44	35	S
7031191	541024	74	28	S
7031191	541024	70	30	S
7031191	541024	78	32	S
7031170	540996	60	46	S
7030918	541804	95	70	S
7030901	541896	93	72	S
7030932	540401	68	50	S
7030932	540401	70	53	S

7030952	541079	83	72	S
7030952	541079	79	70	S
7031033	542387	64	83	N
7031033	542387	63	82	N
7031033	542387	69	85	S
7031069	542488	62	80	S
7031069	542488	66	84	S
7031169	542940	65	77	S
7031169	542940	60	72	S
7031244	543145	107	58	S
7031244	543145	98	55	S
7031304	542931	55	84	S
7031304	542931	59	80	S
7031350	542333	52	70	S
7031350	542333	60	74	S
7031441	541631	65	60	S
7031441	541631	67	58	S
7031441	541631	55	50	S
7027311	536014	22	62	E
7027311	536014	16	58	E
7027311	536014	14	56	E
7027087	535903	18	65	E
7027087	535903	17	65	E
7026781	536598	80	56	S
7026781	536598	77	62	S
7028658	537776	49	88	S
7028658	537776	42	84	N
7028599	537718	32	84	W
7028599	537718	31	80	W
7028599	537718	23	81	W
7028589	537665	122	68	S
7028589	537665	112	64	S
7028601	537615	85	64	S
7028601	537615	89	68	S
7028586	537539	100	53	S
7028586	537539	95	52	S
7028593	537535	76	48	S
7029009	537215	71	65	S
7029009	537215	75	66	S
7028242	537541	65	60	S
7028242	537541	60	58	S
7028242	537541	66	59	S
7028139	537552	68	56	S
7028139	537552	73	60	S
7027381	535142	342	88	E
7027381	535142	352	86	W
7027381	535142	348	87	E
7029199	540633	82	30	S
7029199	540633	76	22	S
7029199	540633	87	22	S
7029199	540633	72	31	S
7029199	540633	65	28	S
7029199	540633	52	36	S
7029199	540633	62	32	S
7029199	540633	62	24	S
7029199	540633	60	28	S
7029110	540451	79	22	S
7029110	540451	56	35	S
7029110	540451	70	28	S
7029110	540451	75	25	S
7029085	540401	49	32	S
7029085	540401	47	34	S
7028930	540125	72	50	S
7028930	540125	74	50	S
7028888	540006	69	60	S
7028888	540006	68	64	S

7028906	539904	67	41	S
7028906	539904	64	38	S
7028652	539585	47	38	S
7028652	539585	51	46	S
7028487	539447	53	30	S
7028487	539447	54	38	S
7028303	539888	43	44	S
7028303	539888	64	48	S
7028303	539888	59	48	S
7028568	540121	35	50	S
7028568	540121	33	40	S
7032380	532210	84	44	S
7034400	534607	58	40	S
7033731	541995	57	62	S
7033731	541995	65	64	S
7033731	541995	62	64	S
7033718	542016	58	66	S
7033780	542064	59	60	S
7033780	542064	58	69	S
7033780	542064	63	66	S
7033882	542031	72	70	S
7033882	542031	74	65	S
7033997	542021	70	73	S
7033997	542021	68	68	S
7033997	542021	67	68	S
7034001	542163	63	66	S
7034001	542163	70	69	S
7034001	542163	62	68	S
7033864	541212	68	64	S
7033864	541212	63	66	S
7033864	541212	67	63	S
7033556	541737	57	82	S
7033556	541737	51	64	S
7033556	541737	56	74	S
7033633	541626	50	58	S
7033633	541626	56	59	S
7033633	541626	51	65	S
7033902	541485	50	62	S
7033902	541485	51	60	S
7033902	541485	47	70	S
7033858	541761	82	70	S
7033858	541761	83	65	S
7033858	541761	79	70	S
7033763	541819	74	60	S
7033763	541819	70	58	S
7033717	541807	62	60	S
7033717	541807	60	58	S
7033650	541711	57	72	S
7033650	541711	54	77	S
7033650	541711	59	74	S
7034103	542158	80	74	S
7034103	542158	80	75	S
7034142	542284	77	72	S
7034142	542284	71	72	S
7034070	542343	78	86	S
7034070	542343	76	80	S
7034070	542343	76	81	S
7034375	540688	85	66	S
7034375	540688	84	58	S
7034408	540697	87	58	S
7034408	540697	88	60	S
7034408	540697	82	55	S
7034408	540697	88	58	S
7034498	540662	77	40	S
7034498	540662	79	43	S
7034662	540671	62	74	S

7034662	540671	64	69	S
7034662	540671	67	70	S
7034769	540684	63	68	S
7034769	540684	62	68	S
7034769	540684	61	64	S
7035026	540945	51	72	S
7035026	540945	55	60	S
7035026	540945	55	64	S
7035129	541032	50	52	S
7035129	541032	55	52	S
7035147	541126	19	42	S
7035147	541126	22	46	S
7035147	541126	24	48	S
7035056	541141	44	40	S
7035056	541141	54	39	S
7034939	541183	46	42	S
7034939	541183	50	48	S
7034868	541271	44	38	S
7034868	541271	40	41	S
7032293	539614	110	55	S
7032547	539549	110	66	S
7032482	539572	109	50	S
7031015	537891	146	78	N
7031015	537891	144	82	N
7031015	537891	143	62	N
7031015	537891	148	86	N
7031056	537914	90	62	N
7031056	537914	92	70	N
7031025	538067	124	65	N
7031025	538067	127	70	N
7030994	538128	120	67	S
7030994	538128	118	68	S
7030994	538128	115	64	S

7030981	538147	145	60	S
7030981	538147	133	62	S
7030981	538147	131	70	S
7030905	538164	119	90	S
7030780	538138	112	54	S
7030780	538138	115	68	S
7031587	536750	97	62	S
7031587	536750	100	54	S
7031753	536555	75	62	S
7031753	536555	73	69	S
7031753	536555	82	63	S
7030879	536634	77	54	S
7030879	536634	68	64	S
7030829	536604	55	38	S
7030905	537893	87	58	S
7030905	537893	91	52	S
7030905	537893	88	54	S
7031424	540696	79	60	S
7031477	540609	99	82	S
7031477	540609	102	88	S
7031477	540609	94	80	S
7031477	540609	94	81	S
7031401	540623	88	82	S
7031401	540623	83	85	S
7031330	540672	101	88	S
7031330	540672	97	86	N
7030822	539902	63	54	S
7030822	539902	70	58	S
7030816	540126	85	72	S
7030816	540126	83	67	S
7030874	540178	91	66	S
7030874	540178	88	66	S
7030896	540236	90	77	S

7030896	540236	85	78	S
7030918	540408	65	52	S
7030918	540408	66	78	S
7030918	540408	70	80	S
7031527	541002	83	87	S
7031527	541002	81	88	S
7031527	541002	105	86	S
7031527	541002	93	76	S
7031597	540998	97	85	S
7031597	540998	86	80	S
7031597	540998	88	88	S
7031540	541108	38	52	S
7031540	541108	36	57	S
7031540	541108	37	54	S
7031540	541108	34	56	S
7031634	541273	76	48	S
7031634	541273	77	56	S
7031634	541273	78	52	S
7031624	541270	69	80	S
7031624	541270	67	70	S
7031595	541354	55	56	S
7031402	541517	61	55	S
7031402	541517	57	59	S
7031402	541517	53	58	S
7031294	541448	52	62	S
7031156	541247	52	54	S
7031156	541247	55	54	S
7031012	541102	45	50	S
7031012	541102	44	50	S
7029405	538142	60	64	S
7029405	538142	53	70	S
7029405	538142	54	66	S
7028624	540330	70	50	S
7028624	540330	68	44	S
7029406	538143	60	64	S
7029406	538143	54	70	S
7029849	539487	18	38	W
7029849	539487	15	42	W
7029200	541639	66	37	S
7029200	541639	68	38	S
7026966	535902	16	62	E
7026966	535902	16	56	E
7027084	535834	16	50	E
7027084	535834	18	59	E
7027100	535820	13	53	E
7027100	535820	13	56	E
7027861	538430	98	52	S
7027861	538430	63	56	S
7027861	538430	70	58	S
7027816	7027816	75	56	S
7027816	7027816	74	64	S
7027816	7027816	67	54	S
7027046	535741	20	65	S
7027266	535820	30	55	E
7027266	535820	26	58	E
7027266	535820	23	66	E
7026638	535673	16	76	E
7026638	535673	24	75	E
7026638	535673	19	74	E
7026750	535648	347	62	E
7026750	535648	353	58	E
7026750	535648	345	65	E
7026800	535626	333	66	E
7026800	535626	334	60	E
7026800	535626	337	62	E
7026840	535683	342	77	E

7026840	535683	348	86	E
7026822	535679	10	74	E
7026822	535679	14	80	E
7026845	535726	30	72	E
7026845	535726	25	84	E
7027179	535475	350	44	E
7027179	535475	355	64	E
7027179	535475	10	55	E
7027179	535475	360	64	E
7027203	535494	125	46	S
7027203	535494	127	40	S
7027363	535274	326	70	SW
7027363	535274	339	68	SW
7027692	535200	54	50	S
7027692	535200	40	55	S
7027692	535200	45	48	S
7027407	535142	342	68	W
7027407	535142	345	76	W
7027407	535142	348	70	W
7027407	535142	338	60	W
7027407	535142	345	60	W
7027335	535137	352	78	E
7027335	535137	357	74	E
7027318	535140	12	70	E
7027318	535140	359	72	E
7027318	535140	7	72	E
7027384	535141	352	76	E
7027384	535141	354	82	E
7027897	535427	48	78	S
7027094	535900	16	68	E
7026637	535671	20	74	S
7027255	535956	20	60	S
7028000	536034	72	72	S
7027918	536008	55	66	S
7026645	535670	26	74	S
7026645	535670	28	68	S
7026825	535680	0	80	E
7026797	535633	333	62	E
7026808	535599	170	60	E
7032293	539614	110	55	S
7032547	539549	110	66	S
7032482	539572	109	50	S

Table 2.2. Joint measurements.

X-Coordinate	Y-Coordinate	Strike (degrees)	Dip angle (degrees)	Dip direction	Spacing (cm)
7033954	534800	83			
7033954	534800	324			
7033969	534754	318			
7034055	534666	330			
7034055	534666	65			
7034404	534322	61			
7034404	534322	316			
7034498	534305	300			
7034623	534242	100			
7034623	534242	10			
7033668	533720	318			
7033993	533656	314			1.5
7033993	533656	308			1.5
7033993	533656	318			1.5
7033742	535610	323			
7033742	535610	229			
7033742	535610	68			
7033670	535655	318			
7033723	535157	314			
7033723	535157	46			
7033711	535248	85	83	S	
7033711	535248	324			
7033711	535248	320			
7033711	535248	51			
7033582	535023	355			
7033582	535023	352			
7033696	535116	118			
7033698	535131	355			
7033698	535131	128			
7033698	535131	359			
7033804	535918	95	82	S	2
7033582	535023	6			
7033698	535131	7			
7033698	535131	124			
7033698	535131	125			
7033698	535131	8			
7033312	536387	20			
7033312	536387	334			
7033312	536387	360			
7033389	536240	335	84	E	
7033389	536240	8	66	E	
7033389	536240	334	22	E	
7033014	535857	341			
7033014	535857	76			
7032952	535845	356	72	E	
7032952	535845	355	72	E	
7032952	535845	355	74	E	
7032952	535845	2	78	E	
7032952	535845	348	76	E	
7032952	535845	108	30	S	
7032952	535845	106	34	S	
7032952	535845	108	36	S	
7032952	535845	8			
7032952	535845	360			
7032952	535845	359			
7032952	535845	1	84	E	
7032952	535845	5	82	E	
7032968	535838	340	83	E	
7033051	535716	315			
7033051	535716	10			

7033051	535716	14								
7033051	535716	318								
7033140	535606	6	88	E						
7033140	535606	3	89	E						
7033140	535606	7								
7033140	535606	359								
7033140	535606	356								
7033140	535606	357	86	E						
7033140	535606	6								
7033140	535606	330								
7033140	535606	339								
7033140	535606	338								
7033140	535606	336								
7033140	535606	333								
7033140	535606	330								
7034411	534806	341								
7034411	534806	80								
7034411	534806	20								
7034411	534806	74								
7034413	534725	18								
7034413	534725	97								
7034461	534665	322								
7034513	534644	331	83	E						
7034513	534644	55	78	S						
7034513	534644	26								
7034513	534644	339	80	E						
7034513	534644	70	76	S						
7034884	534360	60	66	S						
7034946	534520	80								
7034946	534520	310	84	W						
7034946	534520	8								
7034946	534520	340								
7034925	534635	112								
7034925	534635	14								
7035000	534603	72								
7035000	534603	294								
7035000	534603	309								2.5
7035000	534603	40								
7034971	534518	325								
7034971	534518	354								
7034971	534518	82								
7034988	534444	358			80		E			
7034988	534444	93								
7034985	534487	334							2	
7034985	534487	326							2	
7034985	534487	330							2	
7034985	534487	322							2	
7034985	534487	68							2	
7034985	534487	58							2	
7034985	534487	64							2	
7034970	534549	318							1.8	
7034970	534549	327							1.8	
7034970	534549	324							1.8	
7034970	534549	322							1.8	
7034970	534549	314							1.8	
7034985	534597	314							2.5	
7034985	534597	320							2.5	
7034985	534597	318							2.5	
7034985	534597	322							2.5	
7034985	534597	320							2.5	
7034985	534597	314							2.5	
7034985	534597	318							2.5	
7034985	534597	42							2.5	
7034985	534597	46							2.5	
7034985	534597	50							2.5	
7034845	535133	319			76		E		2	

7034845	535133	71				
7034845	535133	355				
7034879	535108	41				
7034879	535108	112				
7034879	535108	360				
7034879	535108	311				
7034879	535108	21				
7034879	535108	357				
7034879	535108	309				
7034879	535108	22				
7034943	535041	305				1.5
7034943	535041	307				
7034943	535041	47				
7034993	534967	357	80	E		
7034993	534967	33				
7034993	534967	294				2
7034994	534800	286				
7034994	534800	22				
7034958	534742	280				
7034958	534742	14	74	E		
7034958	534742	77				
7034958	534742	300				1.5
7034071	535405	347				
7034071	535405	89				
7034071	535405	324				
7034071	535405	84				
7034071	535405	337				
7034071	535405	80				
7034131	535383	354				
7034131	535383	80				
7034131	535383	359				
7034131	535383	85				
7034131	535383	336				
7034131	535383	95				
7034180	535371	1				
7034180	535371	86	36	N		
7034074	535378	348				
7034074	535378	80				
7034238	535350	56				
7034238	535350	56				
7034327	535279	110				2.5
7034327	535279	358				
7034327	535279	47				
7034394	535286	314	60	S		2
7034394	535286	19				
7034394	535286	298				
7034479	535242	313				
7034578	535204	80				
7034578	535204	330				2
7034601	535230	310				2
7033963	535536	326				
7033963	535536	350				
7033963	535536	18				
7033986	535761	332				
7033986	535761	348				
7033986	535761	356				
7033986	535761	320	80	W		
7033986	535761	354				
7033980	535789	332				
7033959	535798	342				
7033959	535798	8				
7034047	535850	34	90			
7034047	535850	337				
7034047	535850	14				
7034064	535870	352				
7034071	535941	330				

7034071	535941	74						
7034055	536031	40	82	NW				
7034055	536031	332	90					
7034055	536031	95	52	S				
7034055	536031	70	84	S				
7034055	536031	114						
7034055	536031	78						
7034055	536031	44						
7034055	536031	334						
7034055	536031	98						
7034055	536031	68						
7034055	536031	332						
7034055	536031	128						
7034157	536035	55						
7034157	536035	345						
7034157	536035	316						
7034010	536071	336						
7034010	536071	2						
7033981	536076	52						
7033981	536076	340						
7033894	536099	332	48	NE				
7033894	536099	360	90					
7033894	536099	36						
7033926	536184	357	88	E				
7033926	536184	15						
7033926	536184	336						
7033926	536184	320						
7034152	536324	320						
7034098	536381	354	80	E				
7033543	536383	336						
7033573	536446	94	76	S				
7033573	536446	360	80	E				
7033573	536446	300						
7033953	536564	22						
7033953	536564	110						
7033577	536570	84	75	S				
7033577	536570	348						
7033577	536570	88						
7033591	536632	105						
7033591	536632	16						
7033681	536658	306						
7033786	536677	100						
7034489	535607	314						
7034489	535607	360						
7034519	535550	16						
7034519	535550	286						
7034519	535550	346						
7034519	535550	89						
7034413	535674	360						
7034413	535674	77						
7034378	535642	8						
7034378	535642	315						
7034378	535642	53						
7034378	535642	324	50	S	2			
7034378	535642	318	51	S	3			
7033926	536184	357						
7033926	536184	15						
7033926	536184	336						
7033926	536184	320						
7034152	536324	320						
7034098	536381	354						
7033543	536383	336						
7033573	536446	94	76	S				
7033573	536446	360						
7033573	536446	300						
7033953	536564	22						

7033953	536564	110			
7033577	536570	84			
7033577	536570	348			
7033577	536570	88			
7033591	536632	105			
7033591	536632	16			
7033681	536658	306			
7033786	536677	100			
7033483	539941	108			
7033483	539941	60	40	N	
7033483	539941	68	40	N	
7033483	539941	345			
7033483	539941	302			
7033483	539941	37			
7033517	539961	312			
7033517	539961	347			
7033517	539961	88			
7033497	539976	308			
7033497	539976	45			
7033550	539966	354			
7033550	539966	74			
7033552	539995	357			
7033552	539995	56			
7033552	539995	336	78	S	
7033552	539995	7			
7033552	539995	102			
7033546	540035	340	55	N	
7033574	540105	341			
7033574	540105	71			
7033595	540172	4	82	E	
7033595	540172	71			
7033595	540172	20	52	E	
7033595	540172	310	74	W	

7033544	540143	348			
7033544	540143	90			
7033497	540210	7	84	W	
7033497	540210	349			
7033497	540210	128			
7033497	540210	81	80	N	
7033462	540220	21	79	W	2.5
7033462	540220	107	62	N	
7033408	540230	10	82	E	
7033408	540230	78			
7033408	540230	322			
7033384	540229	358			
7033384	540229	34			
7033294	540218	2			
7033294	540218	341	52	E	
7033353	540041	360	82	E	
7033353	540041	90			
7033353	540041	346	81	W	
7033353	540041	114	78	S	
7033353	540041	2			
7032736	540720	348	90		
7032736	540720	57	20	N	
7032736	540720	36	78	W	
7032736	540720	6	70	W	
7032736	540720	61	60	S	
7032736	540720	88			
7032736	540720	360			
7032750	540723	348	80	W	
7032750	540723	39	16	N	
7032750	540723	77			
7032775	540724	4			
7032775	540724	94			
7032799	540689	342	72	W	

7032799	540689	320				
7032799	540689	71				
7032799	540689	86				
7032799	540689	68				
7032799	540689	339				
7032854	540668	360	78	E		
7032854	540668	335				
7032854	540668	62	30	N		
7032923	540610	20	70	W		
7032970	540582	357	82	W		
7032970	540582	87				
7033019	540540	360				
7033019	540540	72				
7032832	540748	343	76	W		
7032832	540748	83				
7036718	541789	34	58	N		
7036718	541789	37	64	N		
7036718	541789	39	66	N		
7036718	541789	122				
7036718	541789	123				
7036718	541789	114				
7036568	542279	90	84	N		
7036568	542279	88				
7036568	542279	87				
7036568	542279	85				
7036568	542279	25				
7036568	542279	22	70	W		
7036568	542279	32				
7036568	542279	22				
7036568	542279	20				
7036503	542319	46	50	W	2.5	
7036503	542319	42			2.5	
7036503	542319	46			2.5	
7036503	542319	43			2.5	
7036503	542319	44				
7036503	542319	43				
7036503	542319	9				
7036503	542319	359				
7036503	542319	10				
7036503	542319	7				
7036480	542197	36	86	E	1.8	
7036480	542197	30			1.8	
7036480	542197	35			1.8	
7036480	542197	42			1.8	
7036746	542157	304			2	
7036746	542157	295			2	
7036746	542157	305			2	
7036746	542157	306			2	
7036746	542157	32			2	
7036746	542157	37			2	
7036746	542157	31			2	
7036746	542157	35			2	
7036708	542355	305				
7036708	542355	39				
7036708	542355	304				
7036708	542355	308				
7036708	542355	40				
7036708	542355	37				
7036898	542504	293				
7036898	542504	290				
7036898	542504	25				
7036898	542504	26				
7036898	542504	292				
7036898	542504	293				
7036898	542504	27				
7036898	542504	33				

7034274	539286	100				
7034274	539286	101				
7034274	539286	98				
7034274	539286	102				
7034274	539286	90				
7034274	539286	95				
7034274	539286	80	74	S		
7034274	539286	79	82	S		
7034214	539127	358	88	E		
7034214	539127	360				
7034214	539127	350				
7034214	539127	348				
7034302	539157	330				2.4
7034302	539157	320				2.4
7034302	539157	325				2.4
7034302	539157	328				2.4
7034421	538995	357				
7034421	538995	2				
7034421	538995	92	69	N		
7034421	538995	90	70	N		
7034450	538918	25				
7034450	538918	360				
7034450	538918	1				
7034450	538918	67				
7034450	538918	60				
7034450	538918	65				
7034450	538918	3				
7034450	538918	14				
7036569	539900	27	72	W		
7036569	539900	26	77	W		
7036569	539900	4				
7036569	539900	65				
7036530	539882	21	66	W		
7036530	539882	25	74	W		
7036530	539882	62	88	E		
7036530	539882	69	78	E		
7036530	539882	118	10	S		
7036530	539882	13				
7036473	539843	18	80	E		
7036473	539843	68	78	E		
7036473	539843	51	60	E		
7036473	539843	25				
7036473	539843	48				
7036473	539843	72				
7036473	539843	323				
7036473	539843	110				
7035919	540468	118				1.8
7035919	540468	80				
7035919	540468	76	86	N		
7035919	540468	335	61	W		
7035919	540468	332	60	W		
7035919	540468	115	70	N		
7035919	540468	73				
7035926	540378	120				2
7035926	540378	76				
7035926	540378	50				
7035926	540378	90	89	S		
7035926	540378	122	80	N		
7035926	540378	3	78	W		
7035926	540378	18	84	W		
7035926	540378	5	84	W		
7035926	540378	346	50	W		
7035845	540456	93	81	S		
7035845	540456	101	86	S		
7035845	540456	18	88	E		
7035845	540456	319				2

7035915	540385	324	52	W	
7035915	540385	322	45	W	
7035915	540385	320	42	W	
7035915	540385	326	44	W	
7036096	540306	75	80	S	1
7036096	540306	73	80	S	
7036096	540306	79	74	S	
7036096	540306	72			
7036096	540306	41	88	E	
7036096	540306	47	88	W	
7036096	540306	50	89	W	
7036089	540363	125	80	S	2.2
7036089	540363	119	90		
7036089	540363	118	88	N	
7036089	540363	126	84	S	
7036089	540363	77	80	S	
7036089	540363	98	82	N	
7036089	540363	64	88	S	
7036089	540363	74	89	S	
7036089	540363	49	82	W	
7036089	540363	68	77	N	
7036049	540452	120	86	N	2
7036049	540452	126	86	N	
7036049	540452	125	84	N	
7036049	540452	338	25	W	
7036049	540452	334	30	W	
7036049	540452	74	90		
7035957	540559	88	67	N	
7035957	540559	43	68	W	
7035957	540559	85	72	N	
7035957	540559	77	80	N	
7035475	539976	350	60	E	0.5
7035475	539976	351	54	E	2
7035475	539976	345	62	E	
7035475	539976	117	84	N	
7035475	539976	122	76	S	
7035475	539976	121	80	S	
7035371	540041	84	72	S	
7035371	540041	97	76	N	
7035371	540041	348			
7035371	540041	355	54	E	
7035371	540041	108			
7035371	540041	104			
7035371	540041	347	66	E	
7035371	540041	89	88	S	
7035376	540114	360			
7035376	540114	100			
7035376	540114	92	66	S	
7035440	540147	5			
7035440	540147	358			
7035440	540147	353			1.5
7035440	540147	357			
7035440	540147	50			
7035440	540147	348			
7035440	540147	40			
7035440	540147	344			
7035371	540134	2			
7035371	540134	5			
7035371	540134	4			2
7035371	540134	4			
7035371	540134	358	66	W	
7035371	540134	359	66	W	
7035371	540134	97	88	N	
7035371	540134	104			
7035368	540207	353	61	E	
7035368	540207	348	52	E	

7035368	540207	357				
7035368	540207	352	82	E		
7035368	540207	101	81	S		
7035368	540207	103	78	S		
7035368	540207	104	88	S		
7035368	540207	50			1.5	
7035368	540207	59				
7035356	540258	352				
7035356	540258	350	64	W		
7035356	540258	351	88	W		
7035356	540258	2				
7035356	540258	108				
7035410	540309	346	56	W		
7035410	540309	347				
7035410	540309	91	82	N		
7035410	540309	94	78	N		
7035455	540357	345			2	
7035628	540395	333				
7035628	540395	348				2.4
7035628	540395	108	86	S		
7035628	540395	110	84	S		
7035628	540395	348				
7035628	540395	340				2.4
7035628	540395	340				
7035628	540395	350				2.5
7035673	540531	19	70	W		
7035673	540531	130				
7035673	540531	335				
7035673	540531	344				
7035770	540561	336	82	S		
7035769	540442	89	84	N		
7035769	540442	321				2
7035699	540594	334				
7035699	540594	115				
7035699	540594	106	78	N		
7035699	540594	327				
7031190	537532	1				
7031190	537532	92				
7031281	537556	106	26	N		
7031091	537707	96				1.5
7031091	537707	162				1
7031091	537707	158				1
7031002	537797	27				
7031002	537797	20				1
7030930	537609	2				
7030828	537425	356				
7030828	537425	16				
7030778	537282	354				
7030778	537282	357				
7030791	536735	16				
7030902	536685	24				
7030902	536685	328				
7031226	537391	1				
7031226	537391	4				
7031226	537391	14				
7031226	537391	322				
7031226	537391	321				
7031226	537391	360				
7031226	537391	323				
7031177	537315	357				
7031177	537315	323				
7031167	537241	322				
7031167	537241	328				
7031025	537024	27				
7031025	537024	342				
7031025	537024	18				

7031025	537024	334		
7031025	537024	348		
7031025	537024	343		
7030952	537019	345		
7030952	537019	77		
7030952	537019	334		
7030952	537019	73		
7030952	537019	340		
7030952	537019	13		
7030898	536670	342		
7030898	536670	328		
7030898	536670	341		
7030898	536670	338		
7030898	536670	342		
7030913	536655	329		
7031491	539234	7	87	W
7031491	539234	9	89	W
7031491	539234	14	88	W
7031491	539234	50	80	S
7031491	539234	52	81	S
7031491	539234	8	88	E
7031491	539234	5	78	W
7031491	539234	345	78	E
7031491	539234	347	83	E
7031283	539353	13	78	W
7031283	539353	12	90	
7031283	539353	4	62	W
7031283	539353	10	83	W
7031228	539196	4	84	W
7031228	539196	8	86	E
7031228	539196	1		
7030965	539183	15		
7030965	539183	12		
7030965	539183	5		
7030845	539261	10	80	W
7030845	539261	319	82	E
7030845	539261	360	28	W
7030845	539261	8		
7030845	539261	334		
7030702	539513	353		
7030702	539513	357		
7030702	539513	9		
7030702	539513	310		
7030562	539285	8	88	W
7030562	539285	22	41	W
7030562	539285	19	36	W
7030562	539285	62	90	
7030562	539285	7	88	E
7030562	539285	312	86	N
7030562	539285	10	90	
7031292	539270	10		
7031292	539270	1	90	
7031292	539270	5	86	W
7031374	539697	357		
7031229	539497	3		
7031229	539497	354		
7031254	539452	350		
7031254	539452	354		
7031254	539452	12		
7031060	539745	10		
7031016	539778	355		
7030859	539826	2		
7030875	539915	14		
7031398	539798	344		
7031398	539798	350		
7031398	539798	346		

7031389	540078	356			
7031389	540078	358			
7031357	540135	356			
7031357	540135	15			
7031357	540135	346			
7031357	540135	347			
7031274	540163	360			
7031208	540168	354			
7031208	540168	355			
7030871	539907	360			
7030871	539907	357			
7030871	539907	4			
7030871	539907	1			
7030871	539907	10			
7029215	539500	345	64	E	
7029215	539500	355			
7029215	539500	330			
7029215	539500	70			
7029215	539500	354			
7029140	539178	357			
7029458	539182	352			1.2
7029681	539060	330			
7029681	539060	10			
7029681	539060	333			
7029681	539060	356			
7029773	538712	1			
7029773	538712	346			
7029773	538712	12			
7029687	538372	331			
7029687	538372	13			
7029794	538424	49	63	W	1.2
7029106	539004	2	84	E	
7029106	539004	12			
7029106	539004	37			
7029106	539004	46			
7029106	539004	4			
7029106	539004	42	70	W	
7029105	538726	4	84	E	
7029105	538726	4	86	E	
7029105	538726	3	84	E	
7029437	538341	350	62	E	
7029437	538341	336			
7029437	538341	346			
7029437	538341	346			
7029437	538341	10			
7029610	538031	357	88	E	
7029610	538031	4			
7029610	538031	314	86	E	
7029610	538031	330			
7029610	538031	310			
7030082	540128	4			
7030082	540128	322			
7030082	540128	12			
7030082	540128	341			
7030082	540128	358			
7030082	540128	332			
7030082	540128	26			
7030082	540128	7			
7030136	539557	59			
7030284	539516	80			
7030301	539541	328			
7030606	539595	356			
7030592	539667	358			
7030592	539667	330			
7030618	539662	336			
7029764	540345	94			

7029764	540345	110				
7029764	540345	65				
7029359	539898	20				
7029359	539898	300				
7029436	539859	348				
7029450	539840	352				
7029612	540444	60				
7030059	541199	38			0.8	
7030013	540962	344				
7030013	540962	77				
7030459	541113	16			1.5	
7030459	541113	360				
7030459	541113	354	68	W		
7030459	541113	5				
7030285	541040	82				
7030205	541541	18				
7030205	541541	360				
7030205	541541	345				
7030205	541541	2				
7030205	541541	1				
7030260	541567	9			1	
7030260	541567	2				
7030260	541567	6				
7030408	541518	118				
7030408	541518	87				
7031170	540996	323				
7031170	540996	6				
7030952	541079	4			0.3	
7030952	541079	5				
7030952	541079	10				
7031033	542387	358				1
7031033	542387	318				
7031069	542488	351	76	W		

7031169	542940	341			
7031304	542931	335			1.2
7031441	541631	358			
7031441	541631	9			
7031441	541631	309			
7031441	541631	307			
7027311	536014	92	64	N	
7027311	536014	103	64	N	
7027311	536014	114	56	N	
7027311	536014	20	30	W	
7027311	536014	126	60	W	
7026781	536598	18	86	E	
7026781	536598	4	78	E	
7026937	536083	74	66	E	
7026937	536083	72	65	E	
7026937	536083	38	48	W	
7028599	537718	78	81	S	
7028599	537718	356	80	W	
7028599	537718	74			
7028599	537718	350			
7028599	537718	99			
7028599	537718	95	60	S	
7028599	537718	355	84	W	
7028599	537718	85			
7028242	537541	128	74	E	
7028242	537541	130	72	E	
7028242	537541	30	38	W	
7028242	537541	30	39	W	
7028242	537541	340	84	E	
7028242	537541	332			
7028242	537541	337			
7028242	537541	354	86	E	
7028242	537541	357	88	E	

7028139	537552	349	88	E		
7028139	537552	340	87	W		
7028139	537552	60	27	N		
7028139	537552	53	23	N		
7028139	537552	345	90		0.8	
7029110	540451	360				
7029110	540451	110				
7028930	540125	30			1.5	
7028930	540125	23			1.5	
7028930	540125	316			1.5	
7028888	540006	18	50	W		
7028906	539904	30				
7028906	539904	28	66	W		
7028487	539447	339				
7028142	539605	42				
7028288	539873	28				
7034477	534562	311	70	W		
7034477	534562	317	85	W		
7034477	534562	336				
7034477	534562	300				
7034477	534562	331				
7034477	534562	318				
7034477	534562	331				1.5
7033731	541995	320				1.5
7033731	541995	315				1.5
7033731	541995	319				1.5
7033731	541995	317				1.5
7033731	541995	313				1.5
7033731	541995	312				1.5
7033780	542064	350	88	W		
7033780	542064	310	90			
7033780	542064	356	80	W		
7033864	541212	3	70	W		
7033864	541212	4				
7033864	541212	360	74	W		
7033864	541212	344	82	W		
7033864	541212	340	86	W		
7033556	541737	356	70	W		
7033556	541737	1	74	W		
7033556	541737	350	82	W		
7033556	541737	126				
7033556	541737	320			0.8	
7033556	541737	323			0.8	
7033556	541737	318			0.8	
7033556	541737	316			0.8	
7033902	541485	4	66	W		
7033902	541485	5	76	W		
7033902	541485	320	76	W		
7033902	541485	360	74	W		
7033902	541485	300	82	W		
7033717	541807	321			1.5	
7033717	541807	322			1.5	
7033717	541807	328			1.5	
7034103	542158	355	83	W		
7034103	542158	360	84	W		
7034103	542158	357	82	W		
7034103	542158	318				
7034103	542158	319				
7034103	542158	321				
7034103	542158	314				
7034103	542158	313				
7034103	542158	315			1.5 - 3.5	
7034070	542343	2	82	W		
7034070	542343	4	84	W		
7034070	542343	5	80	W		
7034070	542343	360	86	W		

7034070	542343	5	79	W	
7034375	540688	358			
7034375	540688	353			
7034375	540688	359			
7031138	537614	326			
7031138	537614	321			
7031138	537614	323			
7031133	537653	332			
7031133	537653	333			
7031133	537653	330			
7031128	537662	327			
7031128	537662	332			
7031097	537707	335			
7031097	537707	330			
7031097	537707	328			
7031753	536555	1	75	W	
7031753	536555	358	84	W	
7031753	536555	354	80	W	
7031753	536555	353	87	W	
7031424	540696	4	86	W	
7031424	540696	5			
7031424	540696	358			
7031424	540696	8	82	W	
7031424	540696	359			
7031424	540696	358	86	E	
7031477	540609	358	88	W	
7031477	540609	357	82	E	
7031477	540609	354	88	E	
7031477	540609	3	86	E	
7031477	540609	358	83	E	
7031477	540609	354	84	W	
7031477	540609	5	74	W	
7031477	540609	353	76	W	

7031401	540623	6	86	E	
7031401	540623	356	80	W	
7030874	540178	14			
7030874	540178	18			
7030874	540178	348			
7030874	540178	22	90		
7030874	540178	16			
7030874	540178	24			
7030874	540178	352			
7030874	540178	348			
7030874	540178	352			
7030918	540408	357			
7030918	540408	360			
7030918	540408	2			
7030918	540408	356			
7030918	540408	356			
7030918	540408	360			
7030918	540408	1	80	W	
7030918	540408	5	83	W	
7030918	540408	5	79	W	
7031265	540947	24			1.2
7031265	540947	19			1.2
7031265	540947	14			1.2
7031265	540947	17			1.2
7031265	540947	22			1.2
7031265	540947	20			1.2
7031265	540947	18			1.2
7031265	540947	117	80	E	
7031265	540947	119	81	E	
7031265	540947	115	85	E	
7031265	540947	8	82	W	
7031265	540947	9	78	W	
7031265	540947	10	84	W	

7031265	540947	14	80	W		
7031265	540947	114				
7031460	541032	15				0.6
7031460	541032	18				0.6
7031460	541032	21				0.6
7031460	541032	14				0.6
7031460	541032	19				0.6
7031460	541032	333	78	E		
7031460	541032	333	80	W		
7031460	541032	335				
7031460	541032	332	86	W		
7031460	541032	334	79	W		
7031527	541002	342	78	W		
7031527	541002	2	76	E		
7031527	541002	346	80	W		
7031597	540998	8	88	W		
7031597	540998	3	83	W		
7031597	540998	350	88	W		
7031597	540998	5	88	W		
7031597	540998	4	87	W		
7031597	540998	5	86	W		
7031597	540998	3	88	E		
7031597	540998	2	84	W		
7031597	540998	356			1.2	
7031597	540998	355			1.2	
7031540	541108	10			1.2	
7031540	541108	9			1	
7031540	541108	12			1.5	
7031540	541108	6			1	
7031540	541108	125	86	W		
7031540	541108	129	82	W		
7031540	541108	338	78	E		
7031540	541108	335	82	E		

7031540	541108	342	86	E		
7031540	541108	127	87	W		
7031634	541273	358			1.8	
7031634	541273	352			1.8	
7031634	541273	356				1.5
7031624	541270	357				1
7031624	541270	359				1
7031624	541270	5				1
7031294	541448	360	82	W		
7031294	541448	358	75	W		
7031294	541448	358				1.5
7031294	541448	355				1.5
7031294	541448	6				1.5
7029421	538159	358	80	W		0.5
7026966	535902	118	90			
7026966	535902	120	88	S		
7026966	535902	68				
7026966	535902	66				
7027019	538413	334				
7027019	538413	352				
7027019	538413	355				
7027019	538413	354				
7027093	538425	348				2
7027861	538430	1	90			
7027861	538430	12	70	W		
7027861	538430	8	80	W		
7027861	538430	3				2.5
7026638	535673	118				0.4
7026638	535673	138				0.6
7026638	535673	78				0.6
7026638	535673	116			0.5	
7026638	535673	120			1	
7026638	535673	113			0.5	

7026638	535673	82	78	N		
7026638	535673	82	84	S		
7026638	535673	86	82	S		
7026638	535673	324				
7026638	535673	322				
7026706	535700	116			0.5	
7026706	535700	119			0.5	
7026750	535648	90			0.5	
7026750	535648	100			0.6	
7026750	535648	89			0.6	
7026750	535648	80			0.5	
7026800	535626	63			0.8	
7026800	535626	75			0.8	
7026800	535626	79			0.8	
7026800	535626	66			1	
7026822	535679	128				
7026822	535679	119				
7026822	535679	121				
7026822	535679	117				
7026822	535679	127				
7027363	535274	30	44	S		
7027363	535274	300	40	N		
7027477	535162	76	52	S	2	
7027477	535162	99	42	S	2	
7027477	535162	82	57	S	2	
7027477	535162	75			2	
7027477	535162	95	56	S	2	
7026810	535674	318				
7026810	535674	310				
7026810	535674	313				
7026637	535671	90	78	E		
7026637	535671	87				
7026637	535671	325				

7027094	535900	110	89	S	
7027094	535900	116	88	S	
7027094	535900	118			
7027255	535956	120	70	E	
7026645	535670	116	70	S	
7026645	535670	116			
7026645	535670	114			
7026645	535670	100			
7026645	535670	108			
7026645	535670	104			
7026645	535670	102			
7026645	535670	110			
7026645	535670	108			
7026645	535670	111			
7026797	535633	73			
7026797	535633	77			
7026797	535633	65			
7026797	535633	65			
7026797	535633	68			
7026797	535633	60			
7026797	535633	67			
7026797	535633	67			
7026797	535633	74			
7026797	535633	68			
7026797	535633	69			
7034411	534806	74			
7034411	534806	303			
7026797	535633	70			
7034968	534460	76			
7034968	534460	322			2.5
7029412	539017	110	50	S	
7029633	538928	130	68	N	

Table 2.3. Pseudotachylitic breccia measurements.

X-Coordinate	Y-Coordinate	Strike (degrees)	Dip angle (degrees)	Dip direction	Thickness (cm)
7033312	536387	360			2
7033312	536387	104			3
7033312	536387	335			4
7033312	536387	310			3
7033312	536387	330			1.5
7033312	536387	88			11
7033389	536240	88			4
7032736	540720	66			6.5
7032736	540720	6			4
7032736	540720	74			12
7032736	540720	34			30
7033543	536383	86			2.5
7033963	535536	350			
7033963	535536	84			4.5
7033573	536446	4			
7033573	536446	45			
7033577	536570	326			9
7033577	536570	112			1
7033227	535951	90			15
7033344	535890	71			46
7033804	535918	95			12.5
7034311	535838	60			0.8 - 7
7033165	535565	62			
7034767	534492	310			15
7034767	534492	322			30
7033497	539976	10			1
7033546	540035	69			7.5
7033544	540143	330			2
7033294	540218	335			3
7033294	540218	22			4
7033294	540218	124			3
7032854	540668	325			0.2
7033000	540560	38			5
7035376	540114	359			2
7033019	540540	352			11
7033019	540540	353			11
7032952	540598	64			4
7032952	540598	115			6.1
7036574	542291	6			1
7034274	539286	323			3
7034209	539126	25			3
7034216	539115	62			4
7034216	539115	66			
7034214	539127	70			25
7034214	539127	120			5
7034302	539157	330			0.3
7034309	539158	323			4
7034309	539158	85			6
7034323	539149	325			
7034450	538918	57			2
7034450	538918	91			0.4
7036473	539843	316			
7035376	540114	122			8
7035376	540114	16			
7035410	540309	345			0.8
7035673	540531	10			7
7035673	540531	106			
7035673	540531	115			30
7035957	540559	339			4
7035957	540559	85			12

7029390	539951	62				
7029412	539944	106				
7029215	539500	84				
7030983	536732	57				
7029935	540918	32				
7031167	537241	100				
7029075	538792	93				
7029075	538792	50				
7029437	538341	118				
7027087	535903	66				
7028670	537738	33				
7028591	537679	36				
7028591	537679	115				
7028591	537679	136			6	
7028589	537665	117				
7028601	537615	98				
7034332	534733	300			50	
7032380	532210	320				
7034332	534733	42				
7034332	534733	95				
7033858	541761	82				8
7034103	542158	340				7
7034103	542158	80				7
7034103	542158	72				2.5
7034103	542158	320				4
7034103	542158	52				2.5
7034103	542158	330				6
7034769	540684	61				0.3
7034769	540684	63				
7034822	540664	40				15
7027100	535820	13				5
7027003	535780	40				5.5
7027003	535780	122				5.5
7027179	535475	10				2
7031624	541270	68				
7027003	535780	122				5.5
7030918	540408	65				5
7031015	537891	146				2
7027318	535144	8				5.5
7027384	535141	352				1
7027388	535139	350				8.3
7033963	535536	350				
7033963	535536	84				4.5
7032736	540720	66, 66 S				6.5
7032736	540720	6	82	E	4	
7032736	540720	76	54	S	12	
7032736	540720	34			30	
7032854	540668	325			0.2	
7033000	540560	38	32	S	5	
7033000	540560				4.5	
7033019	540540	352	24	E	11	
7033019	540540	353	28	E	8	
7032952	540598	64	54	S	4	
7032952	540598	115			6.1	
7028589	537665	117				
7028601	537615	98				
7034103	542158	320	30	S	4	
7034103	542158	52	70	S	2.5	
7034103	542158	330			6	
7034769	540684	61	28	N	0.3	
7034822	540664	40	46	S	15	
7034769	540684	63	22	N		
7034327	535279	Irregular				
7034228	535268	Irregular			7	
7034413	534725	Irregular				
7033681	536658	Irregular				

7033629	535310	Irregular		
7034988	534444	Irregular		
7034266	535270	Irregular		
7034623	534242	Irregular		
7034816	534347	Irregular		12
7034767	534492	Irregular		80
7034765	534510	Irregular		100
7033483	539941	Irregular		21
7036695	542369	Irregular		>2
7034245	539140	Irregular		
7034309	539158	Irregular		
7034406	539108	Irregular		
7034463	538987	Irregular		10
7036569	539900	Irregular		2
7031174	539177	Irregular		
7031041	539169	Irregular		
7029120	538737	irregular		
7028644	537794	irregular		
7031244	543145	Irregular		
7030771	536901	Irregular		
7029907	538738	irregular		
7028474	537492	irregular		
535482	7026779	irregular		
535493	7026817	irregular		
535419	7026933	irregular		
7034281	534790	irregular		
7034295	534774	irregular		200
7033837	541812	Irregular		3
7034347	540699	Irregular		10
7034822	540664	Irregular		
7034991	541179	Irregular	17	
7027163	535811	irregular	>10	
7029376	538220	irregular	30	
7027050	535506	Irregular		
7027318	535144	Irregular		5.5
7030922	540263	Irregular		20

Table 2.4. Cleavage measurements.

X-Coordinate	Y-Coordinate	Strike (degrees)	Dip angle (degrees)	Dip direction
7031000	537780	140	50	S
7030892	537551	73	50	S
7031226	537391	75	72	S
7029609	538970	56	78	S
7029437	538341	298	72	N
7030136	539557	208	50	N
7030301	539541	56	75	S
7030318	539575	290	57	N
7030320	539579	270	60	N
7030459	541113	174	68	W
7031170	540996	84	70	S
7036569	539900	295	70	N
7027477	535162	88	40	S
7027477	535162	172	85	W
7027692	535200	25	40	E
7027335	535137	337	64	E
7027318	535140	164	26	W
7027384	535141	333	82	E
7027384	535141	140	28	W
7033902	541485	356	30	E
7027094	535900	360	82	E
7026857	536432	80	46	S
7026534	536182	11	70	E
7032293	539614	130	56	S
7029614	538959	50	70	S

7030780	538138	140	48	S
7031540	541108	2	55	E
7029458	539262	68	78	S
7029458	539262	240	11	N
7029428	539186	70	72	S
7029248	538477	68	80	S
7029406	538143	57	80	S
7029849	539487	198	56	W
7029364	538219	355	88	E

Table 2.5. Quartz vein measurements.

X-Coordinate	Y-Coordinate	Strike (degrees)	Dip angle (degrees)	Dip direction	Thickness (cm)
7033894	536099	117			0.7
7033894	536099	318			0.7
7034071	535941	110			2
7034047	535850	336			0.5
7033980	535789	334			2.2
7033980	535789	324			
7033980	535789	2			
7033995	535833	326			
7033995	535833	344			
7033986	535761	114			
7033986	535761	321			
7033986	535761	315			
7034489	535607	77			
7034946	534520	72			
7034131	535383	70			0.6
7034413	534725	96	80	S	
7034413	534725	342	82	E	
7034623	534242	94			
7034152	536324	320			
7034994	534800	290			0.3
7034958	534742	280			
7034958	534742	77			
7034958	534742	303			
7032775	540724	109			4
7036473	539843	25			5
7035628	540395	79			0.2
7035628	540395	106			0.2
7030301	539541	71	50	S	1
7029764	540345	336			1
7031167	537241	333			0.3
7030995	539179	24			0.2
7030995	539179	28			
7030995	539179	42			
7030995	539179	40			
7030995	539179	102			1.5
7026395	536623	305			
7026395	536623	334			3
7026937	536083	45			
7026937	536083	20			
7026937	536083	69			
7026937	536083	77			
7026937	536083	25	60	W	
7026937	536083	80	70	E	
7034332	534733	20			0.8
7026966	535902	120			0.3

Table 2.6. Striation measurements.

		Bedding			Lineation	
X-Coordinate	**Y-Coordinate**	**Strike**	**Dip angle**	**Dip Direction**	**Azimuth**	**Plunge**
7033312	536387	4	42	E	78	41
7034479	535242				170	30
7033591	536632	80	80	S	87	64
7034879	535108				152	30
7034879	535108				174	32
7034879	535108				190	48
7034943	535041	80	24	S	162	16
7034993	534967	105	29	S	160	24
7034993	534967	105	28	S	162	24
7033546	540035	340	55	N	350	30
7033497	540210	106	44	S	159	36
7032775	540724	360	74	E	7	50
7032854	540668	360	78	E	4	10
7032854	540668	360	80	E	180	4
7032854	540668	2	80	E	360	8
7036049	540452	314	60	E	334	26
7036049	540452	350	44	E	2	17
7036049	540452	357	44	E	3	6
7035957	540559	334	36	E	353	20
7035957	540559	348	38	E	155	10
7035957	540559	342	46	E	357	18
7035957	540559	328	38	E	4	16
7030082	540128	87	60	S	174	56
7030235	539588	82	25	S	182	22
7030235	539588	82	23		193	15
7030235	539588	80	28		174	27
7028658	537776	45	90		40	10
7027381	535142	342	88	E	344	54
7027381	535142	354	86	W	350	55
7027381	535142	348	87	E	350	48
7027861	538430	353	85	W	176	36
7027861	538430	354	85	W	176	34
7027861	538430	351	84	W	176	36
7031540	541108	36	55	S	183	38
7031540	541108	40	58	S	186	42
7031540	541108	40	58	S	178	46
7031540	541108	41	59	S	186	42
7030994	538128	117	70	S	217	63
7030994	538128	117	70	S	212	61
7031753	536555	358	84	W	350	30
7031753	536555	355	82	W	354	24
7031753	536555	358	82	W	355	22
7031753	536555	350	84	W	352	25

APPENDIX III

MICROSCOPE PETROLOGY

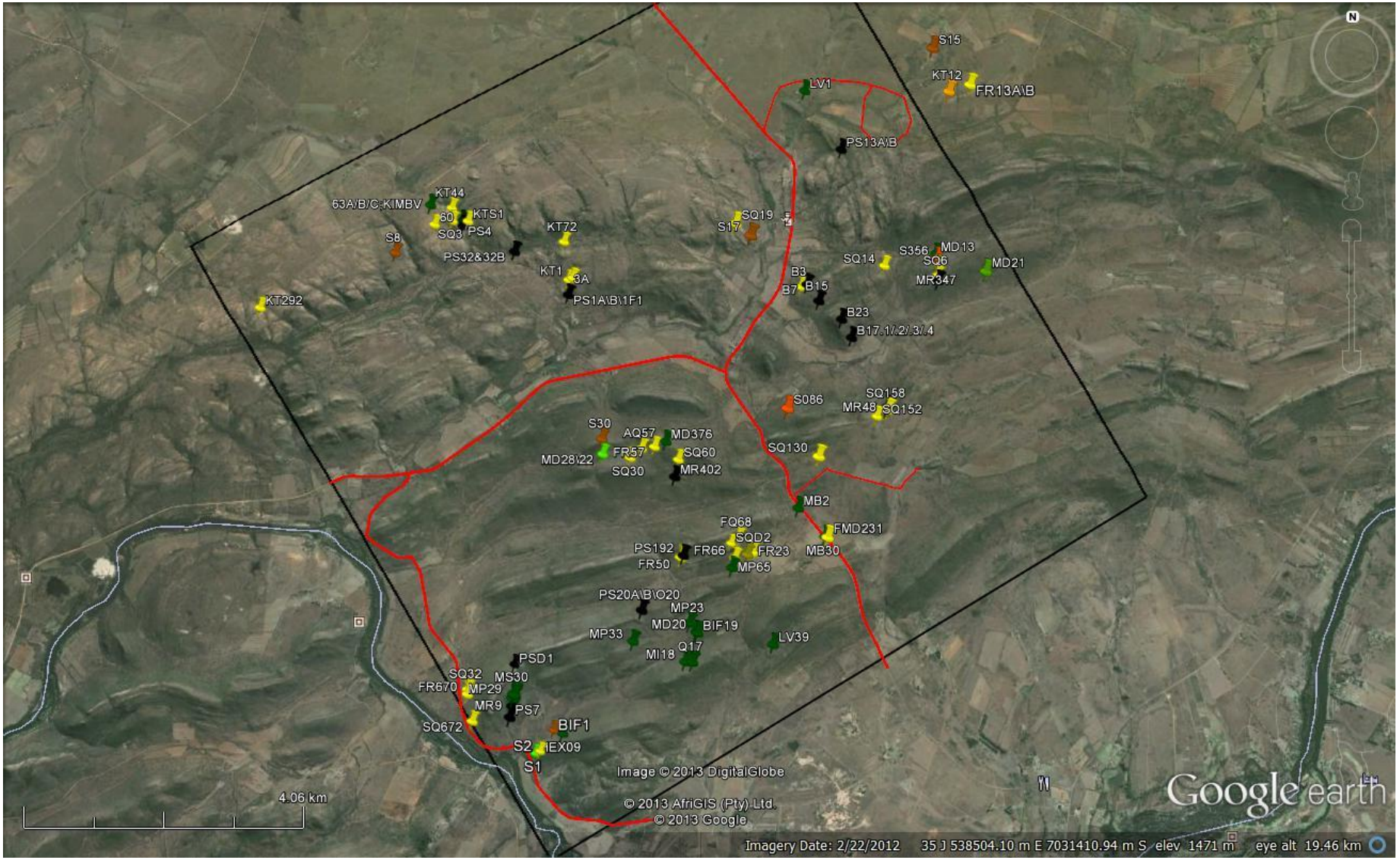


Figure 3.1. *The distribution of samples cut for thin section analysis. Yellow pins represent the location of foliated samples; green for samples of lithological units; brown for pelitic units; and black for pseudotachylitic breccia.*

Table 3.1. Samples cut for thin sections. The coordinates of the samples are in Table 1.2 (Appendix I).

First Batch		
Samples	**Description**	**Thin section Sample no. and pictures**
60	A sampled of the bedding-subparallel knotted quartzite developed in the Turffontein Subgroup. There are lineations along the plane of the sample with an azimuth of 158 (2682). The adjacent bedding dips at 31 and trends ~055, it remains to be seen whether the fabric and lineation follow this dip. Thin sections cut along 158, 073, and along bedding. Pics. 2683-2685	60XASM (073), Pic. 2696 60XBSM (158), Pic. 2696 60XCSM (Bedding), Pics. 2697, 2698
KT1	Knotted quartzite sample from the Johannesburg Subgroup. Thin section along N-S direction.	KT1SM, Pic. 2686
3A	Knotted quartzite sample from the Johannesburg Subgroup, with a local bedding orientation of 075/72 S. Thin sections crosscut the samples along 110 (2688) and 190. True dip direction is ~165. BSM top dips 68 on 190. Pics. 2689, 2690.	3AXASM (110), Pics. 2700, 2701 3AXBSM (190), Pics. 2700, 2702
63B	Unorientated sample of a meta-diamictite boulder associated with the Kimberley Reefs.	63BSM, Pic. 2699
B3	Buffelshoek area knotted quartzite sample, from the Johannesburg Subgroup. Thin sections x-cut sample along 109 (2693) and 172 (2695). Outcrop trends 050, and local bedding=056/23 S	B3XASM (109), Pic. 2693 B3XBSM (172), Pics. 2693, 2695
PS32B	Pseudotachylitic breccia sample. Top surface dips 04 on 148. Two x-sections are cut along 038 and two more cut along the 148 direction. Pictures 2703-2714.	32BXASM (038), Pics. 2704, 2705, 2708 32BXBSM (038), Pics. 2704, 2706, 2708 32BXCSM (148), Pics. 2707-10, 2713, 2714 32BXDSM (148), Pics. 2711, 2712
B15	A vertical pseudotachylitic breccia vein trending 342 (2718, CAM vertical). A horizontal section and a cross-section of the vein along 252 are cut.	B15ASM (Horizontal), Pics. 2715, 2716 B15XBSM (252), Pic. 2717

Second Batch		
Samples	**Description**	**Thin section Sample no. and pictures**
PS32	Pseudotachylitic breccia vein with an elliptical flow texture. Two subhorizontal sections (A and C), and one subvertical section trending 176.	SM-PS32A, SM-PS32C (Subhorizontal). SM-PS32B (SV, 176). Pics 2749-2753
B17.2	Pseudotachylitic breccia vein. Two subvertical cuts, both along 148. The NW contact with quartzite is sharper, with darker and glassier pseudo (SM-B17.2A). The SE contact is irregular, and the contact is irregular with grey pseudo (SM-B17.2B).	SM-B17.2A and SM-B17.2B subvertical along 148. Pics 2735-2739
B17.4	Very glassy pseudotachylitic breccia vein found on top contacts of Area 2 subhorizontal pseudos. Unorientated subvertical sample SM-17.4	SM-B17.4. Pics 2730-2734 and 2740
41A	Pseudotachylitic breccia observed in contact with quartzite at stop 41. subvertical section along 270.	SM-41A along 270. Pics 2741 and 2742
41C	Shale and pseudotachylitic breccia contact sample. Unorientated sample SM-41C	SM-41C, pics 2743 and 2744

KT44	Knotted quartzite sample from the Turffontein Subgroup. Dipping 30 on 154. 224-trending subvertical section (SM-KT44A) and 154-trending subvertical section (SM-KT44B)	SM-KT44A along 224 and SM-KT44B along 154. Pics 2745-2748
KT72	Knotted quartzite sample from the Johannesburg Subgroup. Dipping 70 on 004. Different orientation relative to other knotted quartzite horizons. A subhorizontal section (SM-KT72A) and a 004-trending section (SM-KT72B)	SM-KT72A subhorizontal and SM-KT72B. Pics 2754-2758
1B	104-trending pseudotachylitic breccia vein. Subvertical section along 053.	SM-1B along 053. Pics 2760-2762
B7	069-trending Pseudotachylitic breccia vein with flow textures (ellipsoidal texture observed in the field). Subvectical along 340, top surface dipping at 30.	SM-B7 along 340. Pics 2763-2766
B23	Pseudotachylitic breccia sample. Subvertical section cut along 116 (SM-B23)	SM-B23 along 116. Pics 2767 and 2768

Third Batch		
Samples	**Description**	**Thin section Sample no. and pictures**
FQ68	Cleaved quartzite sample. Cleavage is orientated 055/80 S, which is subparallel to the bedding that strikes 055-072. Strike difference <20. The cleavage is dragged by Z-shaped isoclinal folds. Two subvertical cuts: B that trends 060 (cleavage strike, perpendicular to dip) with a subhorizontal dip; and cut A along 185 (true dip of cleavage=150) with an apparent dip of about 75.	SM-FQ68A (along 185) and SMFQ68B (along 060). Pics. 3445-52
FR670	A sample of crenulated cleavage developed in Rgq2 quartzite unit. S2 is subparallel to bedding (348/90), and S3 is perpendicular to dip. Sample orientated 354/36W. Two cuts: Cut A that trends along the true dip (264); and Cut B along the strike, subperpendicular to dip (354). The samples are mistakenly labelled 'FQ68A&B'.	SM-FR670A (along 264) and SM-FR670B (subhorizontal, along 354). Pics. 3453-56
FR437	Foliated Rgs2 metapelite unit. The cleavage is orientated 070/54 S. Two subvertical cuts, and one along the cleavage plane: Cut A is subparallel to cleavage plane (thin section length along 070); Cut B along true dip (340); Cut C along strike, perpendicular to dip (070).	SM-FR437A (along plane), SM-FR437B (along 340), and SM-FR437C (along 070). Pics. 3457-60
FR66	Foliated Rgs2 metapelite. Trends 084 and is subvertical. Has subhorizontal lineations. Sample orientated 10 on 268. The cleavage is orientated 088/75S. There are three cuts: Cut A that is subhorizontal, cutting perpendicular to the cleavage dip; Cut B along strike (perp. dip), striking 088; and Cut C subvertical and perpendicular to the strike.	SM-FR66A (subhorizontal, perpendicular to dip), SM-FR66B (along strike), SM-FR66C (along 178). Pics. 3461-64
FR57	Cleaved quartzite sample. Cleavage orientated 140/50S, Subparallel to bedding. Bedding measurement not recorded on this stop, adjacent measurements show a strike orientation ~118 and a southerly dip ~60. Two subvertical cuts: Cut A perpendicular to strike, along true dip (212); Cut B along strike, perpendicular to dip (122).	SM-FR57A (along 212), SM-FR57B (along 122). Pics. 3465-67
SQ672	Cleaved quatzite sample collected from a road cut. It should be the same unit as where FR670 was collected. Cleavage trends 352, and is subvertical. Two cuts: Cut A is subhorizontal and perpendicular to dip (trends 352); and Cut B is subvertical and perpendicular to strike (along dip,082).	SM-SQ672A (along 352), SM-SQ672B (along 082). Pics. 3468-70
PS13A	Bedding-parallel pseudotachylitic breccia sample, orientated 010/32E. One cut along 010, subperpendicular to dip. The cut has to expose the relationship between the two pseudo breccias.	SM-PS13A (along 010). Pics. 3471-73

Fourth Batch		
Samples	**Description**	**Thin section Sample no. and pictures**
MD13	Meta-dolerite sample (3995/96). One unorientated cut. One unorientated cut.	SM-MD13. Pics. 4118-21
MD376	Medium-grained Meta-dolerite sample. Sample is X-cut by irregular pseudotachylite. One unorientated cut.	SM-MD376. Pics. 4102-05
S086	Meta-shale sample. One unorientated cut across bedding.	SM-S086. Pics. 4106-09
AQ11	Argillaceous quartzite sample. Very well laminated, with lamination spacing <1 cm. One bedding perpendicular cut along 066.	SM-AQ11. Pics. 4098-101
MR48	Meta-diamictite unit with quartz clasts up to 1.3 cm large, but are typically a few mm large. It's dark brown on weathered surface, and dark grey on a fresh one. It is >10 m wide, quite mapable. one unorientated cut.	SM-MR48 (Unorientated). Pics. 4093-97
SQ14	Cleaved quartzite sample. It's reddish grey on fresh surface, and is medium to coarse-grained. Cleavage is subhorizontal, trending 035. This orientation is oblique to that of bedding, which is orientated 067/64S. One subvertical cut along 162.	SM-SQ14 (162, SV). Pics. 4077-80
SQ3	Sheared quartzite. Cleavage is subparallel to bedding, but dips shallower. Cleavage orientated 064/17 S. The cleavage doesn't look to cut across the porphyroblasts of the knotted quartzite. From Google Earth images, this cleaved unit is displaced by later faults, most likely related to the impact, making this shearing pre-impact. One subvertical cut along 064.	SM-SQ3 (064, SV). Pics. 4089-92
SQ152	Cleaved quartzite sample. Main cleavage is orientated 003/52E. There looks to be a second set of cleavage orientated subparallel to bedding (3824/25). As a result, the main cleavage shows small-scale crenulations. Two cuts: cut 152A trends 120 and is subvertical; and a subhorizontal cut 152B.	SM-SQ152A (120, SV), and SM-SQ152B (subhorizontal). Pics. 4072-76
SQ6	Cleaved quartzite sample. The quartzite is fine-grained, with the cleavage subparallel to bedding. Quartzite unit is orientated 058/66 S. Two cuts, SQ6A along 142 (subvertical); and SQ6B horizontal.	SM-SQ6A (142, SV), SM-SQ6B (horizontal). Pics. 4081-84
AQ57	Argillaceous quartzite sample. Characterised by mm-spaced muddy laminations. One cut along 101. Same stratigraphic depth as SAMPLE AQ11, compare metamorphic grades.	SM-AQ57 (along 101). Pics. 4114-17
S356	Meta-shale sample. Cut perpendicular to bedding.	SM-S356. Pics. 4110-13
SQ60	Cleaved quartzite sample. Cleavage is orientated 120/60 S. Two cuts, SQ60A along 204 (subvertical); and a horizontal SQ60B.	SM-SQ60A (204, SV), SM-SQ60B (Horizontal). Pics. 4085-88

Fifth Batch		
Samples	**Description**	**Thin section Sample no. and pictures**
PS7	5.5 cm thick pseudotachylitic breccia sample. It is trending 122, subvertical. This melt rock contains more than one type of clasts, composed of meta-ironstone and quartzite. One cut perpendicular to bedding dip angle (subhorizontal), with bedding orientated 042/60E. The long axis trends at about 015.	SM-PS7. Pics. 5887-91
MR9	Pseudotachylitic breccia sample with quartzite and meta-dolerite clasts. One unorientated cut.	SM-MR9. Pics. 5892-97

SQ158	Cleaved quartzite sample. Greenish brown on weathered surface, and greenish grey on a fresh one. Cleavage is bedding-parallel (070), and steeply south-dipping (75). Two cuts: Cut A perpendicular to bedding (subhorizontal), and cut B along bedding.	SM-SQ158A (subhorizontal); SM-SQ158B (subvertical). Pics. 5898-905.
MB2	Basalt sample. But it has been described as Andesite by Bisschoff (2000). One unorientated cut.	SM-MB2. Pics. 5906-08.
KT292	Knotted quatzite sample. About 10 m wide zone. Porphyroblasts typically 1.8 cm. one unorientated cut.	SM-KT292. Pics. 5909-12
MR347	Meta-diamictite. It's black on fresh surface, with quartz clasts typically 4 mm, but up to 2 cm large. The rock is clast supported and adjacent to meta-ironstone. Two unorientated cuts along A and B.	SM-MR347A; SM-MR347B. Pics. 5913-5917.
PS192A	Sample of a 30 cm wide pseudotachylitic breccia, trending 024. It's associated with bedding rotation, and is characterized by flow textures. It has a heterogeneous clast composition: depressions that look to be meta-dolerite, and harder clasts that are most likely quartzite, but could also be andalusite. Three unorientated cuts A, A1, and A2.	SM-PS192A; SM-PS192A1; SM-PS192A2. Pics. 5918-24.
SQ130	Sheared, grey quartzite sample. Probably more argillaceous units in the quartzite. Cleavage orientated approximately 100/71 S. One cut perpendicular to the dip angle on the strata (subhorizontal). Bedding orientated 100/71S. The long axis of the section is perpendicular to the trend of the cleavage.	SM-SQ130. Pics. 5929-35
PS4	A sample of a 50 cm wide pseudotachylitic breccia. Two unorientated cuts along A and B.	SM-PS4A; SM-PS4B. Pics. 5936-45.
MR402	Meta-diamictite sample. Has quartzite clasts not greater than 3 cm. Has one unorientated cut.	SM-MR402. Pics. 5946-50.
PS192B	Pseudotachylitic breccia with homogeneous clasts, but doesn't have flow textures like PS192A. One unorientated cut.	SM-PS192B. Pics. 5925-28

Sixth Batch		
Samples	**Description**	**Thin section Sample no. and pictures**
SQ32	Crenulated quartzite sample. Main S2 cleavage (crenulated one) is orientated 333/82E. Crenulating cleavage S3 is orientated 320/28W. Crenulation intersection lineation is orientated 26 on 180; and 28 on 175. Bedding is 352/76 E. There are two cuts: (A) subvertical along dip of the main cleavage (S2), section orientated 093. The length of the thin section is along dip of S2. second cut (B) is subhorizontal along the crenulation intersection lineation.	SM-SQ32A (subvertical); SM-SQ32B (subhorizontal); Pics 1650-1654.
CR1	Crenulated cleavage sample, with a cleavage orientation of 088/40S. The crenulation is developed across strike. The main cleavage (crenulated S2) trends 074, with a crenulation intersection lineation that is orientated 38 on 168. The crenulating S3 cleavage is subvertical and trends 172. Bedding trends 352. There are two cuts: (A) subhorizontal and trends 088 (shows crenulation). (B) is along the crenulation lineation and dip of the S2 cleavage.	SM-CR1A (subhorizontal); SM-CR1B (subvertical); Pics 1655-1660.

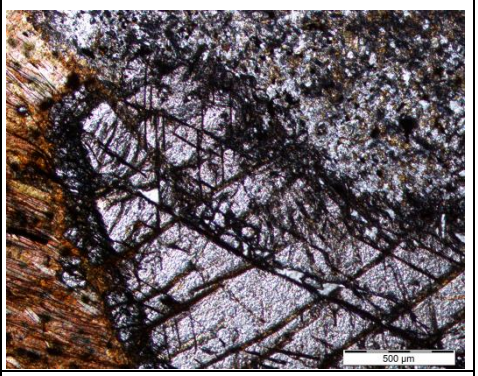
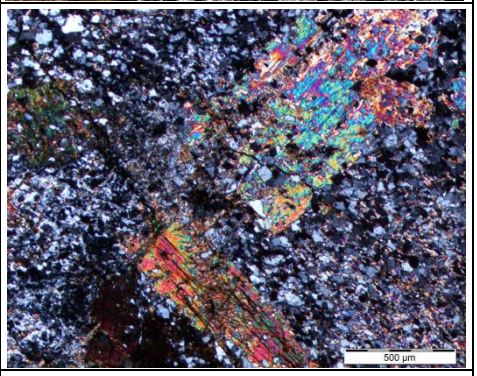
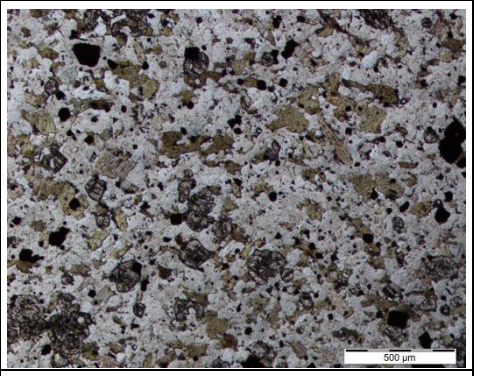
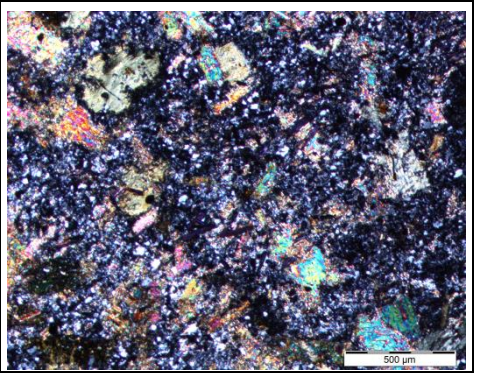
SQ19	Cleaved quartzite sample. Cleavage is orientated 123/37S. The cleavage is X-cut by pseudotachylitic breccia, and is kinked by sub-perpendicular fractures (140-151=session4). The X-cutting pseudos are along bedding (091/48S), and 057-trending subvertical ones. The cleavage dominated by 001 and 067-trending fractures. There are two cuts: (A) subhorizontal along 123 strike. (B) subvertical across the dip, section trends 213.	SM-SQ19A (subhorizontal); SM-SQ19B (Subvertical). Pics 1661-1664.
FR23	Foliated metapelite sample from Rondekop. Has a subhorizontal crenulation intersection lineation that is probably formed by a crenulating cleavage orientated 075/11N. This orientation is similar to that in Donkervliet. Main cleavage is poorly developed, orientated 068/78S, with garnet porphyroblasts <1 mm. Crenulation lineation is orientated 05 on 264. Two cuts: (A) subvertical across S2 dip, trending 160. (B) is subhorizontal along the crenulation cleavage.	SM-FR23A (Subvertical); SM-FR23B (Subhorizontal). Pics 1665-1667.
KT12	Knotted quartzite sample from Surrel's farm. The cut is subperpendicular to the dip of the cleavage. It is orientation couldn't be measured, but the bed is in-between strata that is orientated 050/27S.	SM-KT12. Pics 1668-1669
S08	Pelitic unit sample associated with the Kimberley reefs west of Morala. One unorientated cut.	SM-S08. Pics 1670-1674
S15	Pelitic unit sample associated with the Kimberley reefs at Surrel's Farm. One unorientated cut.	SM-S15. Pics 1675-1677.
S17	Pelitic unit sample associated with the Kimberley reefs in Western Saaiman. One unorientated cut.	SM-S17. Pics 1678-1680.
S30	Meta-shale sample from Mooiplaas.	SM-S30. Pics 1681-1683
MD21	Meta-dolerite sample from Saaiman's. One unorientated cut.	SM-MD21. Pics 1684-1685.
MD22	Dolerite sample from Mooiplaas. One unorientated cut.	SM-MD22. Pics 1686-1690.

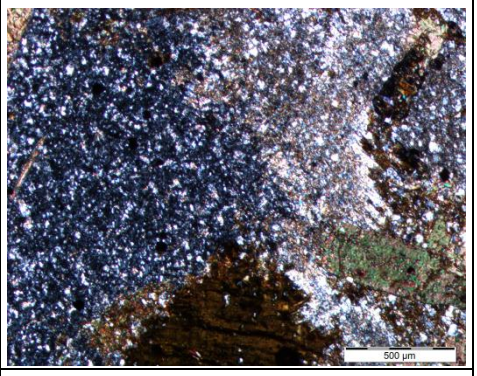
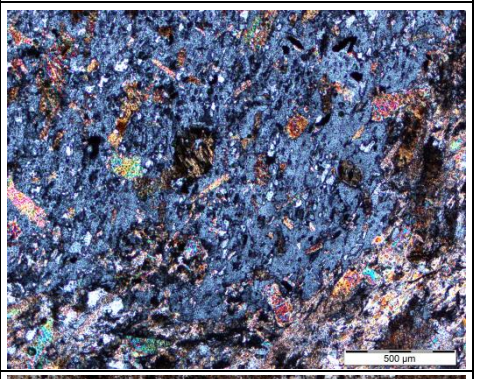
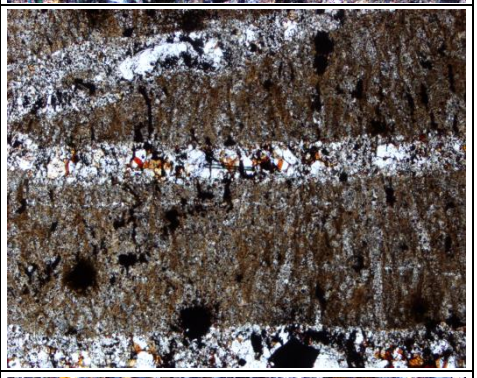
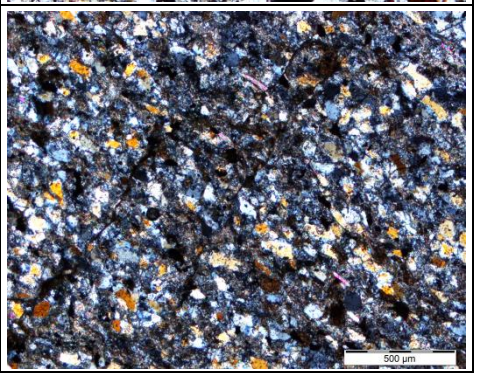
Seventh Batch		
Samples	**Description**	**Thin section Sample no. and pictures**
MP29	Cordierite-andalusite metapelite sample. Has closely spaced sandy/muddy intercalations, and a significant amount of typically 1.5 mm long staurolite needles. Cordierite typically 9 mm, but up to 2.3 cm. A few andalusite porphyroblasts up to 2.4 cm. One unorientated cut.	SM-MP29, Pics. 8829-31
BIF19	Banded Iron Formation sample. Magnetic and has silicate bands typically 2 cm. one unorientated cut.	SM-BIF19, Pics. 8832-34
MR9	A sample of pseudotachylitic breccia with quartzite and meta-dolerite clasts. One unorientated cut.	SM-MR9, Pics. 8835-39
Q17	Medium-grained quartzite sample. Pinkish white. One unorientated cut.	SM-Q17, Pics. 8840-42
MI18	A sample of a well bedded meta-ironstone. One cut.	SM-MI18, 8843-48
MS30	Meta-Slump sample. It's magnetic, and contains cordierite. Has folded and boudinaged quartzite units within the dominant pelitic mass. One unorientated cut.	SM-MS30, 8849-51
MP23	Metapelite sample. Poorly bedded, and cordierite and garnet rich. cordierite still needs to be confirmed petrologically. cordierite up to 2.4 cm large, with garnet typically 2 mm. One unorientated cut.	SM-MP23, 8852-56
MP33	Cordierite metapelite sample. Cordierite is typically 5 mm large, and quartzite intercalations are not more than 2.5 cm. One random cut.	SM-MP33, 8857-60

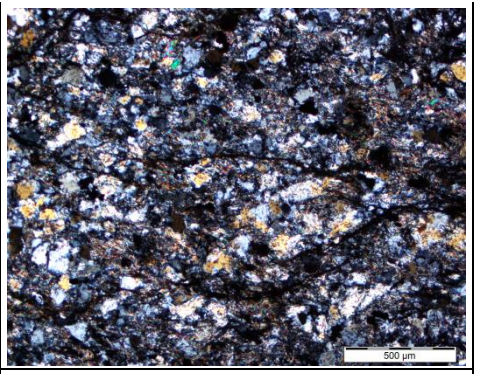
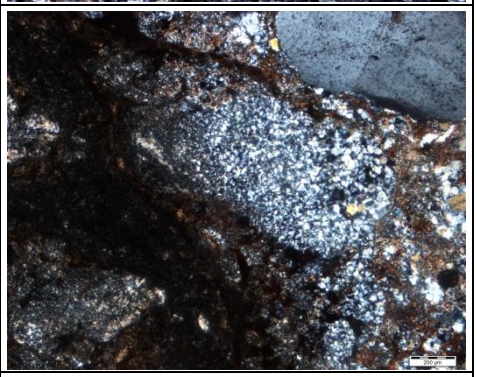
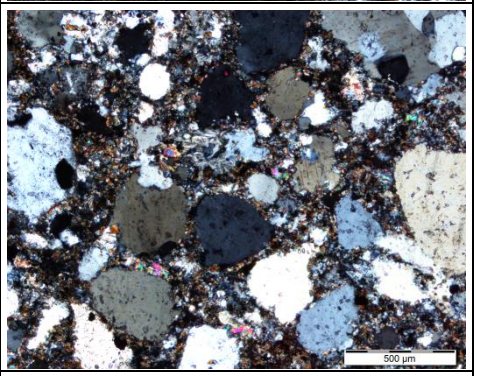
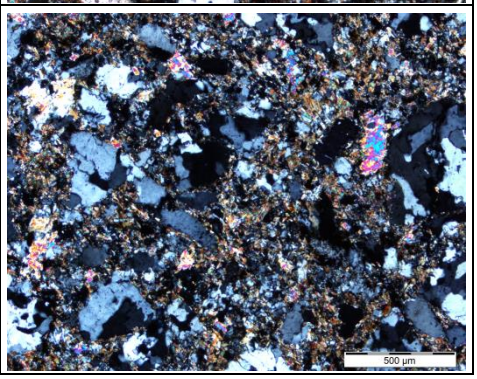
B17.4	Very glassy pseudotachylite vein found on top contacts of Area 2 subhorizontal pseudos. Unorientated subvertical sample SM-17.4. Three subvertical cuts of the injection vein according to the images. The vein is subparallel to brecciating fractures.	SM-B17.4A, SM-B17.4B, SM-B17.4C; Pics. 8861-68
MP65	A sample of the #7 andalusite metapelite. One cut.	SM-MP65, Pics. 8869-73
SQ30	Cleaved quartzite sample, orientated 067/38S. The cleavage is slightly oblique to bedding, and could be related to the cleavage developed in knotted quartzite. One subhorizontal cut along strike.	SM-SQ30, Pics. 8874-79
MB30	Cleaved meta-dolerite sample from Rondekop. Cleavage possibly a result of pre-impact faulting. One unorientated cut.	SM-MB30, 8880-88
FR13B	A sample of a fault rock that trends ~040, dips 60 E. one unorientated cut.	SM-FR13B, 8889-93

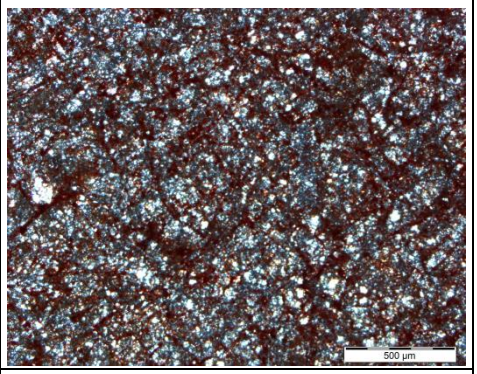
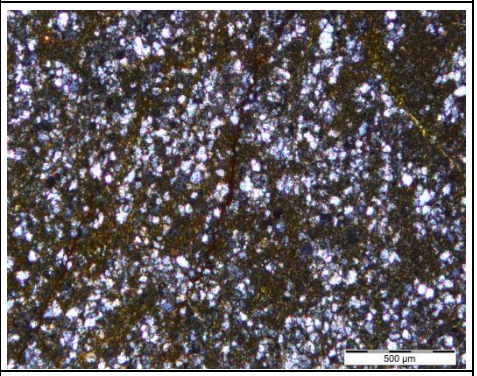
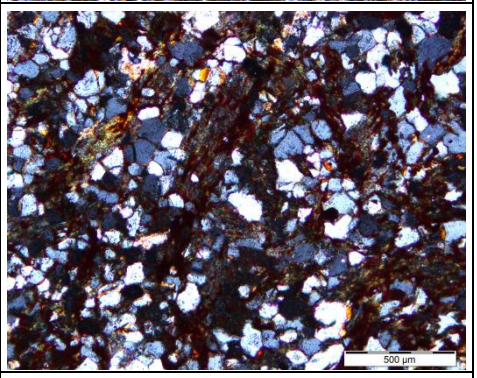
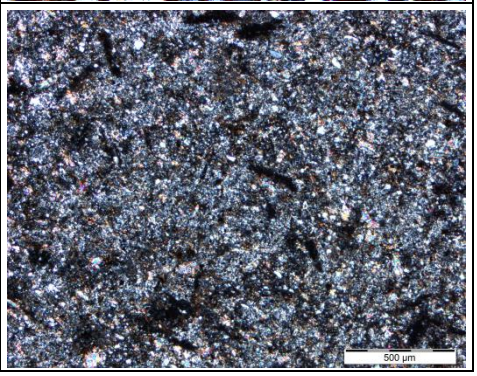
Eighth Batch		
Samples	**Description**	**Thin section Sample no. and pictures**
FMD231	Cleaved meta-dolerite sample from Rondekop. One cut perpendicular to the cleavage dip. Cut trends 094.	SM-FMD231, 2315-19
FR50	Foliated metapelite sample from Rondekop. Trends 004, subvertical. Sample trends 356. This unit is displaced by a later deformation, probably related to the impact. Has a pink, rounded, unidentified mineral, typically 2 mm. Cut A perpendicular to dip, trending 004. Cut B along dip, subvertical and with short axis trending E-W.	SM-FR50A, SM-FR50B, 2320-24
BIF1	Cleaved, garnet-bearing meta-ironstone sample. Garnet is typically 1 mm large. The sample is along bedding and orientated 080/46S. One cut perpendicular to cleavage dip.	SM-BIF1, 2325-30
S2	Cleaved metapelite sample. Cut A perpendicular to dip, along 070. Cut B along bedding, dipping towards 160.	SM-S2A, SM-S2B, 2331-37
SQD2	Cleaved Rgq3 quartzite sample. Cleavage is orientated 050/70S. One cut along dip, dipping towards 140.	SM-SQD2, 2338-42
KTS1	A sample of a bedding surface with andalusite porphyroblasts. One unorientated cut across the surface.	SM-KTS1, 2343-46
PSD1	A sample of a bedding-parallel pseudo with two populations of clasts; quartzite and dark-grey clasts. One cut across the trend of the pseudo.	SM-PSD1, 2347-50
MD20	Coarse-grained meta-dolerite sample (2.8 mm). Bluish grey, and is dominated by greenish platy mineral, most probably muscovite. One unorientated cut.	SM-MD20, 2351-54
HEX09	A sample of Meta-ironstone with garnet porphyroblasts. Forms in-between quartzite units of the southern quartzite ridge. One unorientated cut.	SM-HEX09, 2355-60
S1	Cleaved metapelite sample. Cleaved horizon trends 045, with the cleavage orientated 011/70E. One subvertical cut along dip.	SM-S1, 2361-65
PS20A	Pseudotachylitic breccia along bedding (117/66S). The breccia is divided into two zones, a middle one that is darker and glassier, bound by a contaminated zone of quartzite. The bedding-parallel vein has offshoots that never cut across it. One subhorizontal cut across the pseudo trend.	SM-PS20A, 2366-71
LV39	Dominion Group meta-basalt sample. One unorientated cut.	SM-LV39, 2372-75
LV1	Klipriviersberg Group meta-basalt sample. One unorientated cut.	SM-LV1, 2376-80

Table 3.2. Petrographic descriptions of metapelite and other pelitic units.

Samples of metapelite and other pelitic units			
Sample #	**Coordinates**	**Petrographic description**	**Photomicrographs**
MP23 (Rhs4)	X=7028418 Y=538372	The metapelite sample is composed of 32% quartz, 29% biotite, 25% cordierite, 9% staurolite, and 5% garnet. The metapelite is characterised by: a) Type 2a idioblastic garnet porphyroblasts that are zoned; b) Type 2a cordierite that is associated with a syngenetic S2 cleavage that wraps around it. c) Type 2b cordierite, biotite, and staurolite partial replacements of Type 2a cordierite. Type 2a garnet hosts an intense conjugate set of fractures, which are associated with micro-displacements (Photomicrograph on the right). The matrix of the sample is dominated by biotite and quartz.	
MP29 (Rhs5)	X=7027266 Y=535820	The metapelite sample is composed of 38% biotite, 30% cordierite, 22% quartz, and 10% andalusite. This sample hosts Type 2a biotite, cordierite, and andalusite porphyroblasts. Type 2a biotite forms most of the matrix, with Type 2b biotite developed as replacement of Type 2a cordierite porphyroblasts.	
MS30 (Rhs5)	X=7027316 Y=535831	The metapelite sample is composed of 58% quartz, 13% biotite, 12% garnet, 9% chlorite, and 8% magnetite. This sample hosts the smallest metamorphic mineral assemblages compared to all the other metapelite units (typically <0.5 mm). The sample hosts Type 2a biotite, garnet, and magnetite. The matrix is dominated by Type 2a biotite and chlorite, and quartz. There is also Type 2b chlorite that is hosted as Type 2a biotite replacements.	
MP33 (Rhs5)	X=7027467 Y=535756	The sample is composed of 44% cordierite, 30% biotite, 21% quartz, and 5% chlorite. The sample is dominantly composed of Type 2a cordierite and biotite. Like in sample MS30, Type 2a biotite is replaced by Type 2b chlorite.	

MP65 (Rgs1)	X=7029238 Y=538979	The sample is composed of 42% biotite, 28% andalusite, 20% quartz, 6% garnet, and 4% chlorite. This sample mainly hosts Type 2a biotite, andalusite and garnet. Type 2a biotite and garnet are hosted as inclusions in andalusite and as part of the matrix.	
13D5 (Pre-Ro)		The metapelite sample is mainly composed of Type 2a andalusite and biotite porphyroblasts. The biotite is hosted as andalusite inclusions, and as part of the matrix. The matrix of the sample is dominated by a quartz and biotite, associated with a poorly-developed biotite-sericite cleavage.	
41c (Rt)	X=7034413 Y=534725	The pelitic sample is composed of an oxidised groundmass composed mainly of quartz, chlorite, and sericite (~80%). 13% is of quartz veins, and 7% ilmenite. There two generations of quartz veins that crosscut a poorly developed cleavage in the groundmass. The veins are displaced by two generations of micro-faults, indicative of a multi-deformational history. These relationships represent pre-impact microstructures in the sample (Figure 5.22).	
AQ11 (Rgq8)	X=7033882 Y=542031	The argillaceous quartzite sample is composed of 69% quartz, 19% sericite+muscovite, 5% biotite, 3% chlorite, 3% magnetite+maghemite, and 1% pyrite. The ore minerals are developed along thin laminations in the sample, which host heavy minerals.	

AQ57 (Rgq8)	X=7030971 Y=537590	The argillaceous quartzite sample is composed of 69% quartz, 20% muscovite+sericite, 5% biotite, 3% chlorite, 2.5% magnetite+maghemite, and 0.5% pyrite. Like in sample AQ11, ore minerals (magnetite+pyrite) are developed along thin laminations. This sample a higher concentration of relatively coarse muscovite compared to sample AQ11.	
MR48 (Rgs3)	X=7031654 Y=541258	The meta-diamictite sample is composed of 58% quartz clasts, and 42% groundmass composed of biotite, chlorite, and sericite. The samples is crosscut by pseudotachylitic breccia that is associated with recrystallisation of the quartz clasts. The degree of recrystallisation increases towards the pseudotachylitic breccia vein, indicative of increasing shock pressures.	
MR347 (Rgs8)	X=7033640 Y=542029	The meta-diamictite sample is composed of 58% quartz, 20% chlorite, 13% biotite, and 9% sericite. The quartz clasts hosted in this unit are not recrystallised like those in sample MR402.	
MR402 (Rgs8)	X=7030562 Y=538096	The meta-diamictite sample is composed 56% quartz, 22% biotite, 17% chlorite, and 5% muscovite. Unlike sample MR347, this sample hosts recrystallised quartz clasts, and muscovite in the matrix.	

S08 (Rt)	X=7033877 Y=533736	The pelitic sample is mainly composed of ~58% quartz (< 0.1 mm), which is hosted in an oxidised fine-grained matrix. The composition of the groundmass is too fine-grained and altered to be petrographically distinguished.	
S15 (Rt)	X=7037325 Y=541941	The pelitic sample is composed of ~ 47% quartz (<0.1 mm), which is hosted in an altered and fine-grained matrix. The composition of the groundmass cannot be petrographically distinguished.	
S17 (Rt)	X=7034284 Y=539156	The pelitic sample S17 hosts ~60% quartz (typically 0.2 mm), whose grain size is coarser than that of samples S08 and S15. The matrix of the sample is still oxidised, making it hard to identify minerals hosted in the matrix.	
S30 (Rgs9)	X=7031095 Y=536991	The pelitic sample is composed of 60% quartz, 25% muscovite, and 10% goethite, 5% oxidised chloritoid. The sample is mostly aphanitic, with coarser and oxidised skeletal chloritoid hosted in the groundmass.	

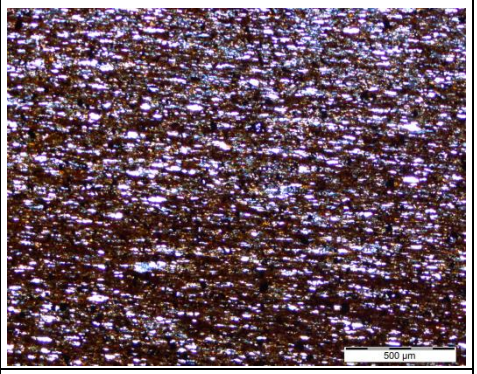
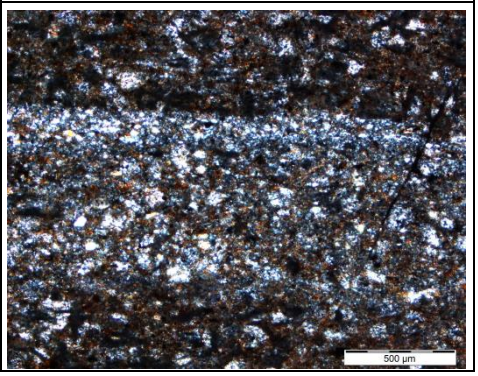
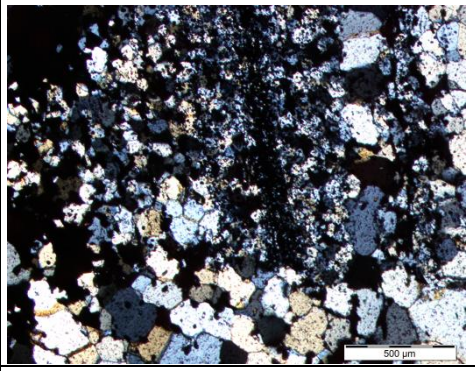
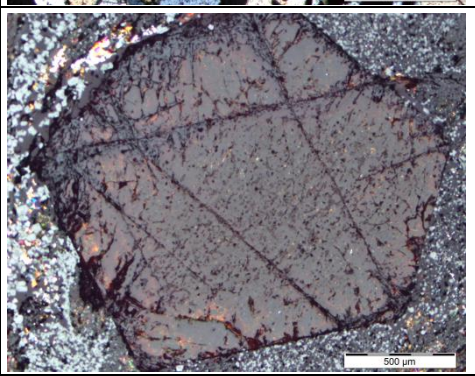
S086 (Rjs2)	X=7031614 Y=539760	The pelitic sample is composed of 40% quartz, 30% Fe-oxide, 22% chlorite, and 08% ilmenite. The samples is fine-grained (<0.1 mm), and hosts a well-developed sub-planar cleavage.	
S356 (Rgs9)	X=7033997 Y=542021	The pelitic sample is composed of 55% quartz, 29% goethite, 16% chlorite. The sample has well-developed quartz-rich laminations, which are displaced by a conjugate set of micro-faults. Goethite stained the mineral assemblage hosted it the groundmass, making it hard to identify.	

Table 3.3. Petrographic descriptions of meta-ironstone samples.

Meta-ironstone samples			
Sample #	**Coordinates**	**Petrographic description**	**Photomicrographs**
BIF19 (Rhc)	X=7028282 Y=538492	The BIF sample has 35% magnetite, 45% quartz; 10% grunerite, 06% biotite, and 04% garnet. Crosscut by quartz veins, most of which are perpendicular to banding.	
HEX09 (Rhs1)	X=7026801 Y=536563	The meta-ironstone sample is composed of 40% magnetite, 28% quartz, 22% grunerite, and 10% garnet. Garnet porphyroblasts are mostly idioblastic, and are crosscut by conjugate fracture sets. Unlike garnet porphyroblasts developed along the Karolina Fault, these ones do not preserve planar inclusion trails.	

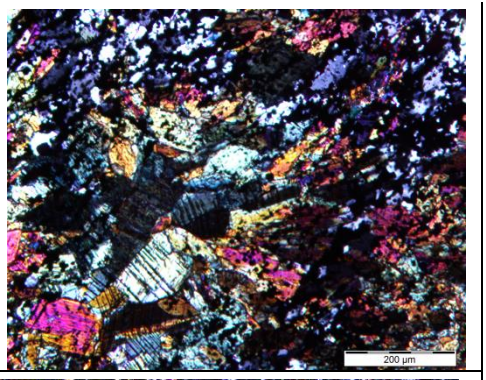
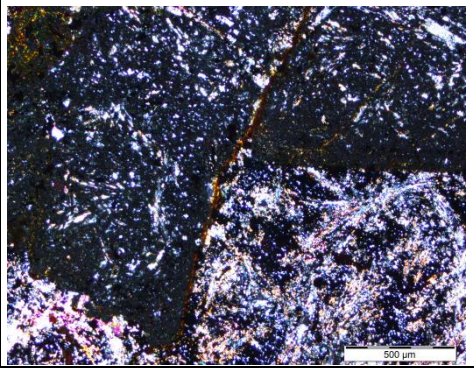
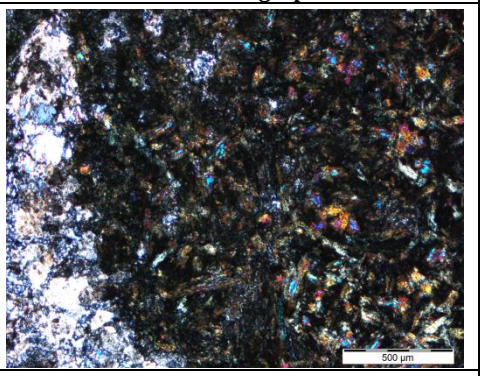
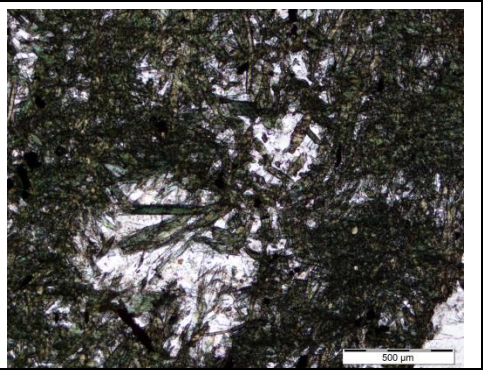
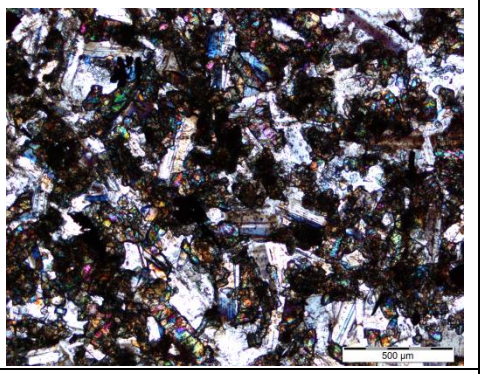
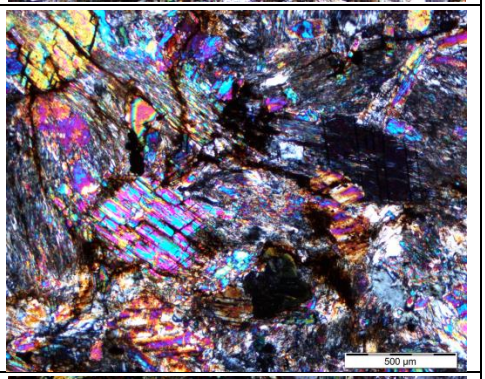
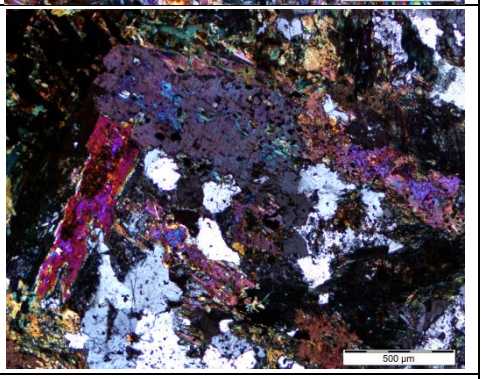
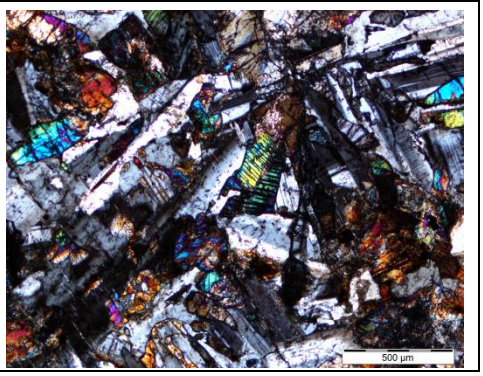
MI18 (Rhs2/3)	X=7027865 Y=538320	The meta-ironstone sample is composed of 50% grunerite, 25% quartz, 5% garnet and 20% magnetite. Grunerite porphyroblasts are characterised by their skeletal and radiating texture (Photomicrograph on the right). Grunerite is characterised by twinning shown in the figure.	
13D4		The meta-ironstone sample is mainly composed of 40% grunerite, 25% quartz, 10% garnet, and 25% magnetite. The idioblastic garnet porphyroblasts are up to 2 mm in diameter, and are displaced by micro-fault. The garnet porphyroblasts also do not host planar inclusion trails like those developed along the Karolina Fault.	

Table 3.4. Petrographic descriptions of meta-dolerite, dolerite, and meta-basalt samples.

Samples of meta-dolerite, dolerite, and meta-basalt units			
Sample #	**Coordinates**	**Petrographic description**	**Photomicrographs**
LV1 (Rk)	X=7036603 Y=539953	The meta-basalt sample is composed of 37% actinolite, 25% clinopyroxene, 15% chlorite, 8% plagioclase, and 12% quartz amygdales, 3% ilmenite. Unlike Sample LV39, the matrix of this sample is highly altered, masking the mineral assemblages hosted in the matrix.	
LV39 (Rd)	X=7028142 Y=539605	The meta-basalt sample is composed of 63% hornblende, 25% plagioclase, 8% quartz amygdales, and 4% ilmenite. Hornblende is characterised by a radiating textures, and the crystals are coarser close to the quartz amygdales.	

MD13 (Vdi)	X=7034059 Y=541992	The dolerite sample is composed of 55% clinopyroxene, 42% plagioclase, and 3% ilmenite. This dolerite hosts the finest pyroxene grains, typically <0.1 mm. It is composed mainly of primary minerals.	
MD20 (Re)	X=7028299 Y=538473	The meta-dolerite sample is composed of 42% hornblende, 34% fibrous actinolite, 10% clinopyroxene, 8% plagioclase, and 6% epidote. Epidote and hornblende replaced primary Cpx, hence the low proportion of pyroxene.	
MD21 (Re)	X=7033787 Y=542754	The meta-dolerite sample is composed of 60% hornblende, 27% plagioclase, 10% quartz, 2% clinopyroxene 1% ilmenite. This sample hosts secondary quartz, and amphibole replacements on primary Cpx. These assemblages represent metamorphic minerals hosted in mafic rocks in the collar.	
MD22/28 (Vdi)	X7030867 Y=537012	The dolerite sample is composed of 39% plagioclase, 37% clinopyroxene, 18% orthopyroxene, and 6% biotite+muscovite. This sample is manly composed of primary mineral. Euhedral plagioclase is typically 1 mm, which smaller Cpx and Opx crystals typically <0.4 mm.	

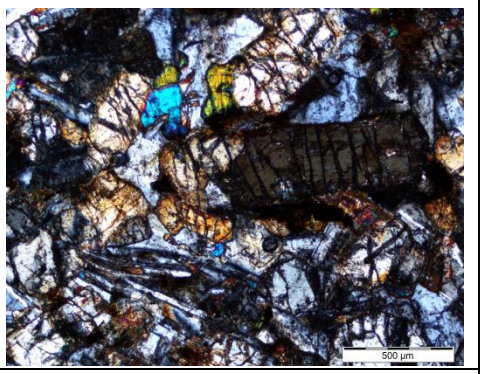
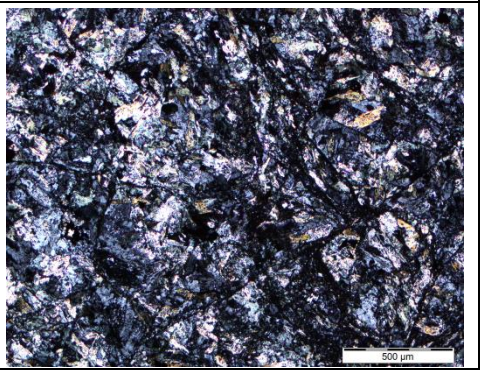
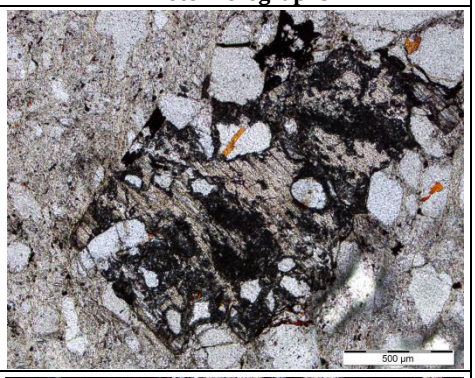
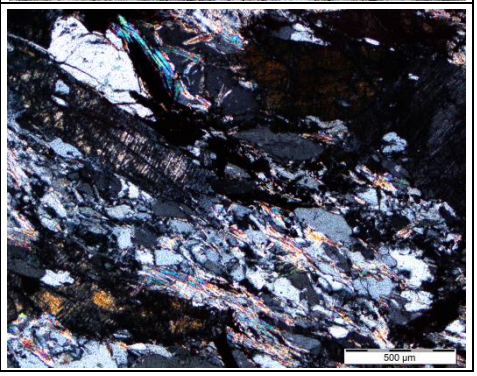
MD376 (Vdi)	X=7031079 Y=531079	The dolerite sample is composed of 60% orthopyroxene, 30% plagioclase, and 10% clinopyroxene. The sample is coarse-grained, with euhedral Opx typically >0.5 mm in length. Unlike the Re sills, this unit does not host a metamorphic assemblage. The composition is mostly primary.	
13D8		A meta-dolerite dyke sample composed of about 40% plagioclase, 35% actinolite, 20% clinopyroxene, and 05% ilmenite. This is a sample from the only meta-dolerite sill hosted in the Central Rand Group.	

Table 3.5. Petrographic descriptions of knotted quartzite horizons.

Knotted quartzite samples			
Sample #	**Coordinates**	**Petrographic description**	**Photomicrographs**
3A (Rjo1)	X=7033543 Y=536383	The knotted quartzite sample is composed of 35% andalusite, 30% quartz, 10% oxidised chloritoid, 15% sericite, and 10% kyanite. The sample hosts subidioblastic kyanite porphyroblasts and skeletal chloritoid that has been oxidised. There is minimal or no andalusite in this sample.	
60 (Rt)	X=7034319 Y=534316	The knotted quartzite sample is composed of 45% quartz, 28% kyanite, 13% muscovite, 12% kyanite and 2% goethite. The cleavage is poorly developed because it is define by the relatively coarse muscovite and quartz. As a result, the cleavage-porphyroblast textural relationship is poorly show, unlike in sample KT72. There is little or no andalusite in this sample.	

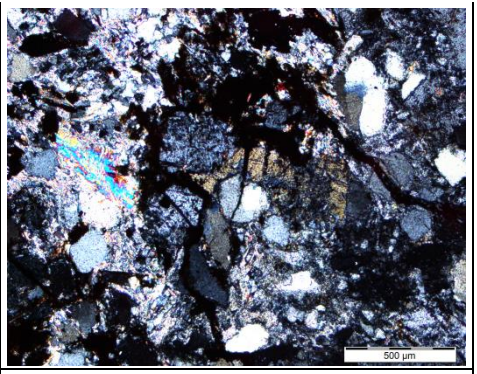
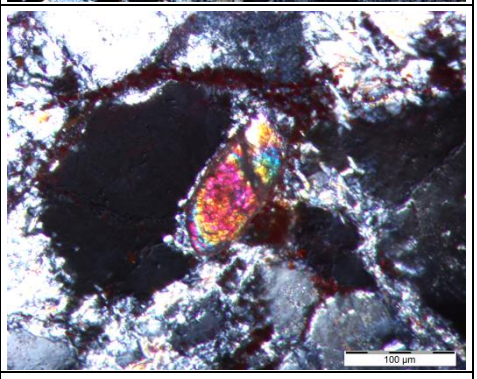
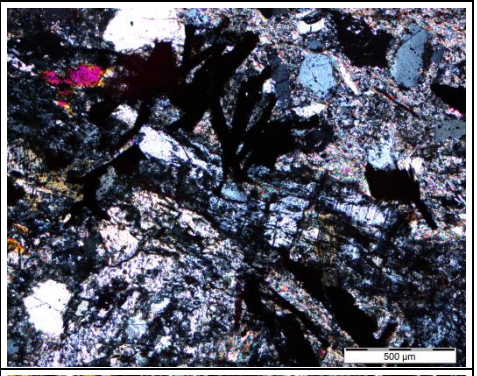
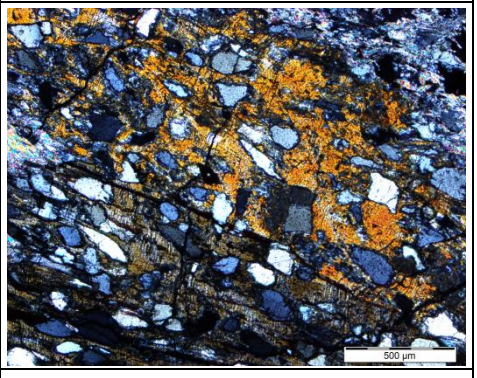
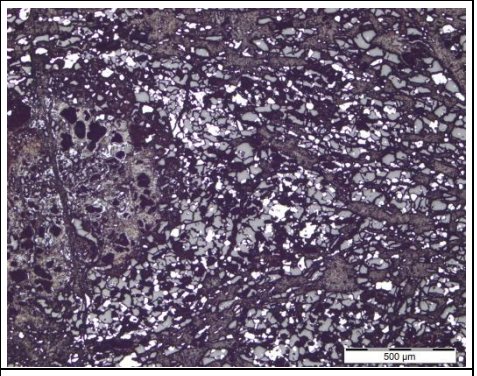
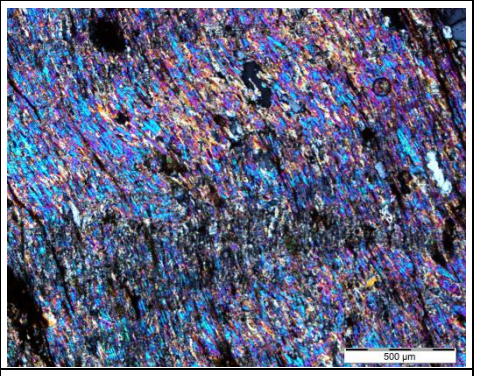
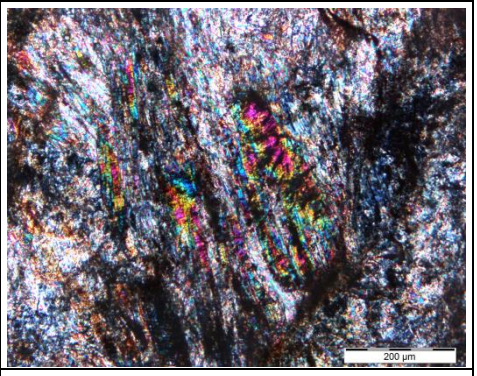
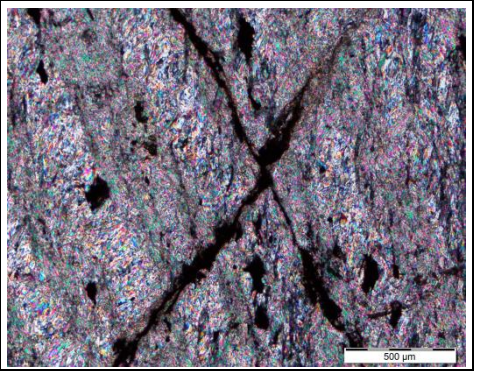
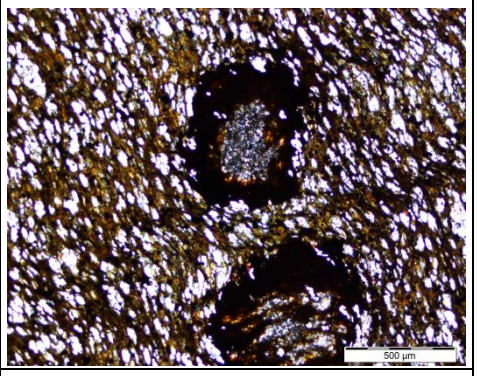
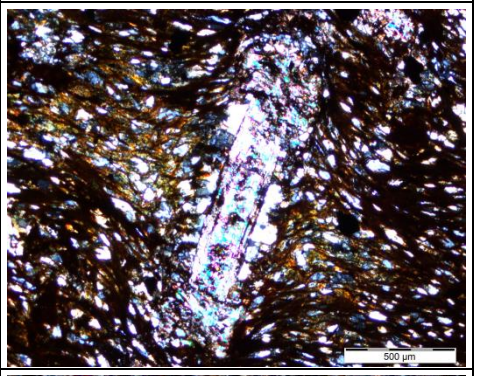
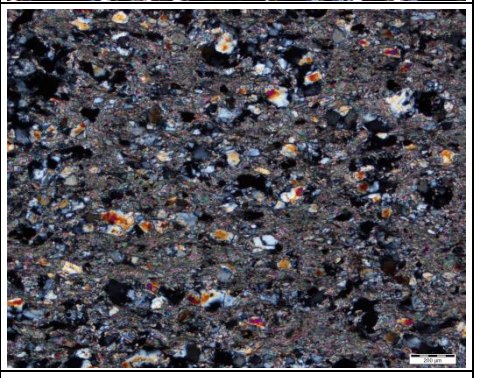
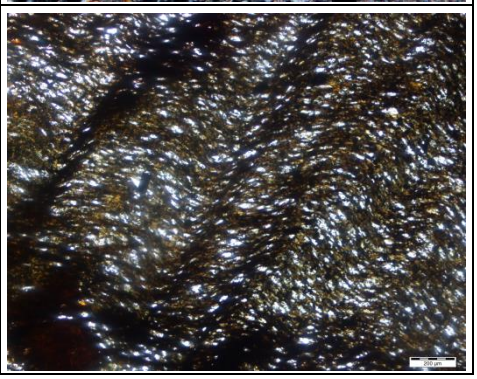
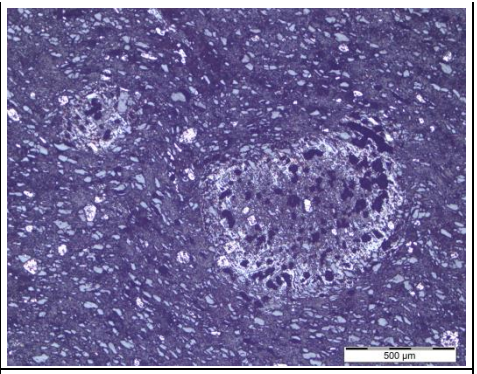
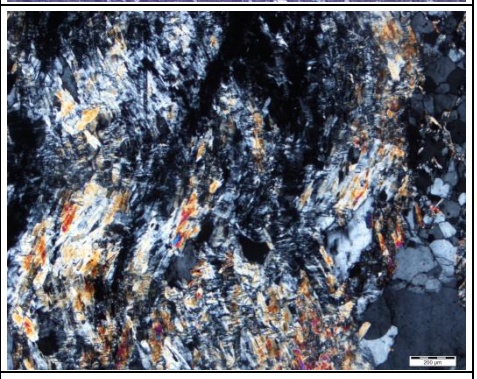
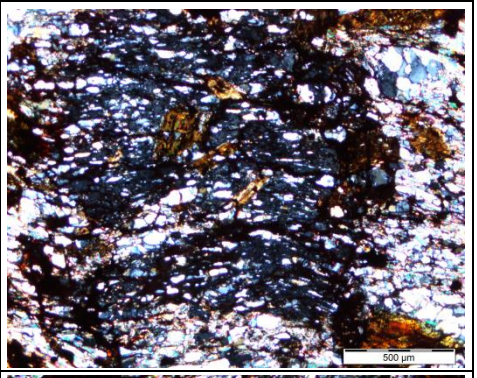
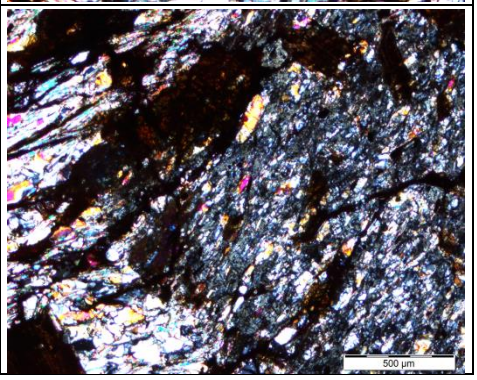
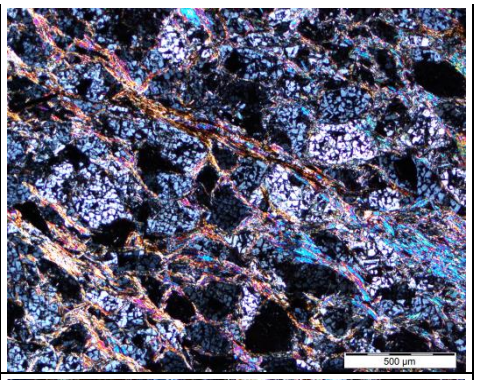
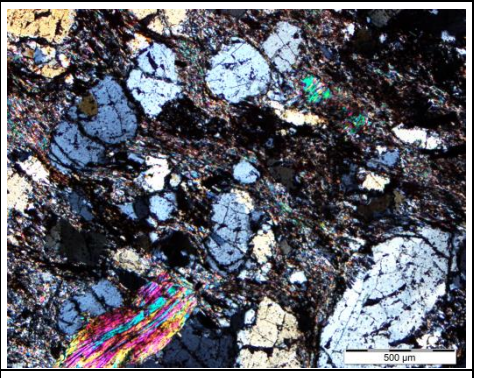
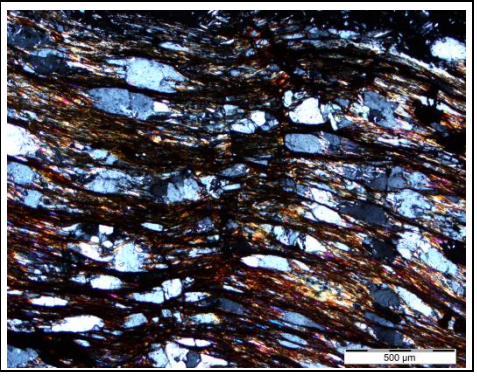
B3 (Rjo2)	X=7033513 Y=539943	The knotted quartzite sample is composed of 46% andalusite, 30% quartz, 15% chloritoid, 5% muscovite, and 4% kyanite. Unlike andalusite porphyroblasts hosted in the West Rand Group, andalusite porphyroblasts in this sample are interlocking and interstitial, as opposed to their idioblastic nature in the West Rand Group. The few kyanite porphyroblasts are developed as patchy replacements on andalusite (see photomicrograph on the right).	
KT12 (Rjo2)	X=7036630 Y=542195	The knotted quartzite sample is composed of 38% quartz, 47% sericite+muscovite, 13% chloritoid, 2% rutile. Unlike knotted quartzite samples hosted on the western side of the Karolina Fault, this sample contains minimal andalusite and no kyanite.	
KT44 (Rt)	X=7034601 Y=534557	The knotted quartzite sample is composed of 45% quartz, 30% muscovite, 15% kyanite, 5% andalusite, and 5% chloritoid. Sample KT44 also hosts a poorly-developed cleavage, which hosts skeletal chloritoid that has been oxidised. Kyanite is more interstitial than idioblastic in this sample.	
KT72 (Rjo2)	X=7034136 Y=536290	The knotted quartzite sample is composed of 35% sericite+muscovite, 30% quartz, 18% kyanite, 12% andalusite, and 5% chloritoid. Kyanite porphyroblasts hosted in this sample are more idioblastic that interstitial. The idioblastic kyanite shows a minor rotation of the sericite cleavage. Quartz inclusions in the porphyroblasts are coarser and relatively rounded compared to quartz grains that form part of the cleavage. Also, the edges of subidioblastic kyanite include sheared quartz grains, which indicate a syngenetic formation of kyanite and the cleavage.	
KT292 (Rt)	X=7032950 Y=531759	The knotted quartzite sample is composed of 62% quartz, 16% kyanite, 10% andalusite, and 12% sericite.	

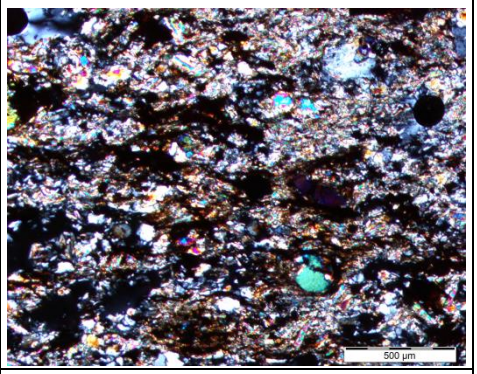
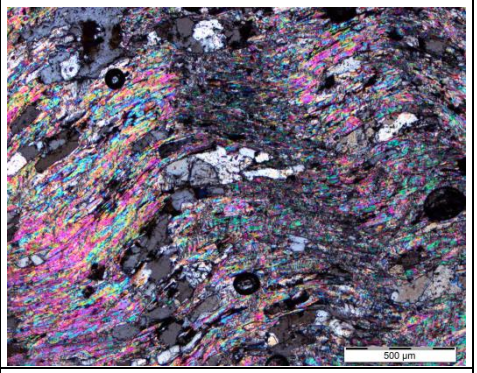
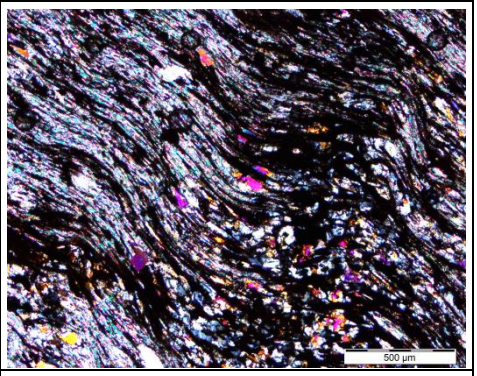
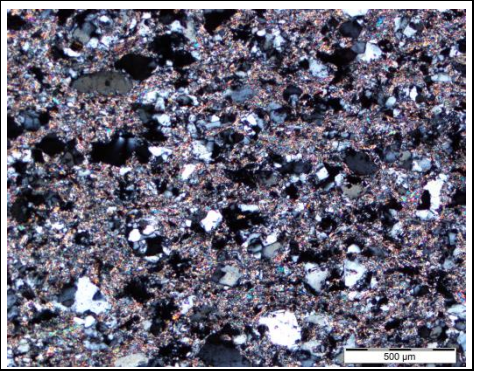
Table 3.6. Petrographic descriptions of foliated samples.

Samples of foliated rocks			
Sample #	**Coordinates**	**Petrographic description**	**Photomicrographs**
BIF1 (Rhc)	X=7026857 Y=536432	The foliated meta-ironstone sample is composed of 50% oxidised matrix, 30% quartz, 16% magnetite, and 4% garnet. The S2 cleavage, outlined by quartz, wraps around garnet porphyroblasts. This indicates the syn-tectonic nature of M2 porphyroblasts with the cleavage, a relationship also seen in metapelite units of the West Rand Group, and knotted quartzite horizons of the Central Rand Group.	
CR1 (Rgq2)	X=7027477 Y=535162	The foliated quartzite sample is composed of 60% quartz, 33% muscovite+sericite, and 7% ilmenite. Muscovite defines the main S2 cleavage, which is crosscut by later S3 crenulations.	
FMD231 (Re)	X=7029700 Y=540382	The foliated meta-dolerite sample is composed of 78% fibrous actinolite, 11% clinopyroxene, 7% plagioclase, and 8% ilmenite. Elongate actinolite outlines the cleavage, although the orientation of this cleavage varies unlike in metapelites and quartzite units.	
FQ68 (Rgq3)	X=7029681 Y=539060	The foliated quartzite sample is composed of 70% sericite, 28% quartz, and 2% Ilmenite. The S2 cleavage is defined by sericite in this sample, developed in more pelitic horizons of the quartzite. The cleavage is crosscut by a conjugate set of goethite-bearing micro-faults, indicative of multi-deformational micro-structures.	

FR23 (Rgs2)	X=7029458 Y=539262	The foliated metapelite sample is composed of 42% quartz, 30% biotite, 10% garnet, 09% magnetite, 05% hematite, 04% chlorite. The sample hosts the S2 cleavage mainly composed of biotite (orientated east-west, and steeply south-dipping). S3 crenulations of the earlier S2 cleavage are only observed along a subhorizontal thin section that perpendicular to strike and along the dip of the S2 cleavage. Crenulations are developed around garnet porphyroblasts, they never go through them because they are relatively rigid compared to the matrix.	
FR50 (Rgs2)	X=7029357 Y=538218	The foliated metapelite sample is composed of 30% biotite, 25% quartz, 12% garnet, 12% chlorite, 11% muscovite, and 10% magnetite. A subvertical S2 cleavage (north-south, steeply west-dipping) cleavage is mainly composed of biotite. The S2 cleavage wraps around andalusite porphyroblasts that have been replaced by muscovite (see photomicrograph on the right).	
FR57 (Rgq8)	X=7031000 Y=537780	The foliated quartzite sample is composed of 54% quartz, 36% sericite, 7% goethite, and 3% hematite. Sericite mainly defines the S2 cleavage developed in the sample, which is crosscut by goethite bearing fractures.	
FR66 (Rgs2)	X=7029385 Y=539019	The foliated metapelite sample is composed of 35% quartz, 28% biotite, 25% goethite+hematite, 7% magnetite, and 5% garnet. The sample hosts a subvertical S2 cleavage (east-west, and steeply south-dipping) that wraps around M2 garnet and replaced andalusite porphyroblasts (syngenetic). The garnet porphyroblasts preserved an earlier planar Sx fabric. The S2 cleavage is crenulated by a subvertical S3 cleavage. The crenulation of the S2 cleavage well developed along a subhorizontal thin section cut, perpendicular to the dip of the S2 cleavage.	

FR437 (Rgs2)	X=7029436 Y=539199	This sample has a composition similar to that of samples FR23 and FR66. Crenulation of the main S2 cleavage (east-west, and steeply south-dipping) is observed along a subhorizontal thin section cut, perpendicular to the dip of the S2 cleavage. Garnet porphyroblasts still host a planar Sx cleavage, which has been rotated.	
FR670 (Rgq2)	X=7027315 Y=535141	The foliated quartzite sample is composed of 68% quartz, 30% muscovite+chlorite, and 2% goethite. The sample hosts a main subvertical (steeply east-dipping) S2 cleavage, which is crenulated by a subhorizontal (shallowly west-dipping) S3 cleavage. The quartz grains are polygonal.	
S1 (Pre-Ro)	X=7026519 Y=536176	The foliated metapelite sample is composed of 48% sericite+muscovite, 25% quartz, 23% biotite, and 4% andalusite. sericite, muscovite, and quartz form a cleavage in the sample. Unlike in garnet porphyroblasts hosted in the Rgs2 metapelite unit, andalusite porphyroblasts host inclusion trails that form a curved fabric.	
S2 (Pre-Ro)	X=7026553 Y=536248	The foliated metapelite sample is composed of 50% sericite+muscovite, 25% quartz, 21% biotite, and 4% andalusite. A sericite-muscovite-quartz cleavage is hosted in the matrix of the sample. Like in Sample S1, inclusion trails in andalusite are curved.	

SQ3 (Rt)	X=7034398 Y=534576	The foliated quartzite sample is composed of 85% quartz, and 15% muscovite+sericite. Quartz grains host perpendicular micro-fractures that divide the grains into micro-domains. The domains go extinct at the same angle, which means that the texture is not polygonal.	
SQ6 (Rgq8)	X=7033718 Y=542016	The foliated quartzite sample is composed of 40% quartz, 34% muscovite+sericite, and 26% goethite. Cleavage in this sample is formed by muscovite and sericite. The cleavage is crosscut by pseudotachylitic breccia associated with quartz recrystallisation along its margins, similar to that developed in sample MR48. The pseudotachylitic breccia is crosscut by a goethite-bearing fracture.	
SQ14 (Rjo2)	X=7033864 Y=541212	The foliated quartzite sample is composed of 55% quartz, 35% muscovite+sericite, and 20% goethite. Quartz clasts show high birefringence colours because the thin section is thicker. The cleavage is defined by muscovite and sericite, and it is not crenulated.	
SQ19 (Rt)	X=7034450 Y=538918	The foliated quartzite sample is composed of 55% quartz, 25% muscovite, 14% goethite, and 6% ilmenite. Muscovite forms the main S2 cleavage, which is kinked. The micro-folds formed by kinking are also seen on outcrop-scale.	

SQ30 (Rgq8)	X=7030827 Y=537424	The foliated quartzite sample hosts a poorly-developed sericite cleavage, which is stained by goethite.	
SQ32 (Rgq2)	X=7027384 Y=535141	The foliated quartzite sample is composed of 50% polygonal quartz grains that are hosted in a 46% muscovite cleavage. There's about 4% goethite in the sample. Muscovite forms the S2 cleavage, which is crosscut by an S3 crenulation. Goethite is mainly hosted along the crenulations.	
SQ60 (Rgq8)	X=7030816 Y=538143	The foliated quartzite sample is composed of 40% muscovite+sericite, 35% quartz, and 25% goethite. The main S2 cleavage (steeply south dipping) is defined by muscovite and sericite. The S2 cleavage is crenulated by a subvertical and S2-strike-perpendicular cleavage (S3). Furthermore, the S2 cleavage folded pre-existing quartz veins.	
SQ130 (Rgq8)	X=7030896 Y=540236	The foliated quartzite sample is composed of 53% quartz, 43% sericite+muscovite, and 4% ilmenite. This sample hosts finer quartz grains than most cleaved quartzite samples (<0.3 mm), and the sericite+muscovite cleavage is relatively poorly-developed.	

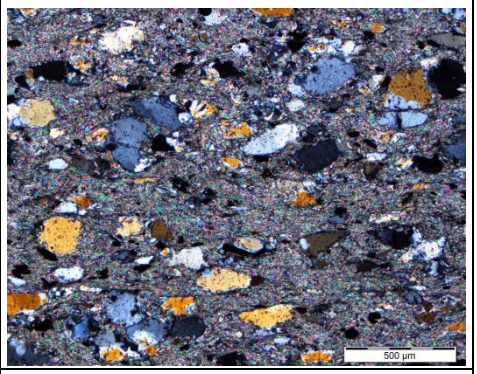
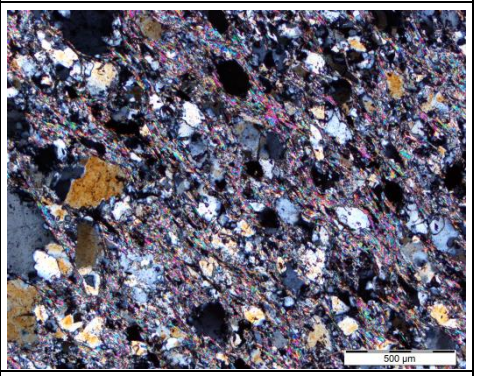
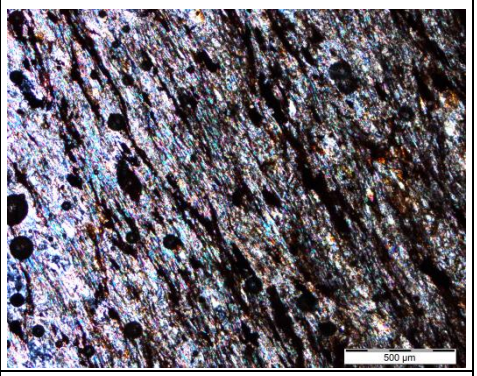
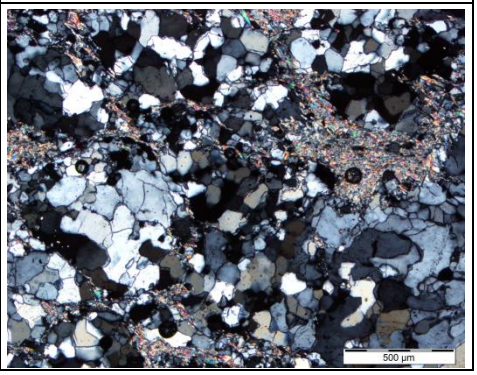
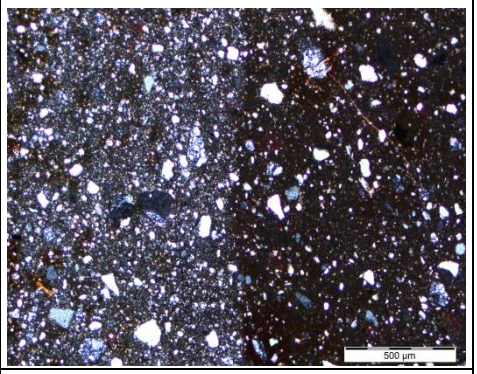
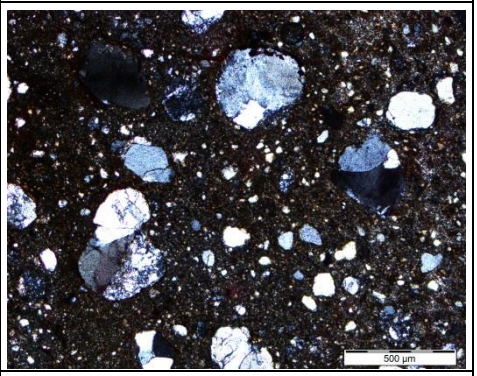
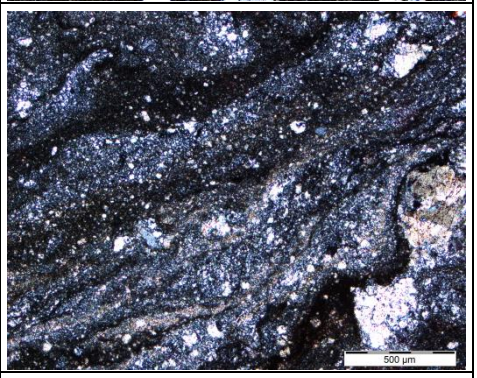
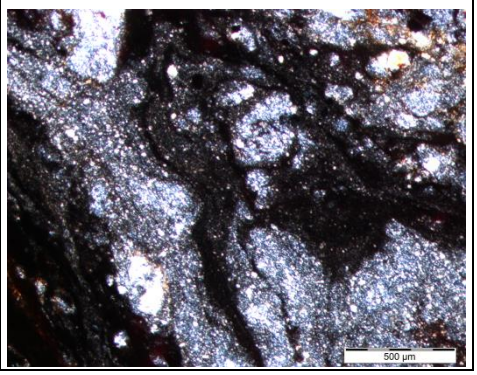
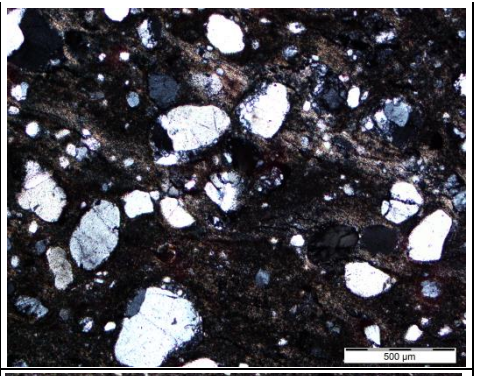
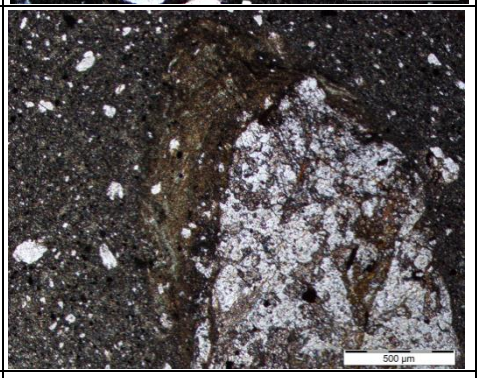
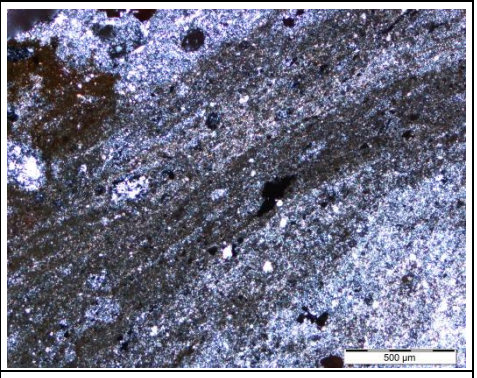
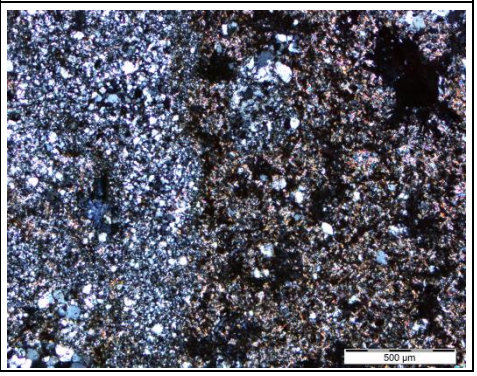
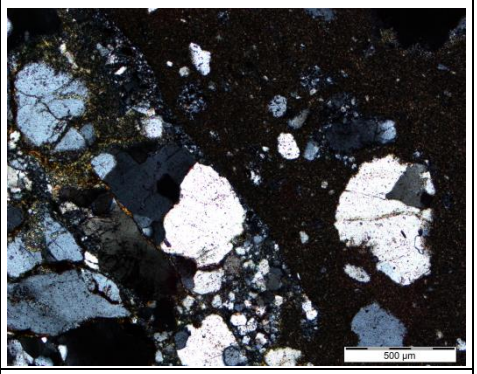
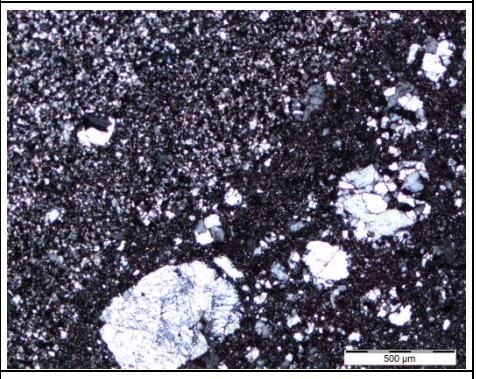
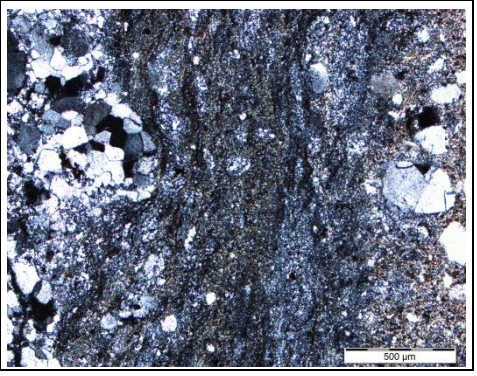
SQ152 (Rgq9)	X=7031540 Y=541108	The foliated quartzite sample is composed of 63% quartz, 33% sericite+muscovite, and 4% ilmenite. The sample hosts cleavage formed by sericite+muscovite. Quartz clasts are not recrystallised as in samples located closer to the core of the dome, and the cleavage is not crenulated.	
SQ158 (Rgq3)	X=7031624 Y=541270	The foliated quartzite sample is composed of 65% quartz, 32% muscovite+sericite, and 3% ilmenite. The sample hosts a cleavage formed by the muscovite-sericite assemblage. Like sample SQ152, quartz clasts in this sample are not polygonal, and the cleavage is not crenulated.	
SQ672 (Rgq2)	X=7026931 Y=535230	The sample was collected in the sample unit as the foliated sample FR670. It is highly oxidised, making it hard to accurately estimate mineral proportions. The sample hosts a cleavage formed by sericite. The cleavage is not crenulated along this thin section cut, and is crosscut by goethite-bearing fractures.	
SQD2 (Rgq3)	X=7029614 Y=538959	The foliated quartzite sample is composed of 71% quartz and 29% sericite. The quartz grains are polygonal. The poorly-developed cleavage is mainly composed of sericite.	

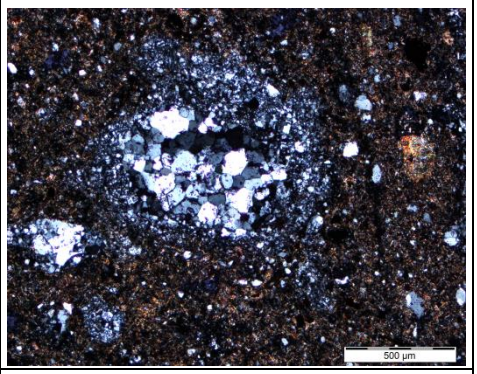
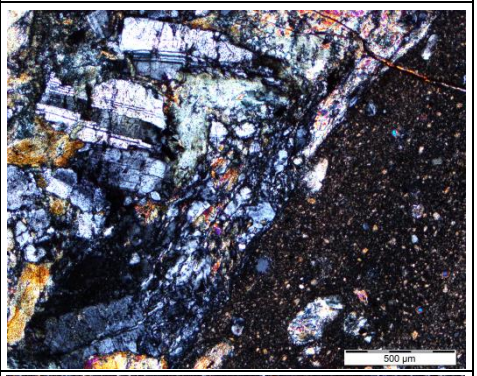
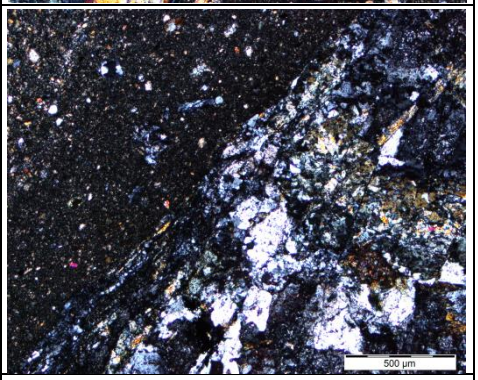
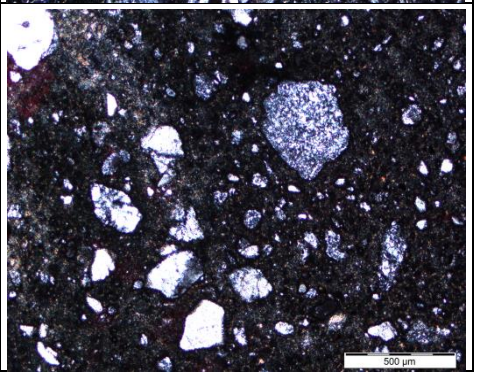
Table 3.7. Petrographic descriptions of Pseudotachylitic breccia samples.

Pseudotachylitic breccia samples			
Sample #	**Coordinates**	**Petrographic description**	**Photomicrographs**

B7 (Rjo2)	X=7033546 Y=540035	A pseudotachylitic breccia sample that is composed of 30% quartz clasts and 70% groundmass. The quartz clasts are mostly not recrystallised, and the groundmass is aphanitic and compositionally layered. Constituents of each layer are too fine-grained to be identified, but the sharp change in colour distinguishes these layers.	
B15 (Rjo2)	X=7033294 Y=540218	The pseudotachylitic breccia sample is composed of ~37% polygonal quartz clasts, and 63% groundmass. The groundmass is aphanitic and structureless. As a result mineral proportions of the groundmass could not be estimated.	
B17.2 (Rjo1)	X=7032736 Y=540720	A sample of a subvertical pseudotachylitic breccia vein that is associated with tabular breccia developed in the Central Rand Group. The sample shows that the footwall vein is an injection vein associated with melt developed along flow bands. The flow bands are associated with displacement in sample B17.4. The groundmass of the sample is dominated by fine-grained and recrystallised quartz grains.	
B17.4 (Rjo1)	X=7032736 Y=540720	This sample shows pseudotachylitic breccia that is associated with brecciation and micro-displacements of quartzite. The breccia is characterised by the largest amount of melt, which is developed along flow bands. The groundmass is dominated by recrystallised quartz. The tabular breccia geometry associated with this sample shows that footwall injections displace bedding-parallel pseudotachylitic breccia (Subsection 8.5).	

B23 (Rjo1)	X=7033000 Y=540560	This pseudotachylitic breccia sample is composed of about 35% quartz clasts, and 65% groundmass. The quartz clasts are not recrystallised, and the groundmass is both microcrystalline and aphanitic. The groundmass is characterised by flow banding.	
MR9 (Rhs5)	X=7027163 Y=535811	The pseudotachylitic breccia sample is composed of 25% clasts of quartz (14%), meta-dolerite (9%), and quartz-, garnet-, and biotite-bearing clasts (2%). The latter was most likely derived from adjacent metapelite units (see photomicrograph on the right). The groundmass (75% of the sample) is aphanitic, too fine to estimate the mineral proportions. The heterogeneous clast composition shows that the breccia was not produced in situ. The groundmass of the breccia is structureless and crosscut by chlorite 'rosettes'.	
PS4 (Rt)	X=7034332 Y=534733	The pseudotachylitic breccia sample is composed of 35% quartz clasts, and 65% groundmass. The groundmass is mainly composed of fine-grained and recrystallised quartz. The groundmass also hosts flow banding that is characterised by a microcrystalline texture.	
PS7 (Rhs5)	X=7027003 Y=535780	The pseudotachylitic breccia sample is composed of ~45% recrystallised quartz clasts, and an aphanitic groundmass composed of 30% biotite+sericite, 19% chlorite, 5% goethite, and 1% disintegrated garnet. The groundmass is compositionally layered. Chlorite is hosted as skeletal and radiating crystals ('rosettes'), which crosscut the pseudotachylitic breccia groundmass. The breccia hosts heterogeneous clasts on outcrop scale, although not show in this section.	

PS13A (Rt)	X=7035673 Y=540531	This sample shows a contact between quartzite and pseudotachylitic breccia. The contact is sharp, and there is no flow banding along it. The breccia has a microcrystalline and structureless groundmass.	
PS20A (Rhq3)	X=7028589 Y=537665	The pseudotachylitic breccia sample is composed of a groundmass that is characterised by zones of different grain size and clasts proportion. The middle of the breccia is composed mainly of recrystallised quartz with relatively minimal groundmass (very fine-grained, without clasts), the margins of the vein are mainly composed of quartz clasts with relatively more interstitial groundmass. On outcrop-scale, this texture is seen as a darker and glassier core, bounded by a cataclastic zone.	
PS32 (Rjo2)	X=7033963 Y=535536	This sample shows the contact between subvertical and fracture-hosted pseudotachylitic breccia with quartzite. Unlike is sample PS13A, this sample shows that the contact is characterised by flow banding, which indicates that the breccia was associated with flow along its margins. Also, the sample is compositionally layered in the middle. the layers are distinguished by goethite-rich layers.	
PS32B (Rjo2)	X=7033963 Y=535536	A sample of tabular pseudotachylitic breccia developed in the Rjo2 quartzite unit. The sample shows that the margins and interior of the breccia are associated with flow banding. The banding is characterised by recrystallised quartz hosted in the groundmass.	

PS192 (Rgs2)	X=7029402 Y=538254	The sample is composed of 20% quartz and 15% meta-dolerite and dolerite clasts. Meta-dolerite clasts host Cpx, plag, and chlorite. The quartz clasts are mostly recrystallised along the edges, with a decreasing degree of recrystallisation into the clasts. The groundmass is dominated by biotite and chlorite 'rosettes'. Like in sample MR9 and PS7, chlorite rosettes overprint the groundmass of the pseudotachylitic breccia. The groundmass is structureless.	
13D1		A sample of pseudotachylitic breccia hosted in a dolerite sill. The breccia hosts dolerite clasts composed of plagioclase and Cpx (Photomicrograph on the right), and an aphanitic groundmass. The breccia has a structureless groundmass.	
13D2		A sample of pseudotachylitic breccia hosted in a metapelite unit. The breccia hosts quartz-biotite-chlorite-bearing clasts, in a aphanitic groundmass. The contact between the breccia and metapelite is structureless. The breccia is crosscut by Fe-rich fractures.	
13D6		A sample of pseudotachylitic breccia that is composed of 30% recrystallised and primary quartz clasts, hosted in an aphanitic groundmass. The groundmass of this sample is structureless.	

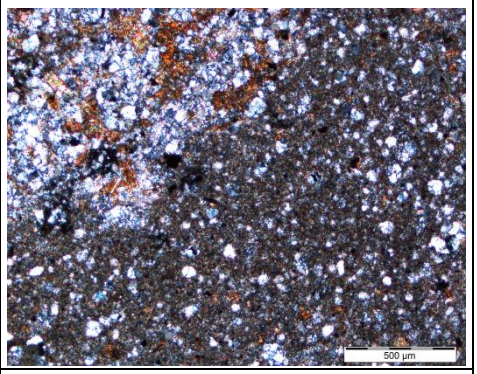
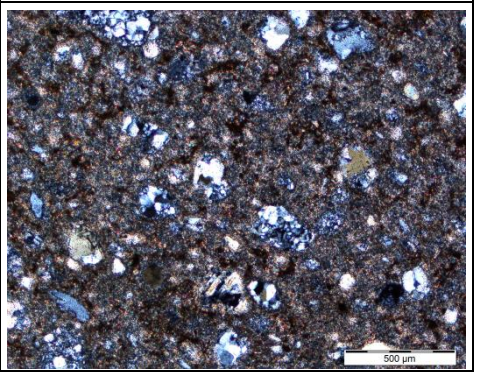
13D9		A sample of pseudotachylitic breccia composed of quartz and quartz-biotite clasts, hosted in an aphanitic groundmass. The groundmass is structureless, and it is mostly composed of biotite. The quartz-biotite-bearing clasts are most like derived from adjacent metapelite units.	
13D11		A pseudotachylitic breccia sample composed of about 32% polygonal quartz clasts, hosted in an aphanitic groundmass. The clasts are typically < 0.2 mm large. The groundmass is structureless, and it is dominantly composed of biotite.	

Table 3.8. Mineral Abbreviations

Symbol	Mineral Name	IMA status*
Acm	acmite	D
Act	actinolite	A
Adl	adularia	I
Aeg	aegirine	A
Ak	åkermanite	G
Ab	albite	G
Afs	alkali feldspar	GROUP
Aln	allanite	A
Alm	almandine	G
Als	aluminosilicate (Al_2SiO_5 polymorphs)	GROUP
Alu	alunite	Rd
Amk	amakinite	Rd
Ame	amesite	G
Amp	amphibole	GROUP
Anl	analcime (analcite)	A
Ant	anatase	A
And	andalusite	G
Adr	andradite	G
Ang	anglesite	G
Anh	anhydrite	G
Ank	ankerite	G
Ann	annite	A
An	anorthite	G
Ano	anorthoclase	I
Ath	anthophyllite	Rd
Atg	antigorite	Rn
Ap	apatite	GROUP
Apo	apophyllite	GROUP
Arg	aragonite	G
Arf	arfvedsonite	A
Arm	armalcolite	Rd
Apy	arsenopyrite	A
Aug	augite	A
Awr	awaruite	G
Ax	axinite	GROUP
Bab	babingtonite	G
Bdy	baddeleyite	G
Brt	barite (baryte)	A
Brs	barroisite	Rd
Bei	beidellite	G
Brl	beryl	G
Bt	biotite	GROUP
Bxb	bixbyite	G
Bhm	böhmite (boehmite)	G
Bn	bornite	A
Brk	brookite	G
Brc	brucite	G
Bst	bustamite	G
Cal	calcite	G
Ccn	cancrinite	G
Cnl	cannilloite	H
Cb	carbonate mineral	GROUP
Car	carpholite	G
Cst	cassiterite	G
Cel	celadonite	A
Clt	celestine	A
Cls	celsian	G
Cer	cerussite	G
Cbz	chabazite	A
Cct	chalcocite	G
Ccp	chalcopyrite	G
Chm	chamosite	G
Chs	chesterite	A
Chl	chlorite	GROUP
Cld	chloritoid	G
Chn	chondrodite	G
Chr	chromite	G
Ccl	chrysocolla	A
Ctl	chrysotile	Rd
Cin	cinnabar	G
Cam	clinoamphibole	GROUP
Clc	clinochlore	G
Cen	clinoenstatite	A
Cfs	clinoferrosilite	A
Chu	clinohumite	G
Cpt	clinoptilolite	A
Cpx	clinopyroxene	GROUP
Czo	clinozoisite	G
Cln	clintonite	A
Coe	coesite	A
Coh	cohenite	G
Crd	cordierite	G
Crr	corrensite	G
Crn	corundum	G
Cv	covellite	G
Crs	cristobalite	G
Crt	crossite	D
Crl	cryolite	G
Cbn	cubanite	G
Cum	cummingtonite	Rd
Cpr	cuprite	G
Csp	cuspidine	G
Dph	daphnite	not listed
Dat	datolite	G
Dbr	daubreelite	G
Dee	deerite	A
Dia	diamond	G
Dsp	diaspore	G
Dck	dickite	G
Dg	digenite	A
Di	diopside	A
Dpt	dioptase	G
Dol	dolomite	G
Drv	dravite	G
Dum	dumortierite	G
Eas	eastonite	Rd
Ec	ecandrewsite	A
Eck	eckermannite	A
Ed	edenite	A
Elb	elbaite	G
Ell	ellenbergerite	A
Eng	enargite	G
En	enstatite (ortho-)	A
Ep	epidote	GROUP
Eri	erionite	A
Esk	eskolaite	G
Ess	esseneite	A
Eud	eudialite	A
Fas	fassaite	D
Fa	fayalite	G
Fsp	feldspar	GROUP
Fac	ferro-actinolite	Rd
Fath	ferro-anthophyllite	Rd
Fbrs	ferrobarroisite	A
Fcar	ferrocarpholite	A
Fcel	ferroceladonite	A
Fec	ferro-eckermannite	Rd
Fed	ferro-edenite	Rd
Fgd	ferrogedrite	Rd
Fgl	ferroglaucophane	Rd
Fkrs	ferrokaersutite	A
Fny	ferronyboite	H
Fprg	ferropargasite	Rd
Frct	ferrorichterite	A
Fs	ferrosilite	Rn
Fts	ferrotschermakite	Rd
Fwn	ferrowinchite	Rd
Fi	fibrolite (fibrous sillimanite)	informal
Fl	fluorite	G
Fo	forsterite	G
Fos	foshagite	G
Frk	franklinite	G
Ful	fullerite	N
Ghn	gahnite	G
Glx	galaxite	G
Gn	galena	G
Grt	garnet	GROUP
Ged	gedrite	Rd
Gh	gehlenite	G
Gk	geikielite	G
Gbs	gibbsite	A
Gis	gismondine	A
Glt	glauconite	GROUP
Gln	glaucophane	Rd
Gme	gmelinite	A
Gth	goethite	A
Gdd	grandidierite	G
Gr	graphite	G
Gre	greenalite	G
Grs	grossular	A
Gru	grunerite	Rd
Gp	gypsum	G
Hl	halite	G
Hrm	harmotome	A
Hst	hastingsite	Rd
Hsm	hausmannite	G
Hyn	haüyne	G
Hzl	heazlewoodite	G
Hd	hedenbergite	A
Hem	hematite	A
Hc	hercynite	G
Hul	heulandite	A
Hbn	hibonite	G
Hbs	hibschite	Rn
Hgb	högbomite	D
Hol	hollandite	G
Hlm	holmquistite	Rd
Hbl	hornblende	GROUP
Hw	howieite	A
Hu	humite	G
Hgr	hydrogrossular	GROUP
Hyp	hypersthene	D
Ilt	illite	GROUP
Ilm	ilmenite	G
Ilv	ilvaite	G
Jd	jadeite	A
Jrs	jarosite	Rd
Jim	jimthompsonite	A
Jhn	johannsenite	A
Krs	kaersutite	Rd
Kls	kalsilite	G
Kam	kamacite (α-FeNi)	D
Kln	kaolinite	A
Ktp	katophorite	Rd
Kfs	K-feldspar	informal
Khl	K-hollandite	H
Kir	kirschsteinite	G
Krn	kornerupine	G
Kos	kosmochlor	A
Kut	kutnohorite (kutnahorite)	G
Ky	kyanite	A
Lrn	larnite	G
Lmt	laumontite	A
Lws	lawsonite	G
Lzl	lazulite	A
Lzr	lazurite	G
Lpd	lepidolite	GROUP
Lct	leucite	G
Lm	limonite	not listed
Liq	liquid	
Lz	lizardite	G
Lo	löllingite (loellingite)	G
Mgh	maghemite	G
Marf	magnesio-arfvedsonite	Rd
Mcar	magnesiocarpholite	A
Mfr	magnesioferrite	G
Mhs	magnesiohastingsite	Rd
Mhb	magnesiohornblende	Rd
Mkt	magnesiokatophorite	Rd

Symbol	Mineral Name	IMA status*
Mrbk	magnesioriebeckite	Rd
Msdg	magnesiosadanagite	Rd
Mst	magnesiostaurolite	A
Mtm	magnesiotaramite	Rn
Mws	magnesiowustite	not listed
Mgs	magnesite	A
Mag	magnetite	G
Maj	majorite	A
Mlc	malachite	G
Mng	manganosite	G
Mrc	marcasite	G
Mrg	margarite	A
Mar	marialite	G
Mei	meionite	G
Mll	melilite	GROUP
Mw	merwinite	G
Mes	mesolite	A
Mc	microcline	G
Mlr	millerite	G
Mns	minnesotaite	G
Mog	moganite	A
Mol	molybdenite	G
Mnz	monazite	A
Mtc	monticellite	G
Mnt	montmorillonite	G
Mor	mordenite	A
Mul	mullite	G
Ms	muscovite	A
Ntr	natrolite	A
Nph	nepheline	G
Nrb	norbergite	G
Nsn	nosean	G
Nyb	nyböite	Rd
Ol	olivine	GROUP
Omp	omphacite	A
Opl	opal	G
Opq	opaque mineral	informal
Orp	orpiment	G
Oam	orthoamphibole	GROUP
Or	orthoclase	A
Oen	orthoenstatite	D
Opx	orthopyroxene	GROUP
Osm	osumilite	G
Plg	palygorskite	G
Pg	paragonite	A
Prg	pargasite	Rd
Pct	pectolite	G
Pn	pentlandite	G
Per	periclase	G
Prv	perovskite	G
Ptl	petalite	G
PhA	phase A	not listed
Ph	phengite	G
Php	phillipsite	A
Phl	phlogopite	A
Pmt	piemontite	A
Pgt	pigeonite	A
Pl	plagioclase	GROUP
Prh	prehnite	G
Prm	prismatine	Rd
Psb	pseudobrookite	Rd
Pmp	pumpellyite-(Al)	A
Py	pyrite	G
Pcl	pyrochlore	A
Prp	pyrope	G
Pph	pyrophanite	G
Prl	pyrophyllite	G
Pxf	pyroxferroite	A
Pxm	pyroxmangite	G
Po	pyrrhotite	G
Qnd	qandilite	A
Qz	quartz	A
Rnk	rankinite	G
Rlg	realgar	G
Rds	rhodochrosite	A
Rdn	rhodonite	A
Rct	richterite	A
Rbk	riebeckite	Rd
Rwd	ringwoodite	A
Rdr	roedderite	A
Rsm	rossmanite	A
Rt	rutile	G
Sdg	sadanagaite	Rd
Sa	sanidine	G
Sap	saponite	G
Spr	sapphirine	G
Scp	scapolite	GROUP
Sch	scheelite	G
Srl	schorl	G
Scb	schreibersite	G
Sep	sepiolite	G
Ser	sericite	D
Srp	serpentine	GROUP
Sd	siderite	G
Sil	sillimanite	G
Sme	smectite	GROUP
Sdl	sodalite	G
Sps	spessartine	A
Sp	sphalerite	A
Spn	sphene (titanite)	D
Spl	spinel	G
Spd	spodumene	A
Spu	spurrite	G
St	staurolite	G
Stv	stevensite	Q
Stb	stilbite	A
Stp	stilpnomelane	A
Sti	stishovite	A
Str	strontianite	G
Sud	sudoite	Rd
Syl	sylvite	G
Tae	taenite (γ-Fe, Ni)	G
Tlc	talc	G
Trm	taramite	Rd
Tnt	tennantite	G
Tnr	tenorite	A
Tep	tephroite	G
Ttr	tetrahedrite	A
Thm	thomsonite	A
Thr	thorite	G
Tly	tilleyite	G
Ttn	titanite (sphene)	A
Tpz	topaz	G
Tur	tourmaline	GROUP
Tr	tremolite	Rd
Trd	tridymite	G
Tro	troilite	G
Ts	tschermakite	Rd
Usp	ulvöspinel	G
Urn	uraninite	G
Uv	uvarovite	A
Vtr	vaterite	A
Vrm	vermiculite	G
Ves	vesuvianite	A
Wds	wadsleyite	A
Wag	wagnerite	Rd
Wrk	wairakite	A
Wav	wavellite	A
Wht	whitlockite	G
Wlm	willmenite	G
Wnc	winchite	Rd
Wth	witherite	G
Wo	wollastonite	A
Wur	wurtzite	G
Wus	wüstite	G
Xtm	xenotime	A
Xon	xonotlite	G
Yug	yugawaralite	A
Zeo	zeolite	GROUP
Znw	zinnwaldite	GROUP
Zrn	zircon	G
Zo	zoisite	G

* International Mineralogical Association (IMA) abbreviations: A = Approved; D = Discredited; G = Grandfathered (generally regarded as valid mineral name); GROUP = Name designates a group of mineral species; H = hypothetical (e.g., synthetic); I = intermediate in a solid-solution series; Q = questionable; Rd = Redefinition approved by IMA Commission on New Minerals, Nomenclature and Classification (CNMNC); Rn = Renamed with approval of the CNMNC.

APPENDIX IV

MOSAICS OF PHOTOMICROGRAPHS

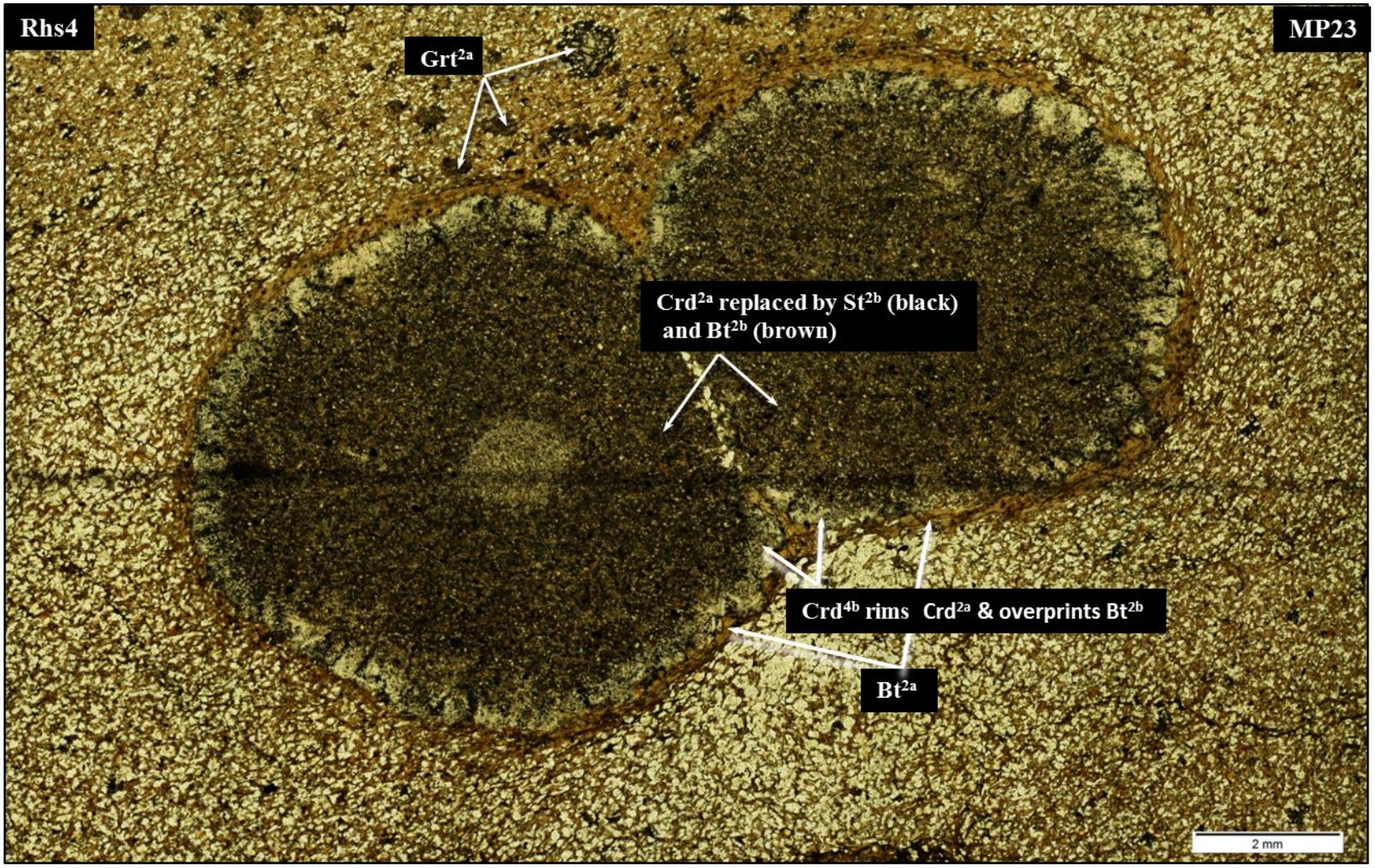


Figure 4.1. *Photomicrograph mosaic of the Rhs4 cordierite-garnet metapelite. The sample is dominantly composed of Type 2a cordierite and garnet. Idioblastic Type 2a cordierite is replaced by Type 2b biotite and staurolite. Type 4b cordierite rims and overgrows Type 2a cordierite and* S_2 *respectively (PPL).*

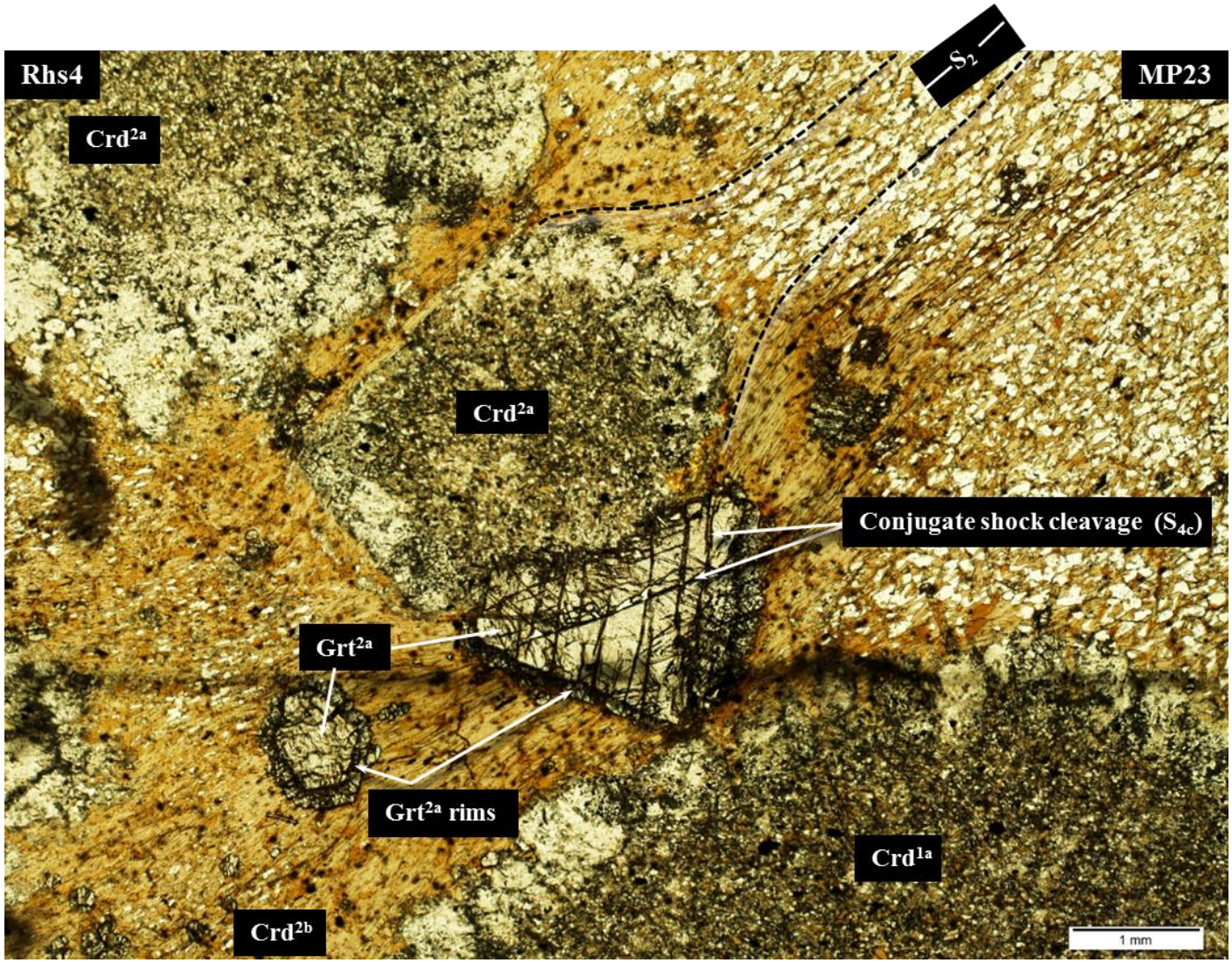


Figure 4.2. *Photomicrograph mosaic of the S_2 cleavage that wraps around Type 2a cordierite and garnet porphyroblasts. This cleavage is similar to S_2 cleavage developed in the Rgs2 metapelite, and S_2 cleavage developed in the Rgq2 quartzite and knotted quartzite horizons (PPL). The Type 2a garnet porphyroblasts are crosscut by a conjugate set of shock cleavage (S_{4c}).*

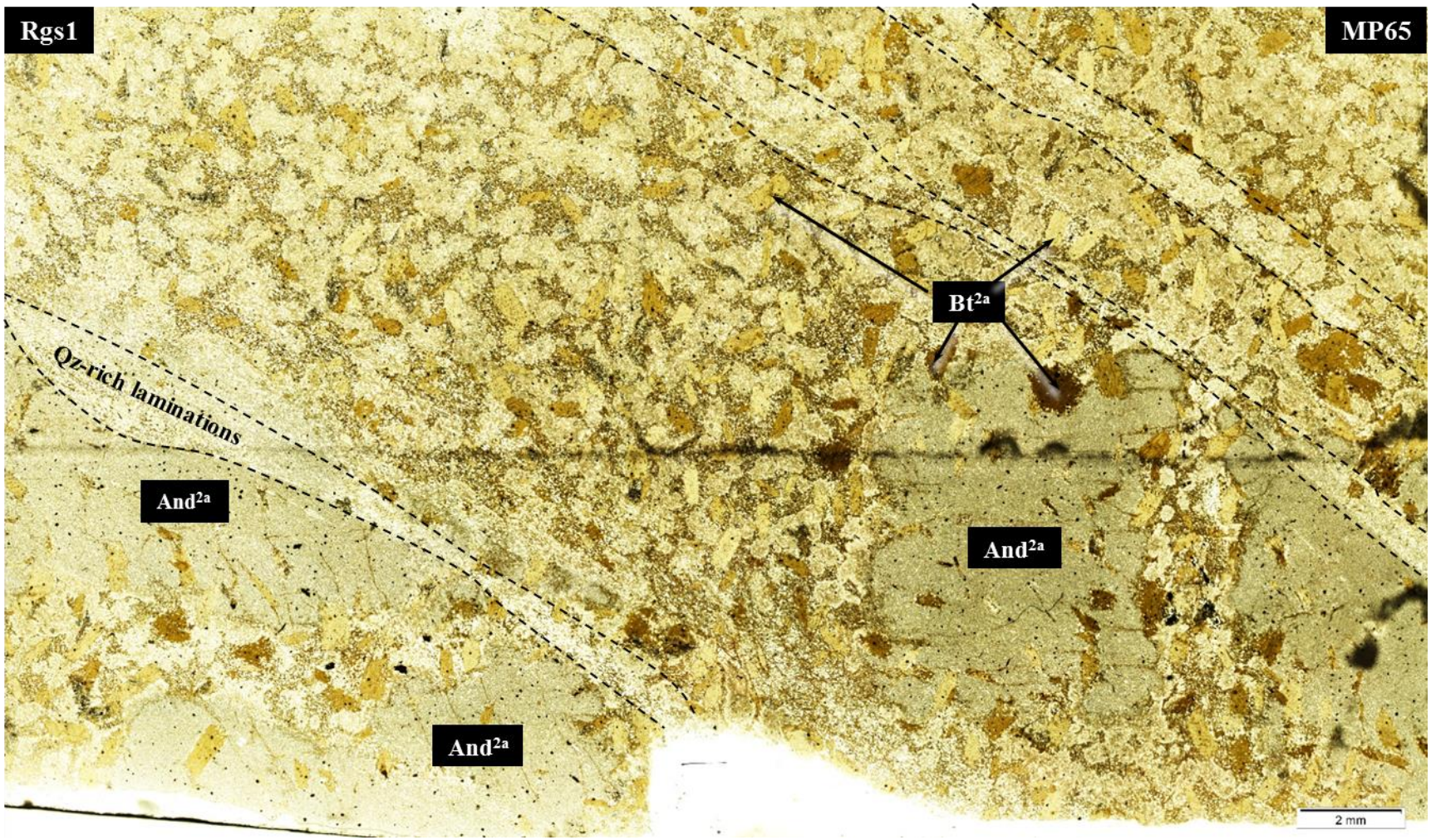


Figure 4.3. *Photomicrograph mosaic of the Rgs1 andalusite-biotite metapelite. It is dominated by Type 2a andalusite and biotite porphyroblasts, with the later hosted in the matrix and also included within the larger Type 2a andalusite porphyroblasts. This metamorphic assemblage is concentrated along more pelitic laminations (PPL).*

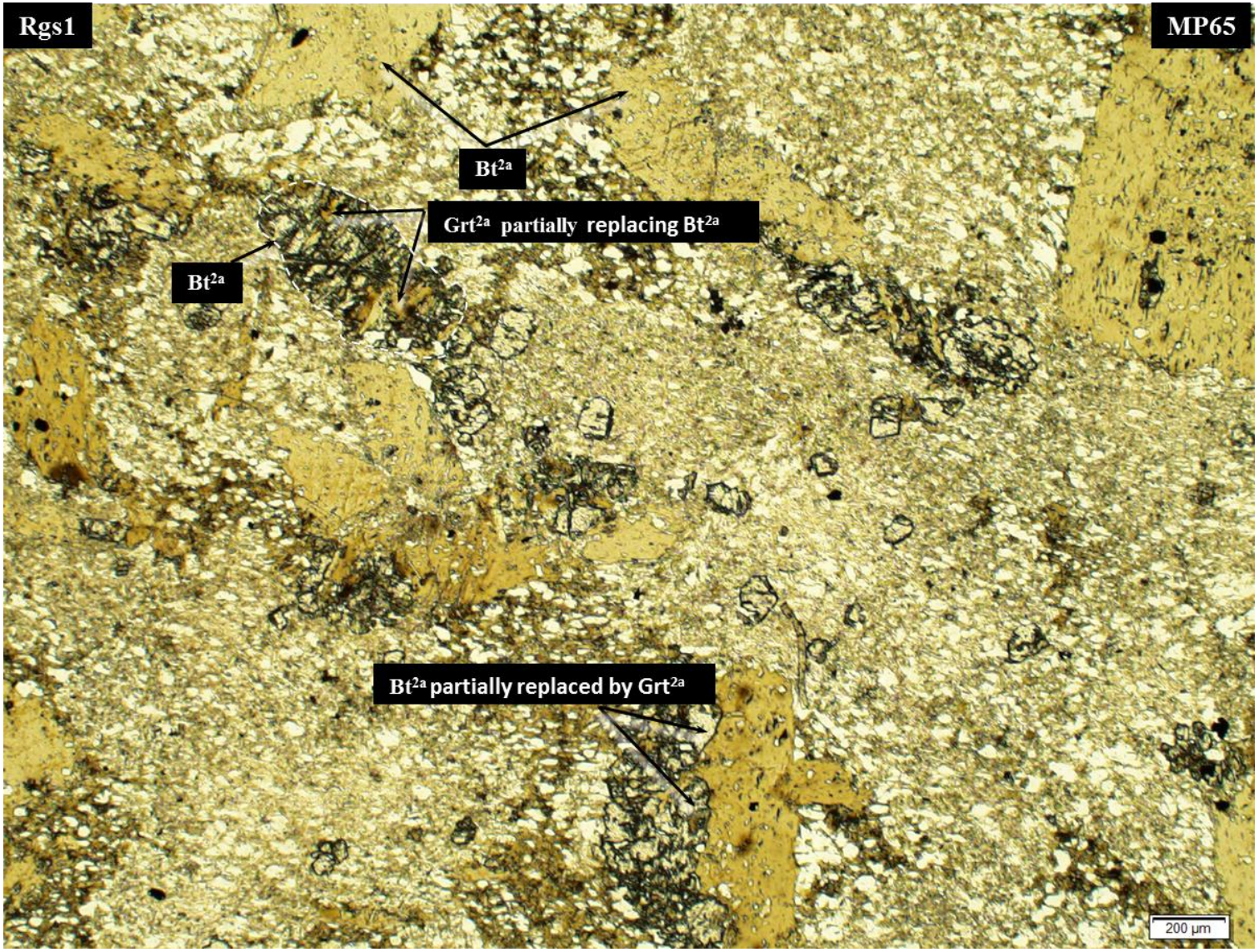


Figure 4.4. *Photomicrograph mosaic showing Type 2a garnet partial replacement on Type 2a biotite porphyroblasts. (PPL)*

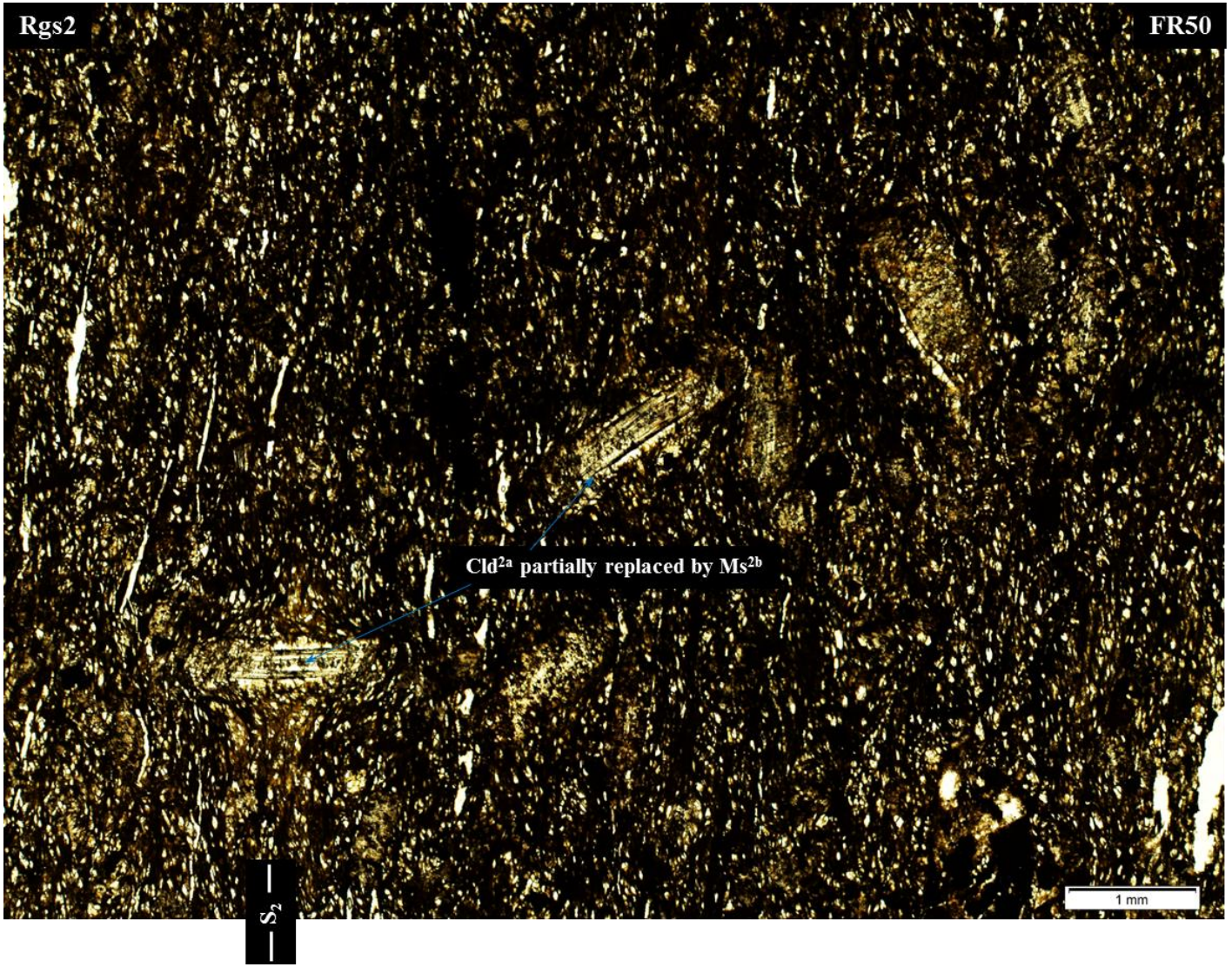


Figure 4.5. *Photomicrograph mosaic showing the syn-metamorphic S_2 cleavage wrapped around partially replaced Type 2a chloritoid porphyroblasts (PPL).*

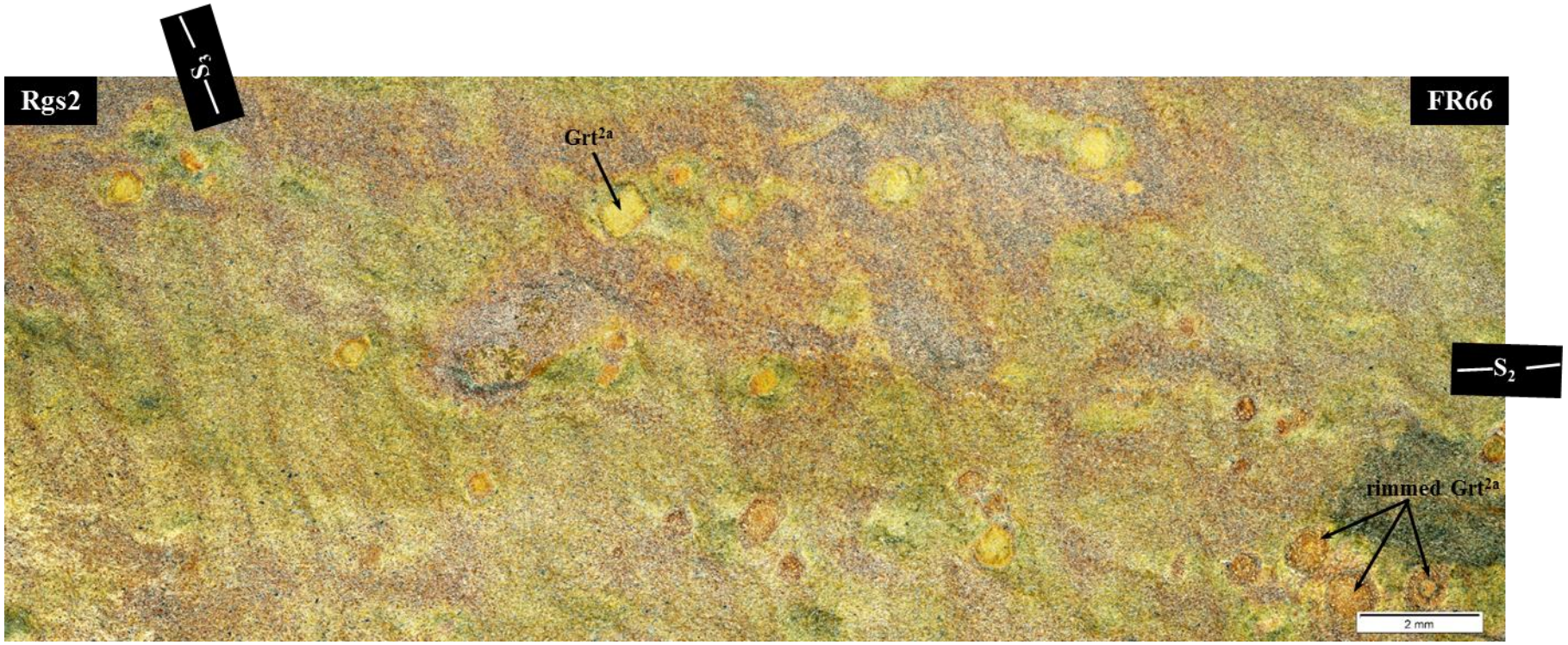


Figure 4.6. *Photomicrograph mosaic showing the texture of Type 2a garnet porphyroblasts, and the S_2 cleavage and S_3 crenulations. The crenulations are generally consistently developed across the sample in a planar manner, but they tend to bend around the garnet porphyroblasts (AL=Ambient Light).*

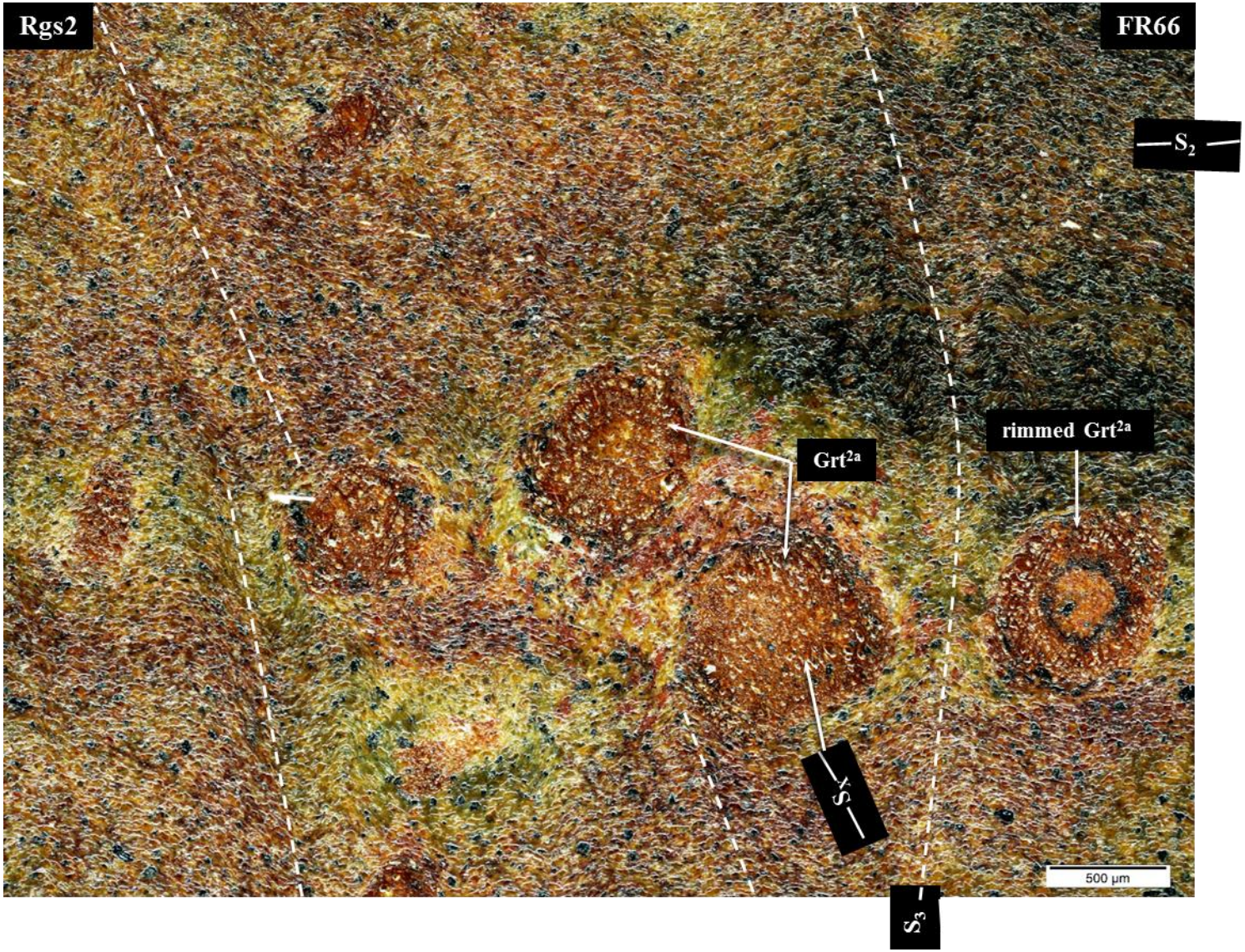


Figure 4.7. *Photomicrograph mosaic showing Type 2a garnet porphyroblasts that are syngenetic to the S_2 cleavage. The generally planar S_X cleavage is at a high angle to the main S_2 cleavage. S_3 crenulations bend around garnet porphyroblasts (DIC).*

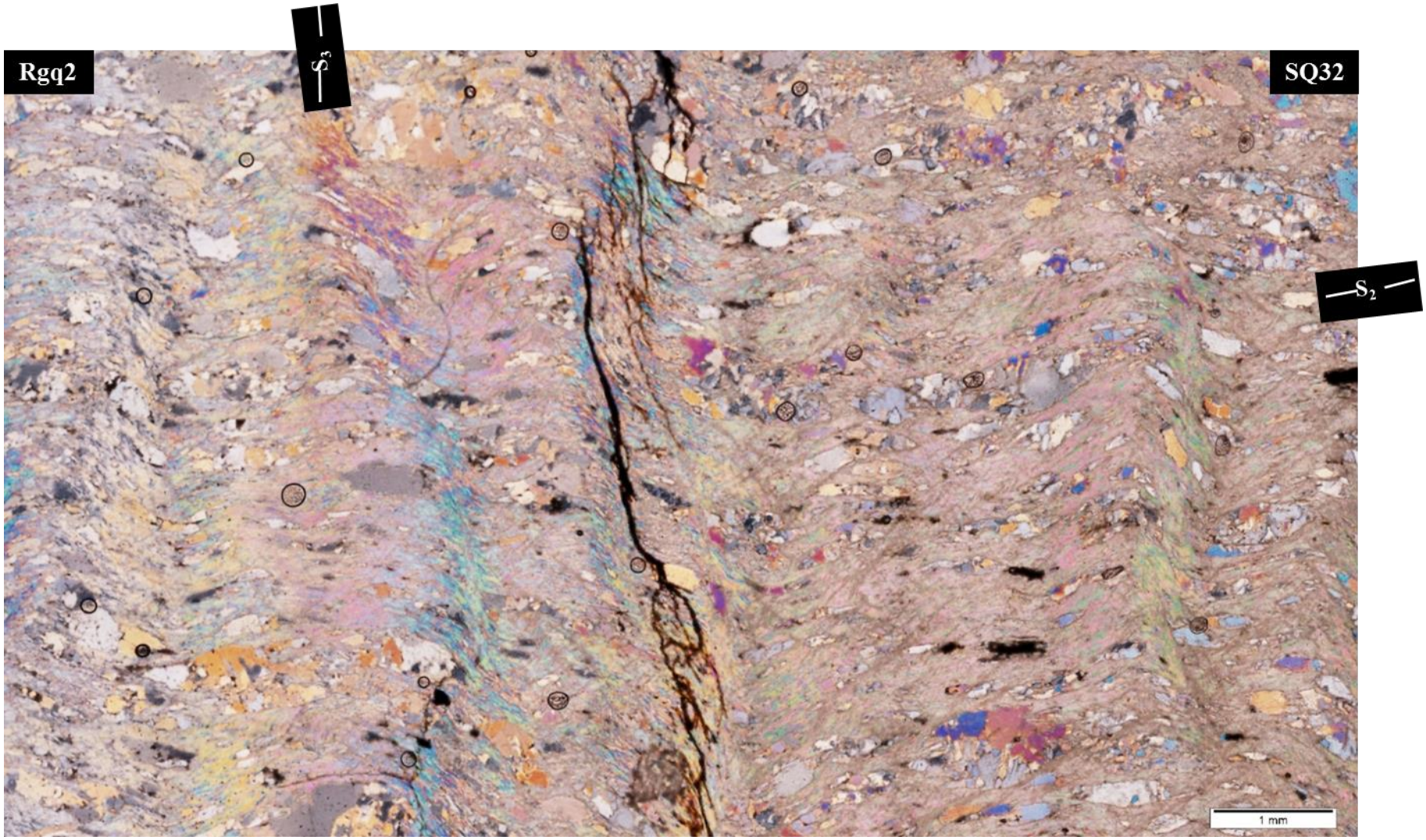


Figure 4.8. *Photomicrograph mosaic of the crenulated S_2 cleavage developed along the Rgq2 quartzite unit. The crenulations have been infilled with goethite (DIC=Differential Interference Contrast).*

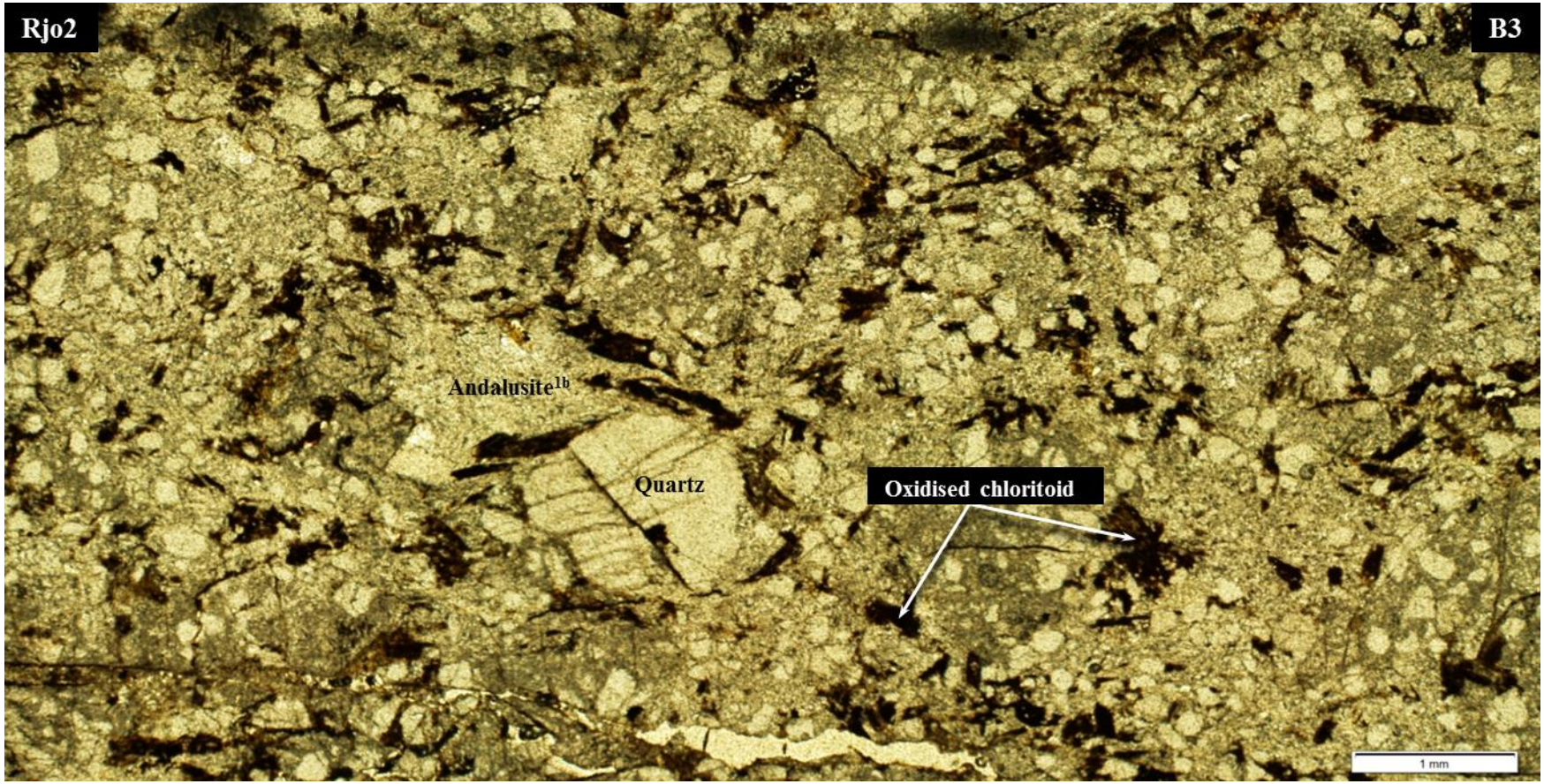


Figure 4.9. *Photomicrograph mosaic of the B3 knotted quartzite sample. The sample is composed of 46% andalusite, 30% quartz, 15% chloritoid, 5% muscovite, and 4% kyanite (PPL).*

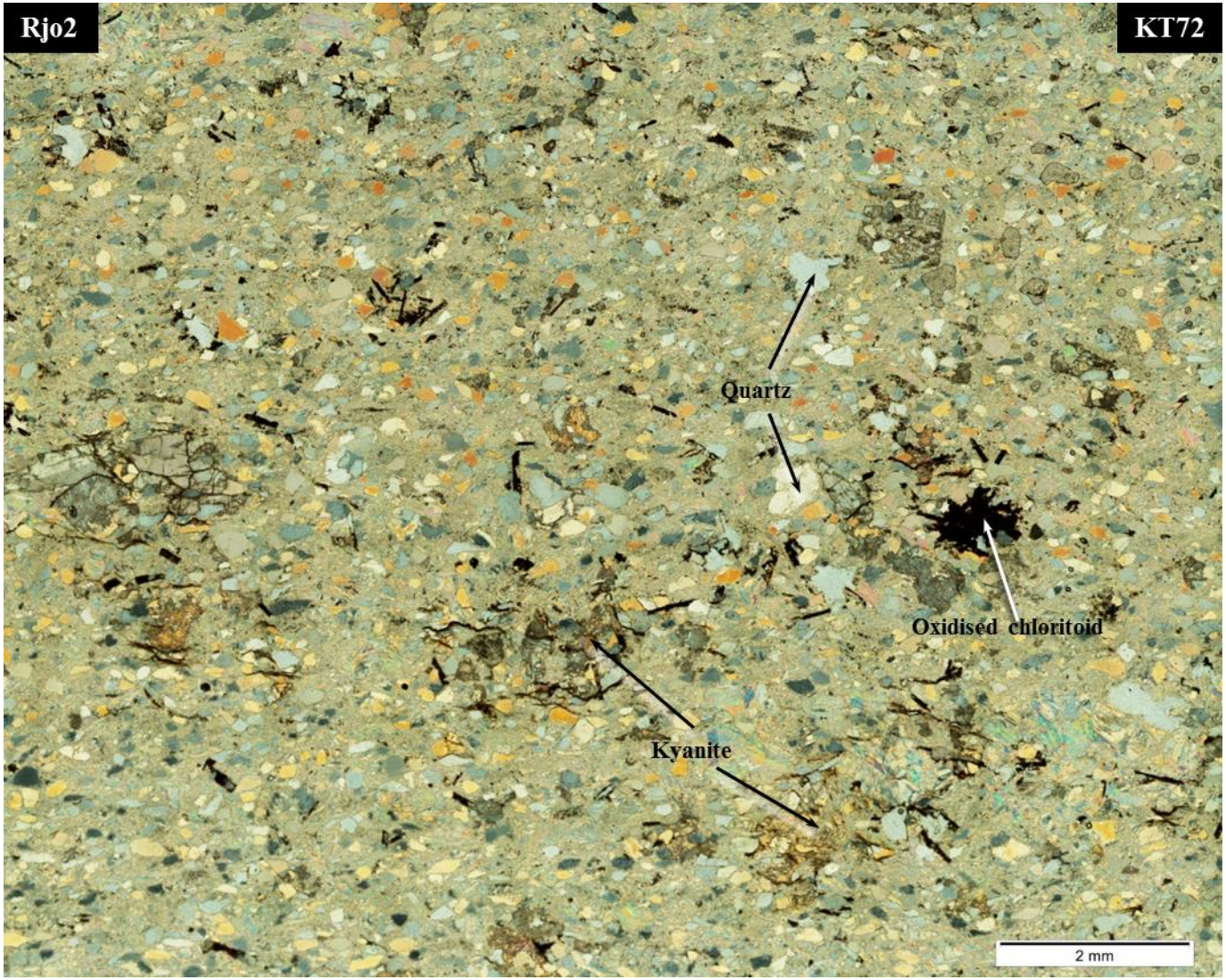


Figure 4.10. *Photomicrograph mosaic of the KT72 knotted quartzite sample. The sample is composed of 30% quartz. 35% sericite+muscovite, 18% kyanite, 12% andalusite, and 5% oxidised skeletal chloritoid (DIC).*



Figure 4.11. *Photomicrograph mosaic of the KT12 knotted quartzite sample. The sample is composed of 38% quartz, 47% sericite+muscovite, 13% chloritoid, 2% rutile+zircon (DIC).*

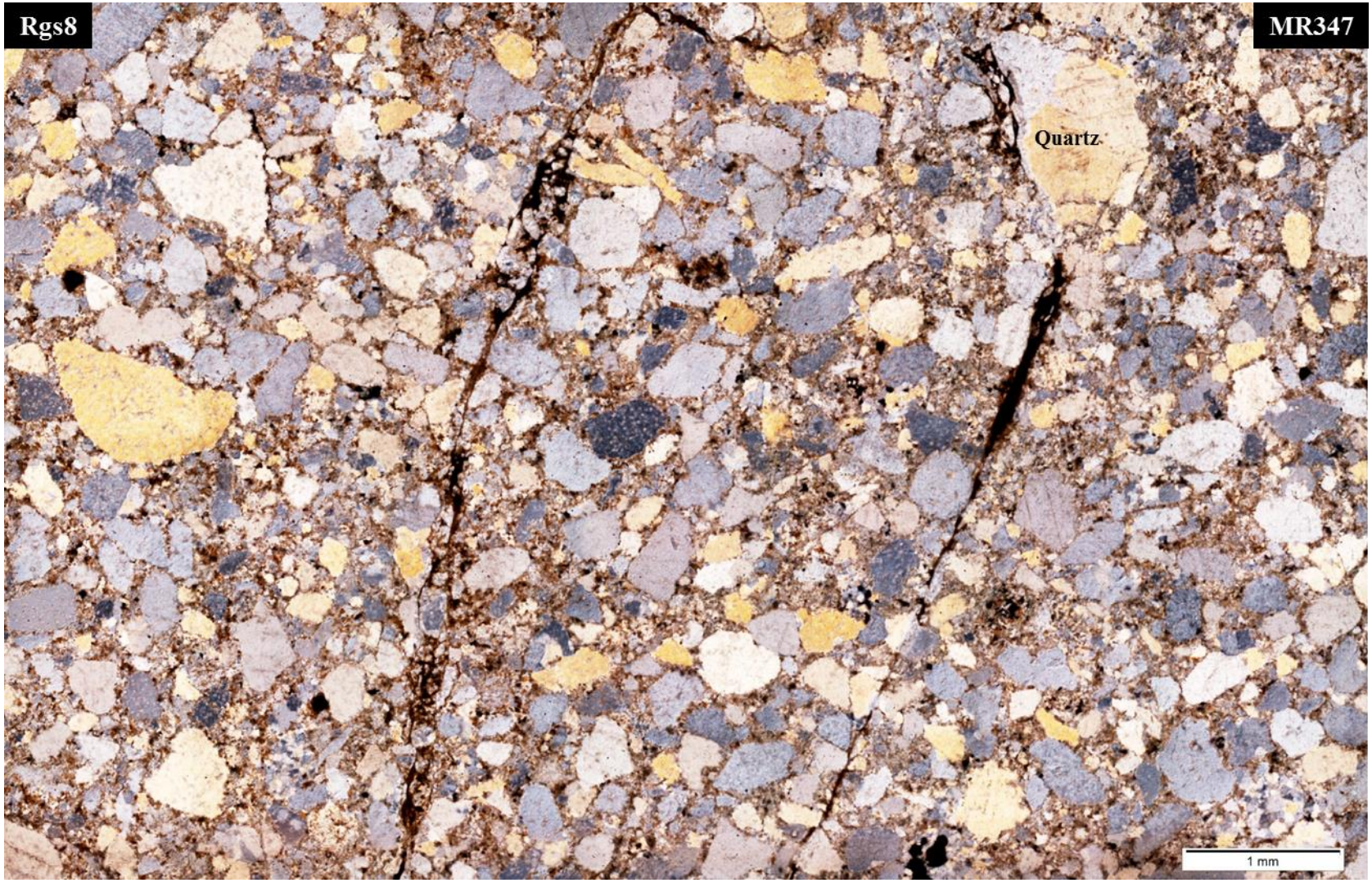


Figure 4.12. *Photomicrograph mosaic of the MR347 meta-diamictite sample. The sample is composed of 58% quartz, 20% chlorite, 13% biotite, and 9% sericite. The quartz clasts hosted in this sample are not recrystallised like those in sample MR402 (DIC).*

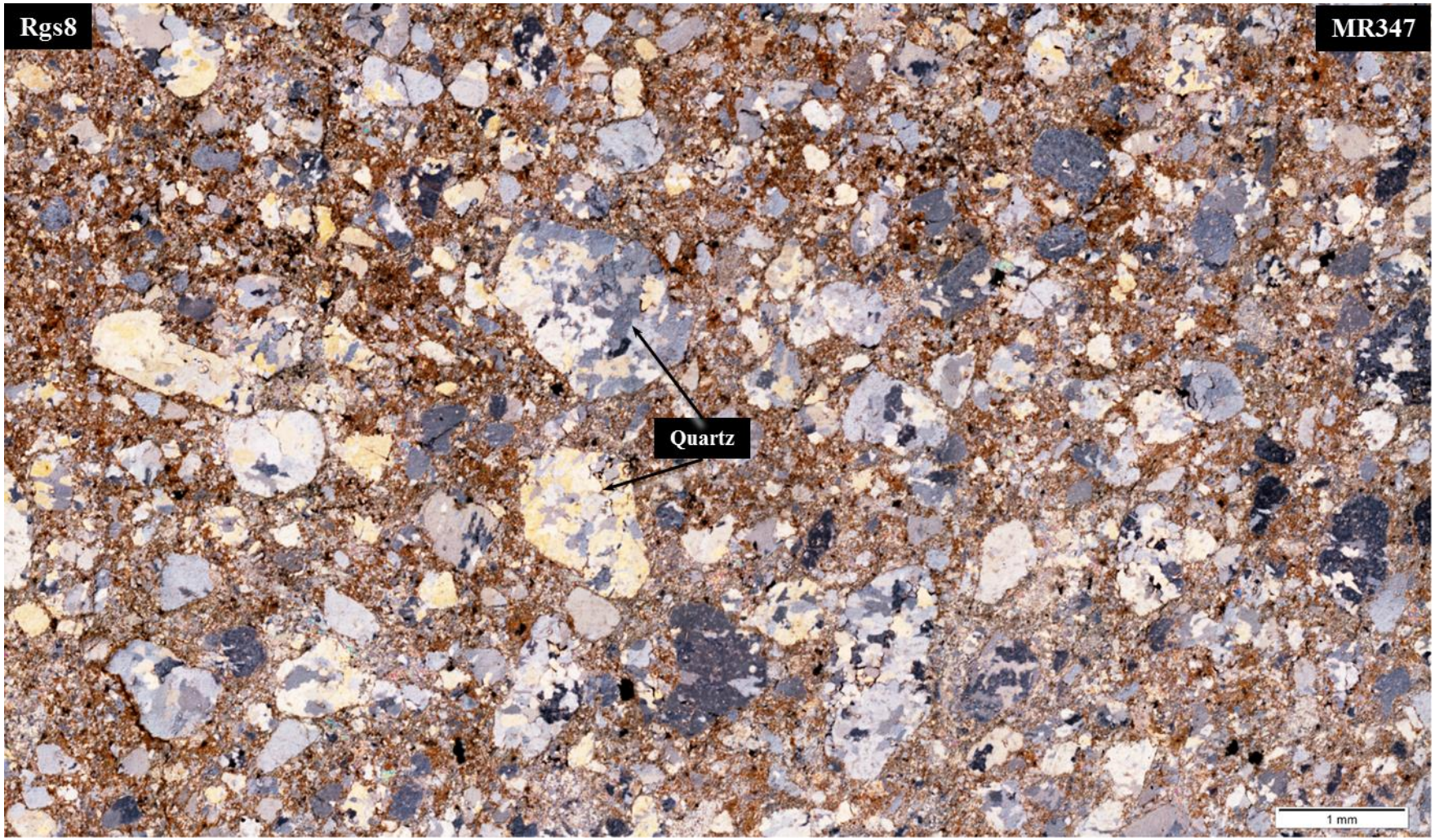


Figure 4.13. *Photomicrograph mosaic of the MR402 meta-diamictite sample. The sample is composed 56% quartz, 22% biotite, 17% chlorite, and 5% muscovite. Unlike sample MR347, this sample hosts recrystallised quartz clasts, and muscovite in the matrix (DIC).*

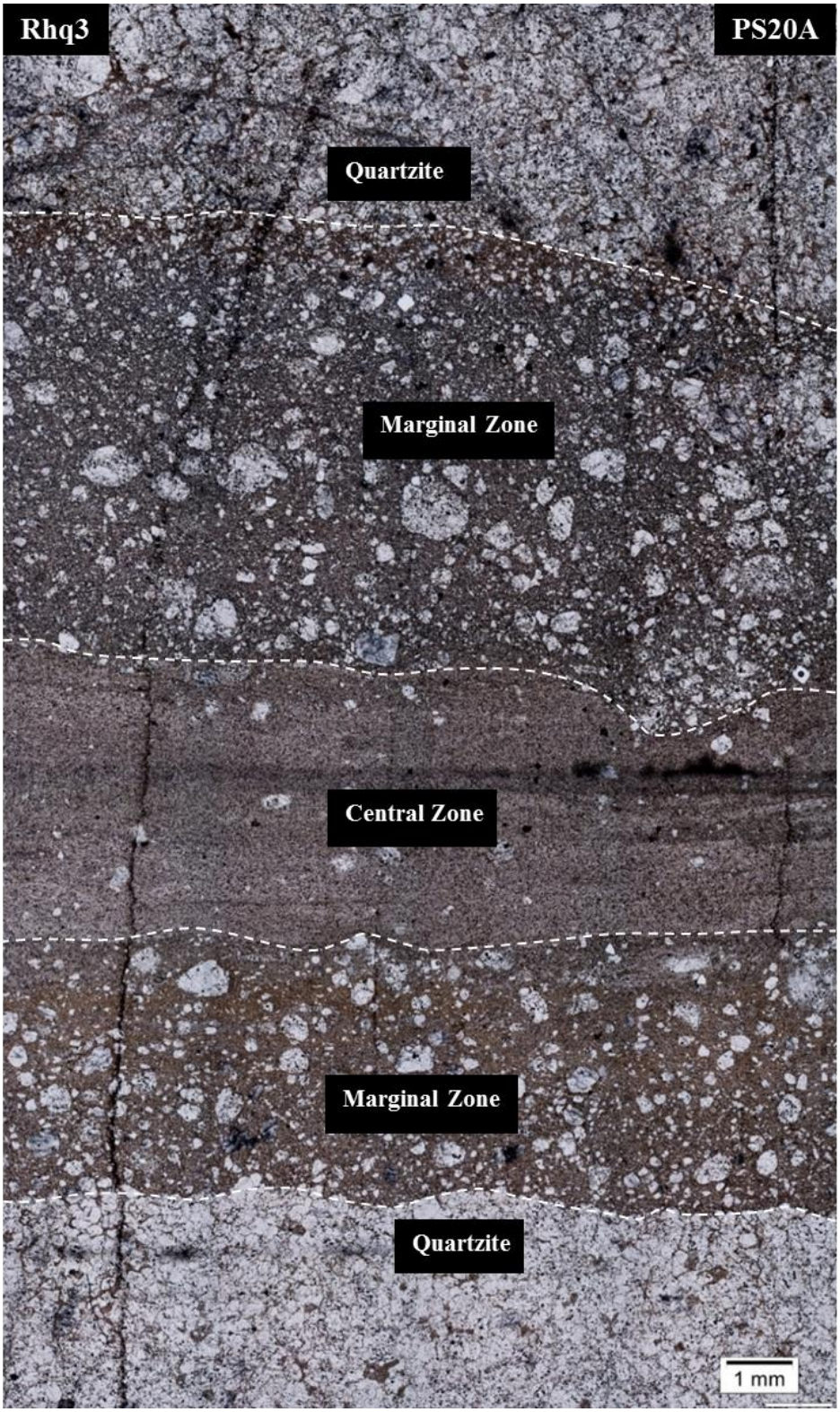


Figure 4.14. *Photomicrograph mosaic of the layered, bedding-parallel PS20A pseudotachylitic breccia. The breccia fines inwards, towards the central zone. The central zone of the breccia has fewer clasts (~15%) than the marginal zones (~50%; PPL).*

APPENDIX IV

A1-SCALE GEOLOGICAL MAPS