Regional study of the Mt. Gee area, Arkaroola, Northern Flinders Ranges, South Australia

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DIPLOMA THESIS

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Tübingen, Sep 2008

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Diploma Thesis

REGIONAL STUDY OF THE MT. GEE AREA, ARKAROOLA,
NORTHERN FLINDERS RANGES, SOUTH AUSTRALIA

ABSTRACT

The report gives a geologic overview over the area around Mt. Gee in the Mt. Painter Inlier, Northern Flinders Ranges, South Australia. Mapping was carried out on an approximately 5km² area in late 2007. The geology is dominated by >1575 Ma old metasediments which were folded during the Delamerian orogeny 500 Ma ago in large upright, north verging folds. Spinel, corundum and sapphirine porphyroblasts in the metasediments were analyzed and a growth relationship was established. The porphyroblast growth postdates the S_m formation which was broadly constrained to 1575 Ma – 800 Ma. Around 440 Ma extensive potassium metasomatism took place and led to the formation of the Pink Pegmatitic "Granite". The metasomatism was followed by hydrothermal activity which produced two sets of breccia zones. The mostly quartz and wall rock dominated breccias are locally enriched in hematite which is associated with uranium enrichment. Remnant magnetite and sulphides indicate that the uranium enrichment was caused by oxidation of magnetite to hematite and therefore reduction of soluble uranium and precipitation. The breccias form two sets, one more E-W and one more NE-SW trending. The main mineralization took place at the intersection. The breccias are crosscut by the Pebble Dyke, interpreted as sediment-filled cracks and tunnels during glaciation times, probably in the Permian. The near surface quartz sinter of Mt. Gee formed after the Pebble Dyke. Furthermore observations suggest that the mountain is formed by a shallow NE dipping sheet with two substitutional sheets. The sheets dip towards the intersection of the breccia zones and it is thought that the fluids used the same pathways. Fluorescence under UV light was observed in several samples.

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1 INTRODUCTION

This project is based on a detailed mapping carried out by the author and his advisor in late 2007. The about 5km³ mapping area is based on the property of Arkaroola Wilderness Sanctuary in the northern Flinders Ranges between the two salt lakes Lake Torrens and Lake Frome approximately 600km north of Adelaide in South Australia (Fig 1).

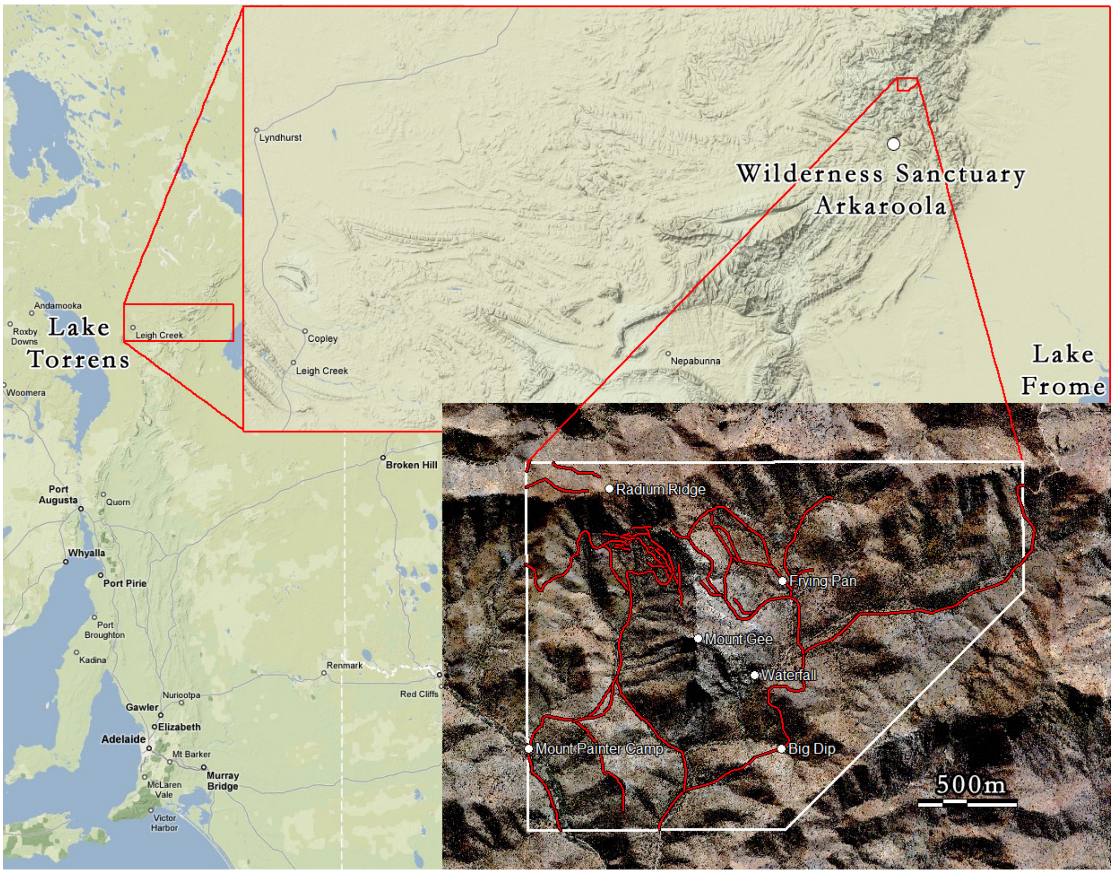


Fig 1- Location of the research area (overview map obtained from googlemaps)

In general the countryside is very arid. Red desert varnish and rugged hills with sparse vegetation is common in this part of Australia. That also means that outcrop quality is better than in most more humid areas because there is less soil development, but instead of soil there are scree slopes in most parts of the area and together with the red weathering color it can also be hard to distinguish the rocks correctly.

The altitude difference between the creeks and the hills is moderate, mostly between 200 - 300 m. Main geographic features of this area are the Mt. Gee right in the center and Mt. Painter just outside the area. Mt. Painter is an aboriginal sacred site and was therefore excluded from the mapping area.

Exploration in this area is going on for more than a decade now. Inside and around the so called Mt. Painter Inlier there are many small workings mostly active during the late 19th and the early 20th century. Most of them were copper workings, inside the Inlier there are more uranium workings. There is only one gold mine in this area, but not much gold has been found.

Currently Marathon Resources is again exploring for uranium in that area, which was also the reason for this mapping project. The main focus of the exploration activity is concentrated on the depressions to the east and to the west of Mt. Gee. The eastern side is also referred to as the "Frying Pan". North of Mt. Gee lies the east-west running Radium Ridge which forms the northern boundary of the mapping area. So far there was no existent detailed geological map available for this region, which is why Marathon Resources saw the need for this project. At the moment the estimates are about 43 Mtonnes of uranium ore.

A short report about the area was already written to come along with the final map for Marathon Resources. This project is the continuation of the mapping as we are not only interested in the uranium deposit and the structures related to that, but also in the timing and relationship of all the other fluid flow events in that area. The study is mainly based on analyses of about 65 thin sections (transmitted and reflected light microscopy and SEM).

2 REGIONAL GEOLOGY

2.1 AUSTRALIA

Australia consists of several cratons which are of archean and proterozoic age. Small Archean crustal parts merged together during the proterozoic age and formed the three main cratons in Australia know today, the Western Australia craton, the South Australia craton and the North Australia craton. These cratons formed the Proto-Rodinia supercontinent with all the continental crustal parts merged together. The following rifting and breakup of Rodinia developed a superbasin between the West and North Australian cratons. Widespreaded sediment deposition took place. The sediments formed during that time before the formation of the next supercontinent Gondwana are known as the Adelaidean sequence. In the early to middle Cambrian age, on completion of the Pan-African deformation a stress transfer occurred to the outboard trailing edge of the newly assembled Gondwana supercontinent which lead to the formation of the Adelaide Fold belt or in general the Tasmanian Fold belt system in Australia and the Ross Orogen in Antarctica continued to the Cape Fold Belt in southern Africa (Fig 2) (Foden, et al. 2006). This event was dated with new U-Pb and Rb-Sr Methods and the conclusion was, that the Orogeny commenced at 514+-3Ma in Australia while the Ross Orogen in Antarctica already commenced at about 540Ma, 25m. yr. before the Delamerian deformation. In general the Delamerian was a compressional event and produced westward verging folds and thrust faults (Paul, et al. 1999, Flöttmann, et al. 1994). Following this stress transfer, rifting occurred approximately where the Murray Basin can be found today. Around 440 Ma this rifting failed and subduction commenced in both directions. Additional terranes got merged against the eastern boundary of Australia and extended it to its present outline.

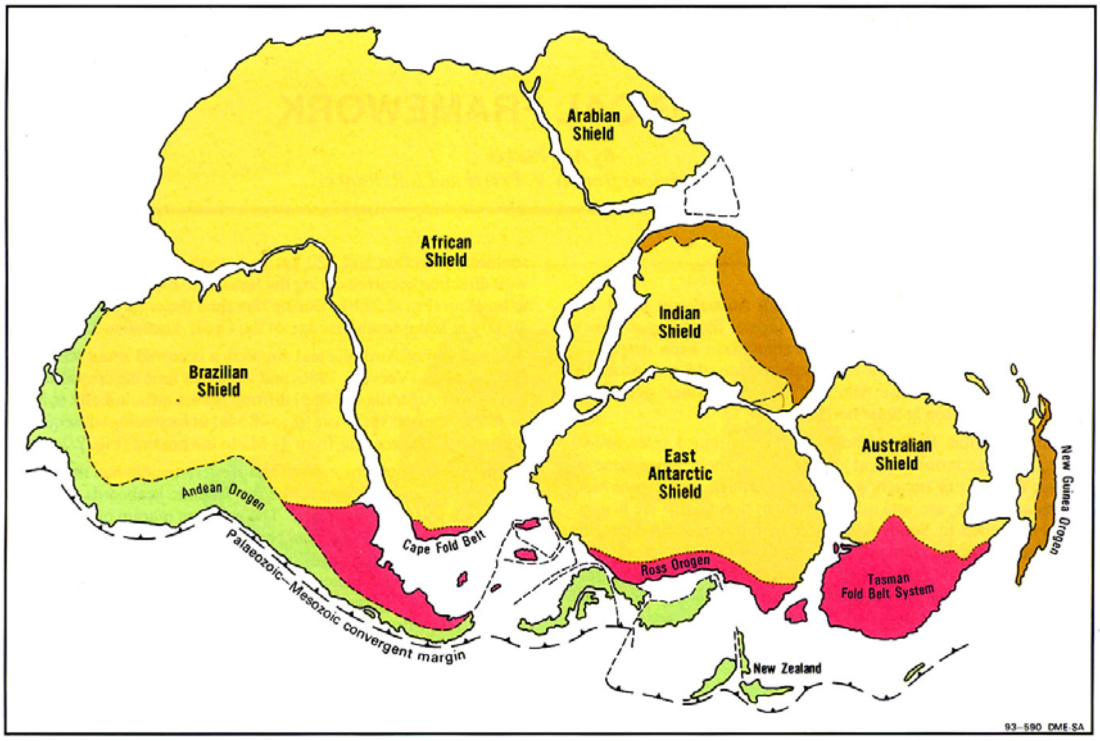


Fig 2 - Gondwana prior to breakup at ~160Ma (Drexel, et al. 1993)

The breakup of Gondwana commenced in the Permian age. Antarctica and Australia were still combined during that time and widespread deep sea sedimentation took place in the eastern part of Australia. The newly formed Adelaide Fold belt underwent erosion and not much happened in the western part of Australia. During the Jurassic age Australia split from Antarctica and started its northward drift (Veevers 2000). At the Moment there is active subduction going on where the Australia plate margin collides with the Asian plate (Banea Arc). This is thought to be one of the reasons why old faults in the center of Australia are active at the moment and that there are minor intraplate earthquakes (Johnson 2005).

2.2 THE MT. PAINTER INLIER

The Flinders Ranges are part of the Adelaide Fold Belt mentioned above, also often called Adelaide "Geosyncline". Geographically they form the central part of South Australia and stretch from the Peake and Denison inliers in the far north to the western tip of Kangaroo Island in the south.

The Mt. Painter Inlier (MPI) is located almost next to the village of the Wilderness Sanctuary Arkaroola in the northern part of the Flinders Ranges (Fig 3). It is mainly composed of Palaeo- to Mesoproterozoic sediments which have to be older than 1575 Ma, since the Mt. Neill granite intruded into them and was dated to 1575 Ma (Elburg, et al. 2001). The unconformity to the overlying cover rock has to be around 800 Ma old, since the first cover rock layers are of that age. Sedimentation took place from 800 Ma to 500 Ma and formed the Adelaidean Sequence (Preiss 1987). All the rocks exsistant so far were affected by the Delamerian orogeny about 500 Ma ago. Undeformed granites can be found within the MPI, they therefore formed after the deformation and are younger than 500 Ma. The largest intrusion in the MPI, the British Empire granite was dated to 440 Ma (Elburg, et al. 2003), which would be about that time when the rifting to the east of the Adelaide "Geosyncline" failed. It is also thought, that widespread metasomatism and fluid flow activity took place during that time (Backer and Elburg 2006). One of the youngest events that took place in this region was the formation of the enormous quartz sinter mountain Mt. Gee, but not only Mt. Gee itself is a witness of this event. There is quartz veining all over this region. It is thought that Mt. Gee is approximately 210 Ma old (Elburg, unpublished data). That would point out a possible linkage to the separation of Australia from Antarctica.

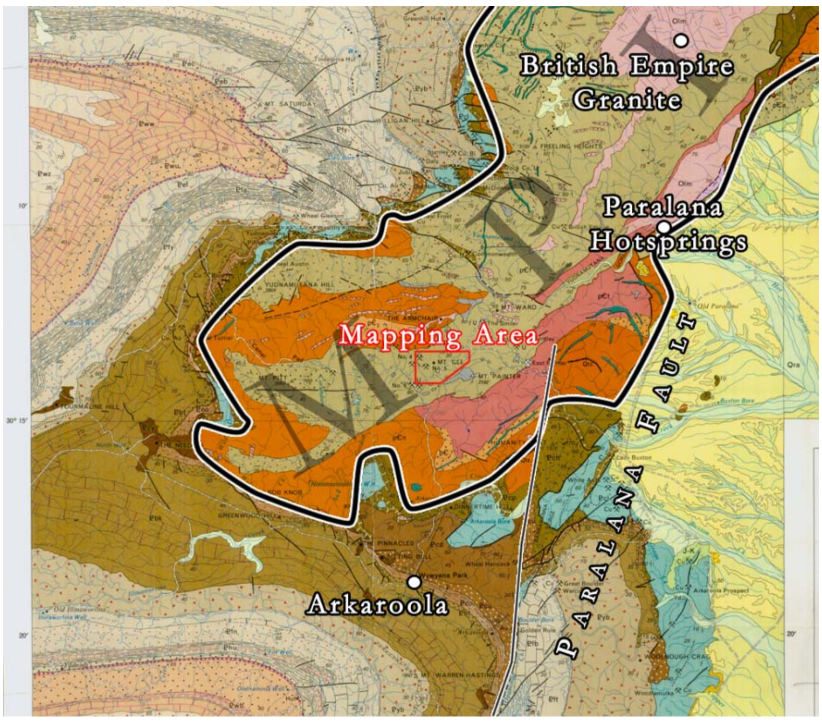


Fig 3 – Geological map (Coats and Blissett 1971)

In this part of the Flinders Ranges the deformation resulted in a big anticline which is tilted to the west. Because of erosion and uplift over the last 400 – 500 Ma the anticline is cut open and the Neoproterozoic sediments of the Adelaidean Sequence form a big u-shaped outline of the anticline which is open to the northeast. The basement inlier in the core of that anticline is called Mt. Painter Inlier and the research area forms a small part of it. At the Paralana Fault to the east, the Flinders Ranges are thrusted over the sediments of the plains, their own erosion product. The fault system is still active today.

3 LITHOLOGICAL UNITS

3.1 RADIUM CREEK METAMORPHICS

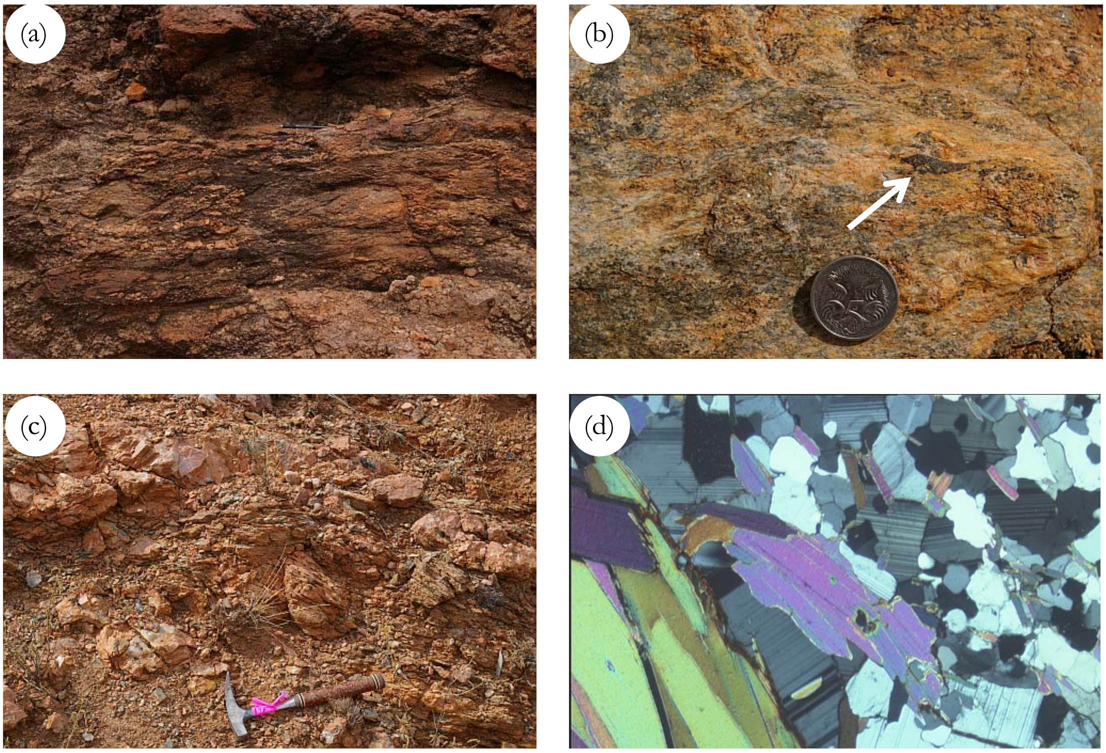
The Radium Creek Metamorphics (RCM) are one of the main lithological units of the research area. Originally clastic sediments ranging from quartzitic psammites to pelites, the RCM are thought to be the oldest rocks in the area. At first it was thought of a Palaeoproterozoic age for the complete series (Coats and Blissett 1971) which was later on divided into the "Younger Series" of Mesoproterozoic age and the "Older Series" of Palaeoproterozoic age (Teale 1993). Following that classification the RCM in this area would belong to the Older Series. However this subdivision was put in doubt and it was thought of a single unit again, at least older than the approximately 1575 Ma old Mt Neill granite, but not necessarily of Palaeoproterozoic age (Elburg, et al. 2001). Today they are highly deformed and experienced several metamorphic overprints. They mainly occur in the western and southern part of the mapping area. In the eastern part they are also common but due to the many breccia zones it is harder to distinguish them. Many of the breccia zones were once indeed RCM but since they experienced an overprint which is crucial for this area, they are merged to "brecciated host rock", a separate subsection.

Because of the massive overprint and deformation the only structure that could be identified in most of the outcrops is a foliation that is from now on referred as S_m, the main foliation. Sometimes a probably D_{m+1} crenulation cleavage was visible but by far not in all outcrops. In thin section an event that precedes S_m was identified as S_{m-1}. Still this is only the minimum number of deformations in that area, there could well have been additional previous events, but there is no evidence for them anymore.

Because of the lack of stratigraphic marker horizons, it was almost impossible to create a systematic stratigraphy within the RCM unit. However possible former subsections of this unit could be traced over longer distances, especially the so called "Black Biotite Schists". These schists form distinct layers within the RCM which can be identified easily most of the time and even traced for several 100 meters. Other well traceable layers forms the so called "Quartz-Feldspar Gneiss" which is probably more quartzitic than the rest of the RCM and hence resist weathering more. In the following the three main subunits of the RCM are described separately.

3.1.1 Undifferentiated Radium Creek Metamorphics

The main part of the RCM consists of the undifferentiated subgroup. It is most likely that they once were sediments but experienced a metamorphic overprint and now are more a well foliated quartz-feldspatic gneiss with lots of biotite in most cases. Grain size is in the order of millimeters and the biotite is well foliated and shows the foliation of the RCM in many cases very well (Fig 4a). Some signs of the crenulations foliation (D_{m+1}) can be seen here and there, but by far not as good as in the pure Black-Biotite-Schist (BBS). At some outcrops stretching lineations in sillimanite could be identified as well. Bigger porphyroblasts of feldspar and also magnetite sometimes show pressure shadows with sillimanite (fibrolite) (Fig 4b). The metamorphic grade probably reached partial melting of this rock type because some migmatitic structures, which well could be leucosomes, can be seen in outcrop (Fig 4c). Furthermore, the formation of fibrolite suggests a minimum temperature of approximately 500°C.



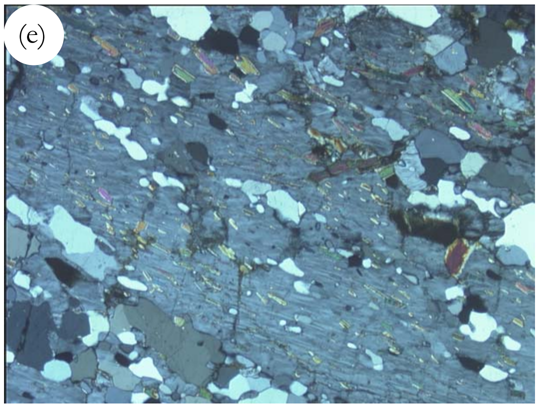


*Fig 4 – **(a)** Foliated RCM (pen in the center for scale) **(b)** RCM with a magnetite porphyroblast (arrow) right above the coin with its white fibrolite pressure shadows. **(c)** Pegmatitic structures inside the RCM unit, thought to be leucosomes from partial melting. **(d)** Thin section of a RCM sample, well annealed microstructure, only biotite crystals show an alignment (XPL, w.o.v. 4mm). **(e)** Big feldspar crystal overgrowing everything else. Quartz inclusions are aligned (XPL, w.o.v. 4mm).*

In thin section this rock type generally consists of fine grained quartz and feldspar grains with biotite in variable amounts. The general texture of those rocks shows a well annealed character (Fig 4d). The annealing phase must have postdated the main deformation event since no subgrains or undulose quartz extinction are visible. The only evidence for the previous foliation of the rock are the aligned biotite crystals, the other two main minerals show a foam texture with smooth grain boundaries. Probably during the annealing phase microcline growth got boosted, those late microcline crystals reach size of up to 10 mm. They sometimes contain aligned inclusions of quartz and biotite (Fig 4e).

3.1.2 Quartz-Feldspar Gneiss

In general the Quartz-Feldspar gneisses (QFG) are the same rocks as the RCM but with one essential difference. They show a higher quartz and feldspar content (Fig 5a) and hence resist weathering more than the regular RCM. There are some locations in the area where it wasn't clear whether these layers belong to the RCM or are the product of sheared gneisses. But most of the time the layers are interbedded in the RCM unit and it is therefore clear that they form layers, up to 10m thick, inside this unit. The biotite content is low. In the field these layers show an orange to red color and sometimes can be traced over several hundred meters. The grain size is usually larger than in the regular RCM but still in the range between millimeters and centimeters.

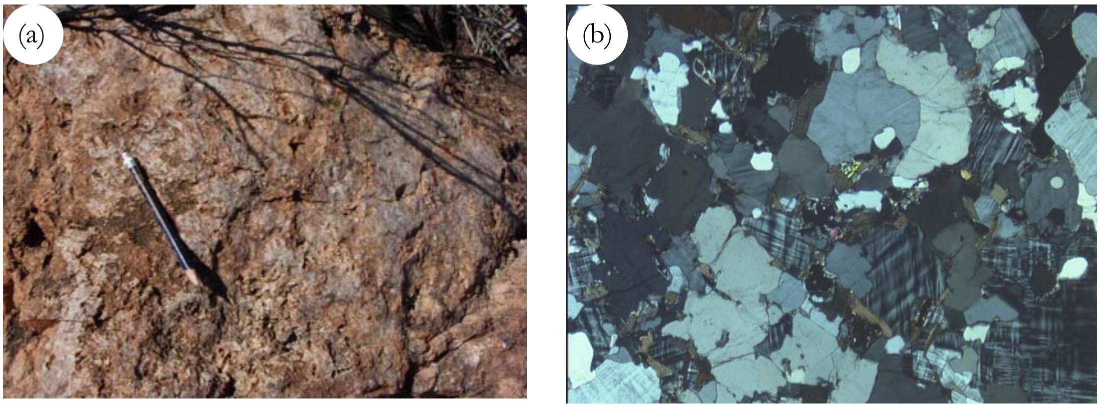


*Fig 5 – **(a)** QFG in the field, higher quartz content is obvious. **(b)** Thin section shows quite a higher amount of quartz and feldspar as well as less aligned biotite crystals (XPL, w.o.v. 4mm).*

In comparison to the undifferentiated RCM, the QFG unit shows a higher amount of quartz and feldspar in thin section (Fig 5b).

3.1.3 Black Biotite Schist

The Black Biotite Schist (BBS) forms distinct layers within the RCM, usually their thickness varies between tens of centimeters to meters. In contrast to the QFG they are dominantly composed of pale green to black coarse-grained biotite. The color depends on the different iron content. Magnesium dominated biotite crystals are typically referred as phlogophite, while the iron end member is called annite, both are part of the biotite solid solution. They show a well developed layering and the crenulation is sometimes visible as well (Fig 6a). The point why those layers form traceable units in the RCM is not because they are more resistant to weathering, it is more because of their completely different appearance. The only problem in tracing was that there were often more than one layer. After a few meters of rubble, where the layers couldn't be identified at all, it was sometimes hard to decide which one was the right BBS layer again. Since they all show the same trend it wasn't that critical. Interesting as well are the different porphyroblasts within the schist. They appear in different shapes. Most common are egg like shapes (Fig 6b) which mostly consist of corundum (blue and white) and spinel, sometimes also tourmaline. Rarely more elongated, planar shapes, which mainly consist of sapphirine, have been observed. At one location those sapphirine porphyroblasts occur as cross-twins. Foliation partly bends around these blasts, and partly goes right through them. This would point out growth of the blasts more or less at the time of deformation. But it could as well mean, that there only was some deformation after the porphyroblast had already formed, which is responsible for the bending. See chapter 5.1 for a detailed study on the porphyroblasts.

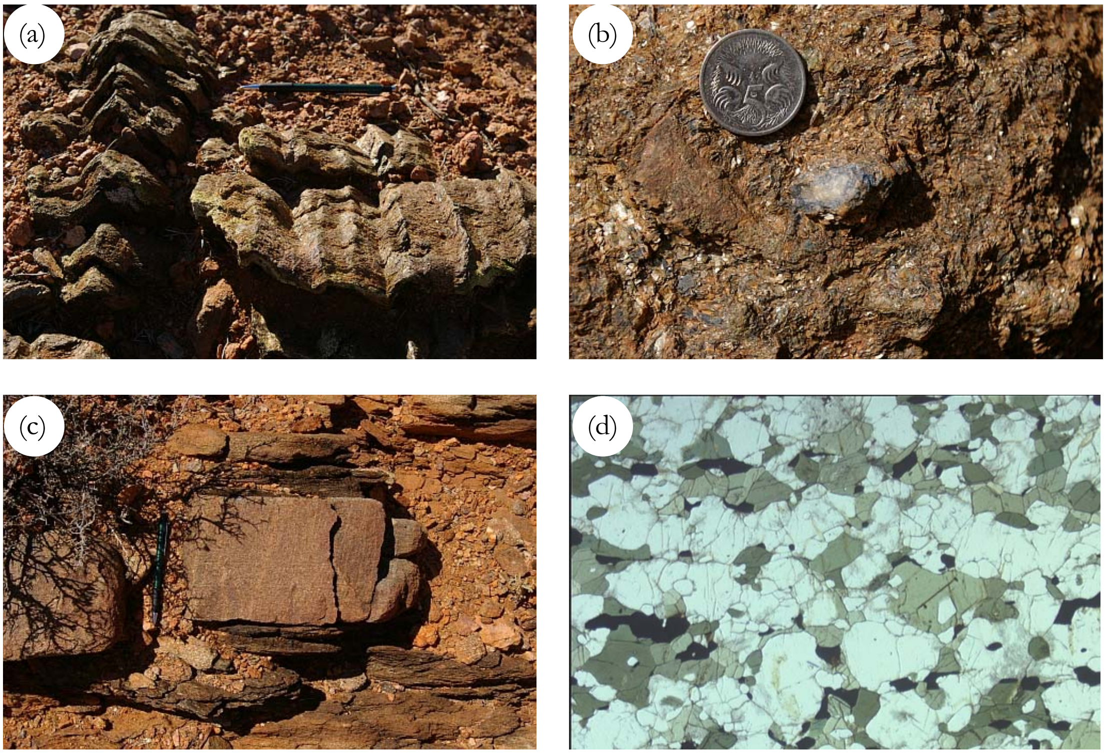


*Fig 6 – **(a)** Crenulated BBS (pen for scale). **(b)** Corundum porphyroblast inside a BBS layer in outcrop. **(c)** Amphibolite interbedded in RCM rocks. **(d)** Thin section shows the well annealed microstructure, quartz, feldspar and amphibole grains, some opaques in between (PPL, w.o.v. 4mm).*

3.1.3.1 Amphibolites

Amphibolites can be found in the southern part of the area, near the Big Dip. In the field they look like a fine grained black and white dotted rock, with a vague foliation parallel to the surrounding metasediments (Fig 6c). The rock consists of plagioclase and dark green hornblende, which is sometimes stretched. In thin-section the well annealed structure of the rock is revealed (Fig 6d). It must have experienced a strong thermal overprint, similar to the RCM. The fact that the Amphibolites are intercalated with layers of Black Biotite Schist could be an evidence for more of these Amphibolites in the area, but because they look very similar to the fine grained Black Biotite Schists they weren't recognized as such.

3.2 PEGMATITE

Pegmatites can be found almost everywhere in the area but most of the time they form small vein like structures, parallel to the main foliation in the surrounding rock, which weren't mapped separately. Sometimes they could have been misinterpreted as leucosomes from the thermal overprint of the Radium Creek Metamorphics that probably reached partial melting. The pegmatites show different ages as well. Some, probably the Proterozoic ones show strong deformation which can be seen as folding or boudinage in the field. They contain larger amounts of coarse grained biotite. The younger pegmatites are usually larger bodies and show a yellowish weathering color. They also contain less biotite and the feldspar crystals can be up to centimeters in size. The large feldspar crystals show graphic intergrowth with quartz grains. The younger pegmatites also don't seem to be affected by any deformation and are therefore probably younger than Delamerian age. It is very well possible that they form the most coarse grained end member of the Pink Pegmatitic "Granite" described later (Bons and Rößiger 2008).

3.3 PINK PEGMATITIC "GRANITE"

After the Radium Creek Metamorphics, the Pink Pegmatitic "Granite" (PPG) is the second most common lithology in the area. The northern part of the area, Radium Ridge, is almost completely made of Pink Pegmatitic "Granite". A second big occurrence is in the south western part of Mt. Gee where it looks like a continuous transition from Pink Pegmatitic "Granite" to Radium Creek Metamorphics in some spots. At first sight the rock type really looks like granite in the field (Fig 7a). Large feldspar crystals are surrounded by milky quartz grains most of the time. There is biotite visible as well, but in contrast to the Radium Creek Metamorphics this rock type barely shows any signs of foliation. Grain size is variable, there are fine grained Pink Pegmatitic "Granites", but also more pegmatitic ones with crystals a few centimeters in size. The shape of the crystals itself is uncommon for feldspars seen so far. They break apart in more sugary cube like pieces not with the typical feldspar habit. This probably means that there are almost no idiomorphic feldspar crystals in these rocks.

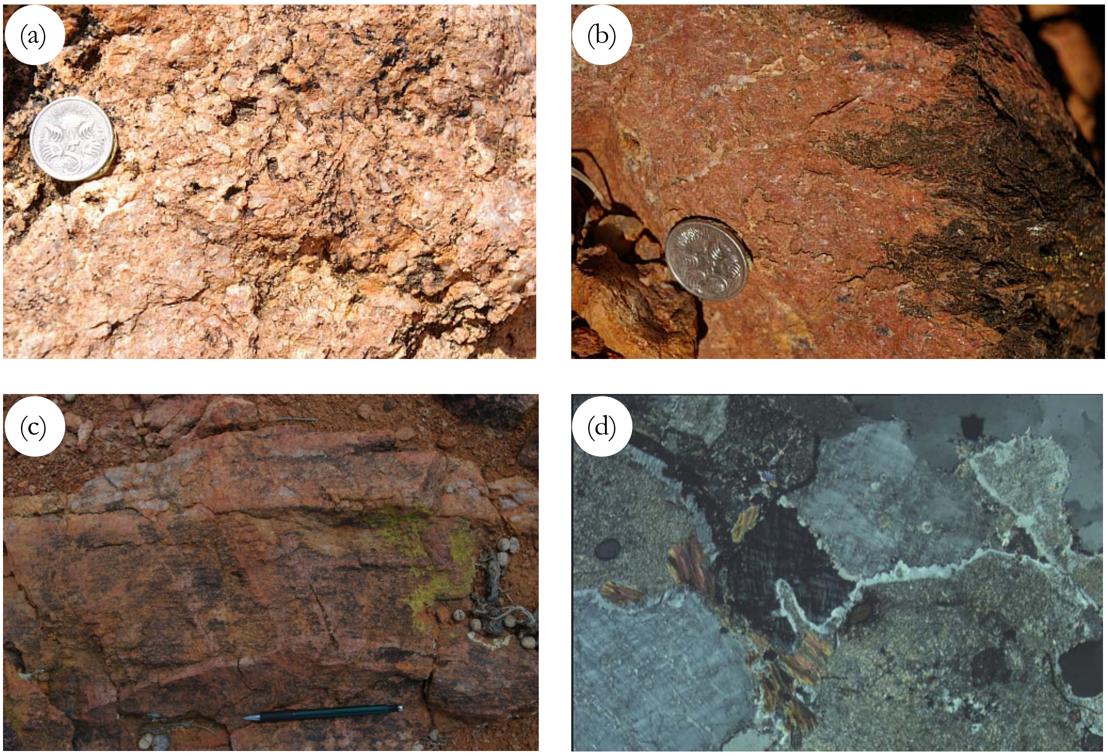


*Fig 7 – **(a)** Typical appearance of PPG in the field. **(b)** Transition between PPG on the left and BBS on the right. **(c)** RCM with fractures that show replacement of RCM to PPG. **(d)** Thin section shows large, altered feldspar crystals with a fresh rim (XPL, w.o.v. 4mm).*

Although the Pink Pegmatitic "Granite" unit looks like common granite in the field, it is questionable whether it is of igneous origin. Like in other parts of the Mt. Painter Inlier and the overlying Adelaidean, this might well be a consequence of the widespread potassium metasomatism. Fractures through the Radium Creek Metamorphics often look like the host rock got replaced by another mineral (Fig 7c). The pink color and appearance of that mineral is very similar to the PPG unit. These veins can show different appearance throughout the area. Some show a subsequent quartz precipitation event in the center of the joints, some not. In some parts of the mapping area a transition from pure BBS layers into PPG could be observed (Fig 7b). That could also be observed on a larger scale in the field. Along the main foliation no sharp boundaries between those units were found. It looked more like a continuous transition between RCM and PPG.

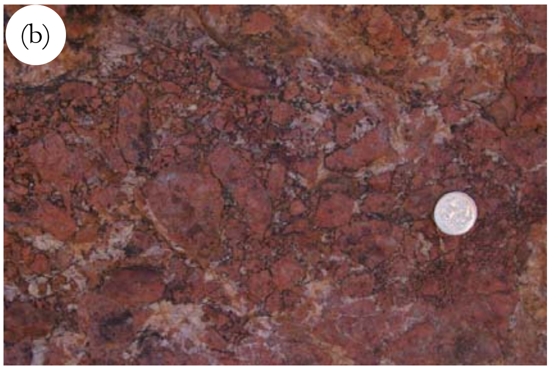
In thin section, in contrast to RCM samples, the PPG samples in general show larger and altered feldspar crystals (Fig 7e) and most of the time no signs of annealed microstructure.

3.4 HYDROTHERMAL DEPOSITS

The main reason for the work in this area, is the abundant occurrence of hydrothermal deposits in the area. They occur as simple breccia zones of host rock material, to more complicated ones which almost only consist of hydrothermally precipitated material, especially quartz and hematite. Most of the breccia zones show a more east-west trend but even inside one breccia zone the composition may change continuously. The hematitic character is focused more on the central part of the area, while the simple breccias can be found more along the boundaries of the research area. The hematitic breccias were also most valuable for Marathon Resources, because they are associated with uranium deposits which are the reason for the exploration activity in this area. In contrast to the breccia zones, there can be quartz veins all over the area, but only in the central part the massive quartz sinter of Mt. Gee may be found with its characteristic appearance. According to that a classification into four subgroups was performed.

3.4.1 Brecciated Host Rock

The most common breccia type in the research area is the simple breccia type. It is mainly composed of the surrounding host rock, typically Radium Creek Metamorphics or Pink Pegmatitic "Granite". The size of the clasts contained by the breccias varies from fine with a few millimeters to coarse with a few centimeters (Fig 8a), even up to meters in size. The finer breccias are usually quartz dominated, pale in color. The coarse ones also show feldspar impregnation, already mentioned above. Therefore it is sometimes difficult to differentiate between brecciated Pink Pegmatitic "Granite" and its undeformed host rock. In general the breccia zones are usually more resistant to weathering than the host rock, especially in the Radium Creek Metamorphics. In the field they form smooth boulders which usually stand out higher than the surrounding rocks. All clasts contained in the breccia zones can be found as lithological units in the area itself. Furthermore they mainly show an angular (Fig 8b) to sub-angular character and are sometimes fractured.



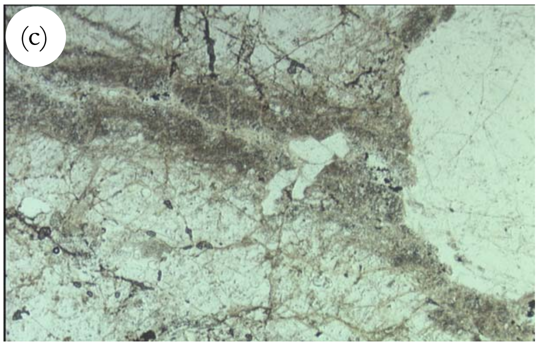


*Fig 8 – **(a)** Coarse grained breccia, composed of large clasts of RCM. **(b)** Brecciated PPG with barite between the clasts. Note the angular clasts. **(c)** Thin section shows heavily fractured PPG with alteration along fractures (PPL, w.o.v. 1mm).*

The main difference in thin section compared to the host rocks is the heavy fracturing and alteration along these fractures (Fig 8c) and all over the thin section. Biotite is sometimes altered to chlorite. Especially in the Frying Pan alteration is most advanced and the breccias show a brown to green color.

3.4.2 Hematite Breccia

At some places in the area, the normal breccias contain large amounts of hematite. In the field this can be seen because of the rusty-brown color (Fig 9a) and in some almost black patches shiny specular hematites (Fig 9b) were found. Usually the matrix is very fine grained and the hematite crystals are not visible with the naked eye. Main occurrence of hematite containing breccias is around Mt. Gee, for example the "Boomerang" an outcrop on the western slope of Mt. Gee shaped like an upright boomerang. Of course the mountain itself as well, although that is classified as a separate unit here because of some curial differences. See section 3.4.3 for details. Apart from that there are deposits on Radium Ridge to the north and on the ridge to the west of Mt. Gee, and one at the #6 workings.

As already mentioned, the hematite breccias were the most important rock type for Marathon Resources, because it is thought that uranium is associated with them. It is known about a century that uranium occurs in this area and scintillator measurements in the field and along drill cores confirm this. In the field measurements show that the hematite breccias show higher readings than the background in the surrounding rocks.

Especially the rusty fine grained breccias show readings from 1000cps up to 7000cps, but there are as well other patches of hematite breccias that only show readings about 400cps which approximately equals the background value. So far no process that could have led to uranium precipitation is confirmed. Furthermore the possible focusing structures were important for an underground model by Marathon Resources. It is thought that this research project brings these problems a bit forward.

In thin-section, reflected light and EDX analyses almost no uranium minerals were found. Some very small secondary uranium minerals were found within hematite breccias and identified as torbernite. Although it is thought that the main source of the radiation is thorium since much more minerals were found and identified as a solid solution of monazite ((Ca, La, Th)PO_4) and huttonite ($ThSiO_4$). Monazite in these breccias is already dated to 440±50 Ma (Pidgeon 1979) which would make the formation of the monazites contemporaneous with the emplacement of the British Empire Granite and the diopside-titanite veins (Backer and Elburg 2006). Jarusite and sulphides are sometimes common accessory minerals.

Up to three different iron oxide generations were identified with the SEM. The early bladed hematite crystals (Fig 9c) had to grow in almost open space and probably were brecciated later on, a second generation that forms a coating of several open vugs in the quartz (Fig 9d) and a third one, probably remobilization of hematite and precipitation as globular goethite and limonite in open cavities between the quartz (Fig 9e). As already mentioned above the first iron oxide generation is brecciated in several parts of the samples and often associated with monazite crystals (Fig 9c). Therefore it is thought that those two minerals formed almost contemporaneous and later on where brecciated by a fluid that precipitated the large amount of quartz in the breccias. Fluorite had to form after the quartz since it precipitated around idiomorphic quartz crystals (Fig 9c). Jarusite seems to postdate the second iron oxide generation, since it probably continues alteration of sulphides that already have an iron oxide coating (Fig 9d). Possibly more recent is the third iron oxide precipitation and the uranium micas that had to form after the third iron oxides since their flake like structure overgrows the iron oxide globes (Fig 9e). Barite, as well as the sulphides are also associated with iron oxide (Fig 9d), probably also the third generation.

The analyses of the reflected-light sections revealed that in the core of many large hematite crystals there are still remnants of magnetite (Fig 9f). Therefore probably much of the present hematite was once magnetite. Other remnants in the hematite crystals are mainly iron-copper sulfides (chalcopyrite) but not as much as magnetite. This is not surprising since in other prospects nearby, for example the Armchair prospect, chalcopyrite has been found as well, and of course there are many old copper workings in the immediately overlying Adelaidean Sequence. Additionally many of the hematite crystals in reflected light show a rim of further oxidized iron oxide, probably goethite. Similar observations have been made in SEM and it is thought that this rim belongs to the third generation which is possibly a remobilization iron.

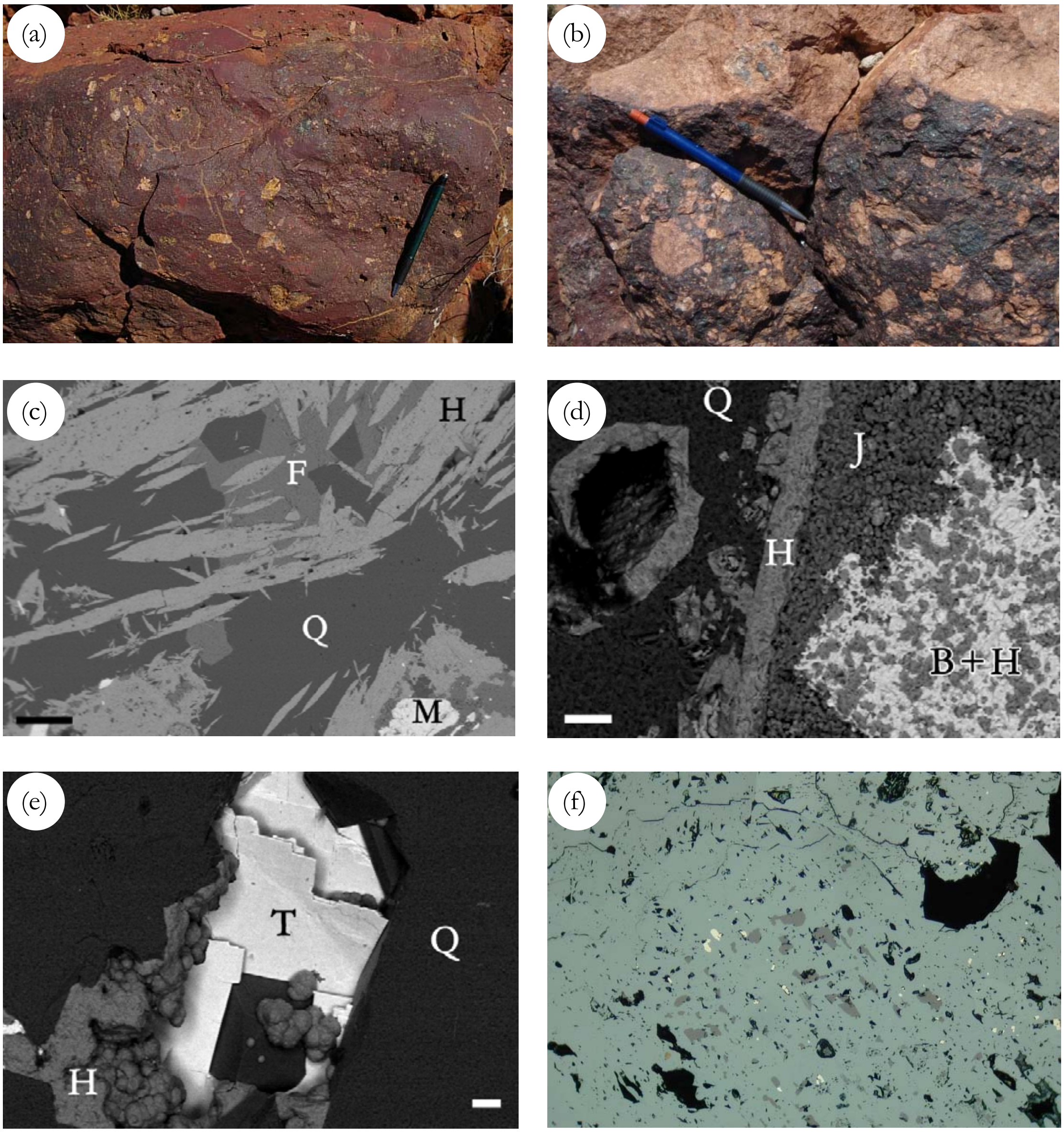


*Fig 9 – **(a)** Rusty-brown, fine grained hematite breccia. **(b)** Almost black hematite breccia with specular crystals. PPG clasts are contained inside. **(c)** SEM backscatter, hematite (H) as blades and brecciated with monazite (M), quartz (Q) precipitated around the hematite blades and fluorite (F) fills some remaining open space around idiomorphic quartz crystals (scale: 200µm). **(d)** SEM backscatter, iron oxide coating (H) sometimes in cavities in the quartz and sometimes as alteration along former crystal outlines (Q), followed by jarusite (J) and a combination of barite and hematite (B+H). Probably former iron-copper sulfides were altered (scale: 20µm). **(e)** SEM backscatter, globular iron oxide (H) precipitated in remaining vugs between the quartz (Q) and torbernite (T) flakes overgrow the globules afterwards (scale: 30µm). **(f)** Reflected light section, hematite crystal with small remnants of magnetite and sulphides (chalcopyrite) in the core (w.o.v. 700µm).*

3.4.3 Mt. Gee unit

The whole sinter which forms Mt. Gee, basically a combination of the Mt. Gee type veins and hematite breccias is defined as the Mt. Gee unit. Rounded clasts of hematite breccia cemented by Mt. Gee quartz form the main part of the unit (Fig 10b). Sometimes the Mt. Gee type veins are all oriented and the whole outcrop looks layered with aligned cavities (Fig 10a). Wherever an open cavity could be found, it was covered with dogtooth idiomorphic quartz crystals. Especially in the quartz veins the quartz crystals are usually aligned in clusters that have a distinct hole in the center, which is further on referred as "pinhole". All pinholes show a diamond shaped cross section and are empty most of the time. For more details on the pinholes refer to chapter 6. The unit itself never has been dated since pure quartz is hard to date. According to dating that has been carried out on fluorite often associated with the quartz veins, it is approximately 200 Ma old (Elburg, unpublished data). Although this age is poorly confirmed it gives a first clue on the actual age.

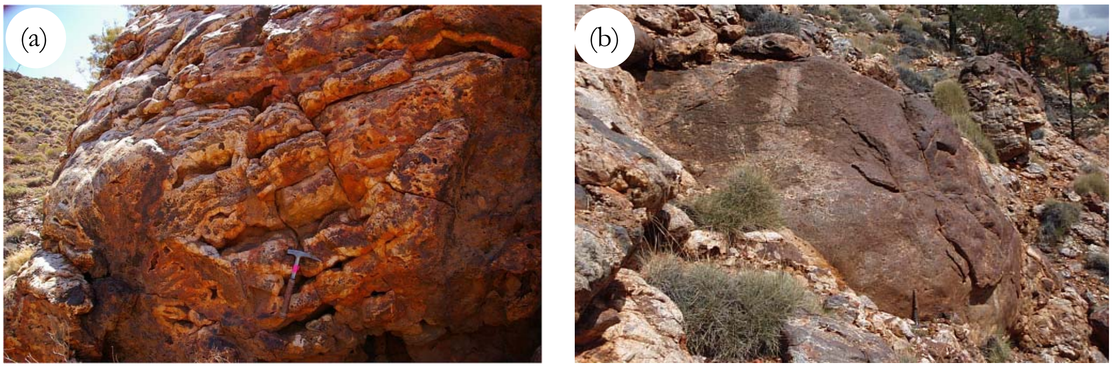


*Fig 10 – **(a)** Mt. Gee unit with aligned quartz precipitation and cavities. **(b)** Round shaped hematite breccia clast surrounded by the Mt. Gee unit.*

Mt. Gee Veining in detail is not a unit on its own. Quartz veins that can be found all over the mapping area with these distinctive pinholes are referred to as Mt. Gee Veining. The quartz crystals themselves are most of the time milky white with colorful crusts. The veins may appear on the millimeter to centimeter scale. They are mostly filled with dogtooth quartz, but not every vein is completely sealed. There may still be some open cavities in the center of the veins which were sometimes filled with fluorite and calcite. They may occur in every lithology and they cut every lithology therefore the veins are the latest event in the study area, they even postdate the Pebble Dyke. One event actually has to postdate even the Mt. Gee veining because at some points even that quartz got brecciated (Fig 11b). Although the only know occurrence of that breccia is within the Mt. Gee unit.

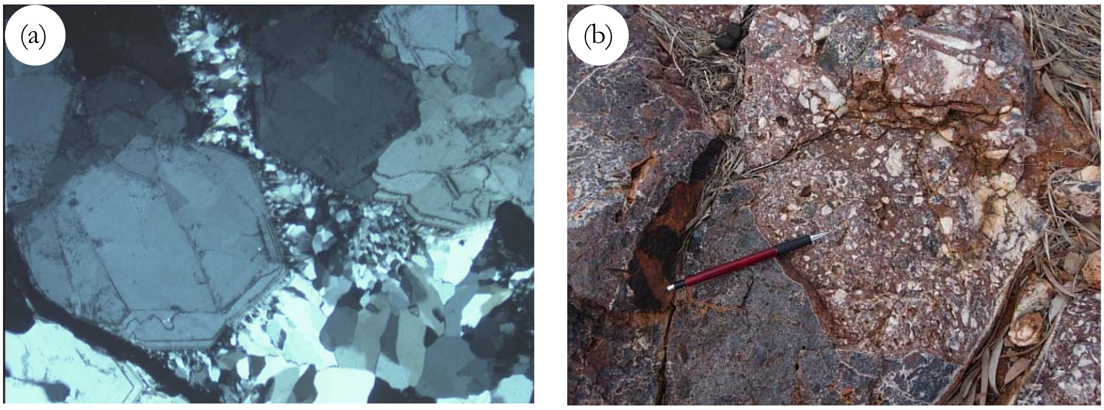


*Fig 11 – **(a)** Thin section shows two quartz generations, older large crystals with growth bands are overgrown by smaller clean quartz crystals (XPL, w.o.v. 4mm). **(b)** Brecciated Mt. Gee quartz only observed in the Mt. Gee unit itself.*

In thin section Mt. Gee type quartz is characterized by growth subgrains and it also contains dust rims that show successive growth stages. Those crystals are overgrown by a younger generation of clear quartz crystals with a much smaller grain size (Fig 11a). In some veins other minerals were observed as the youngest precipitation as well. Calcite could sometimes be seen apart from fluorite.

Another interesting observation about the Mt. Gee quartz veins is the fluorescence under short-wave UV light. It doesn't occur in all quartz generations and is therefore maybe another interesting way to distinguish between different generations. Fluorescence is summarized in chapter 7 along with all the other minerals that show fluorescence in this area.

3.5 PEBBLE DYKE

The Pebble Dyke is probably one of the oddest structures in the study area. Its occurrence ranges from big tens of meters wide patches to thin, only a few centimeter wide dyke. Its main occurrence in the study area lies to the west of Mt. Gee, a big patch in the center of the area currently under investigation by Marathon Resources. Outcrop conditions weren't that good because of many drill pads and tracks, but the size of the patch has a diameter of about 20-30 meters. North of it, at the boundary another dyke was found, although this one was very thin and contained no clasts at all. No connection between these two locations could be mapped because of the poor outcrop but striking of the thin dyke suggests that they have something to do with each other. The second largest occurrence was found east of Mt. Gee in the Frying Pan. Right beneath the lower boundary of the Mt. Gee unit an about one meter thick dyke was found and could be traced for several hundred meters towards the creek flowing through the Frying Pan almost next to the location where Reginald Sprigg already dug out the dyke for his studies. At this point there is a second dyke visible which seems be parallel to the first one, but in the creek both dykes were lost because of the poor outcrop. Further to the east it was picked up again as a much thinner dyke (Fig 12c). Whether this one connects to the first one or not cannot be said for sure. Furthermore it shows sharp boundaries to the surrounding host rock and formed almost 90° kinks although the hinge of the kink pointed almost perpendicular into the sky. The Pebble Dyke cuts every lithology except Mt. Gee and its veins. They themselves cut the Pebble Dyke (Fig 12d).

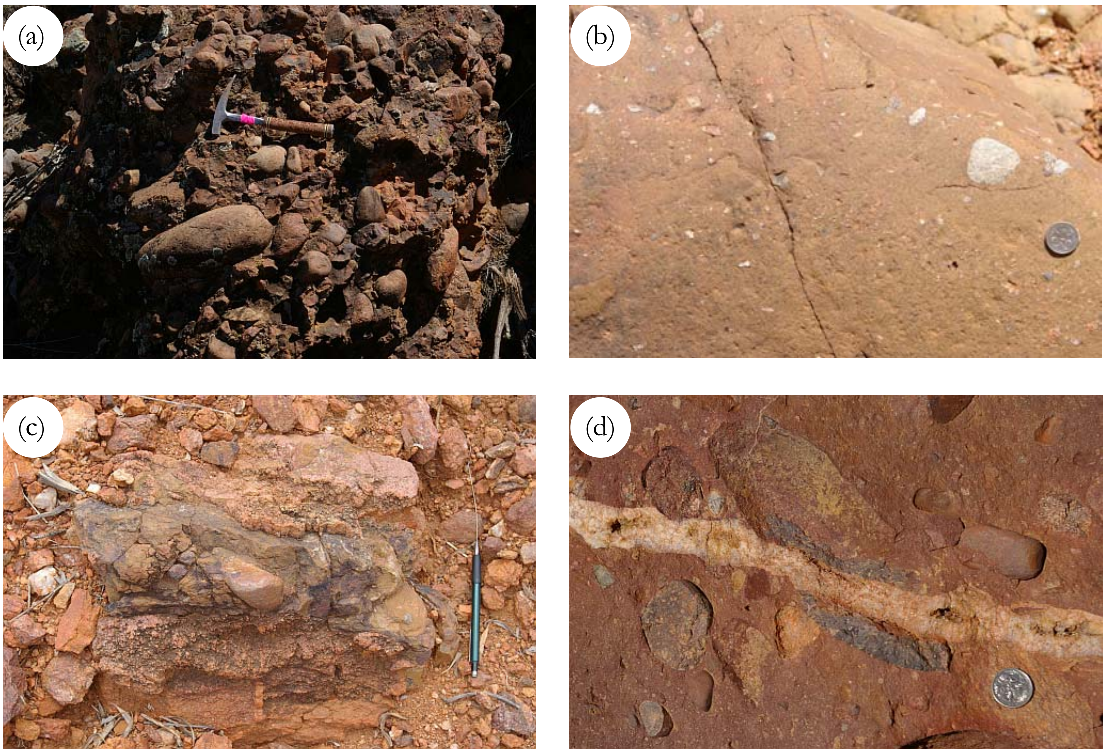


*Fig 12 – **(a)** Clast supported sections, more conglomerate like appearance, rounded clasts. **(b)** Matrix supported sections, more tillite like appearance, angular but also rounded clasts. No signs for deformation or metamorphic overprint. **(c)** Thin dykes with sharp contact to the wall rock. **(d)** Mt. Gee veins cutting through the Pebble Dyke.*

The Pebble Dyke itself consists of a conglomerate like rock type. Most of the time the clasts within the dyke are well rounded and supported by a brownish-green to rusty-red fine grained matrix (Fig 12b). Only at the big patch west of Mt. Gee the Pebble Dyke seems to be clast-supported (Fig 12a). There the clasts can reach half-meter diameters while normally the clasts are up to ten centimeters in size. Some of the clasts were identified as Freeling Heights Quartzite because of its distinct wave ripple marks with heavy mineral laminations which are only know from this lithology in the area (Coats and Blissett 1971). Probably laminations are formed by volcanic sediments from Gawler Volcanics. Some other clasts probably derive from volcanic rocks only known from further away. Most of the clasts although consist of the rocks known from the area of its immediate surrounding units. The shape of most clasts is well-rounded especially the larger ones. However there are some angular clasts as well which are probably more common in a tillite type rock. Even the small mostly quartz grains of the matrix show different rounding grades. The sorting is different as well. Summarized the Pebble Dyke looks like a sedimentary rock that never experienced any deformation or metamorphism. Therefore it is odd that it appears in dykes and large cavities surrounded by strongly deformed RCM and other lithologies in the area. The contact to the wall rock is always sharp and interaction between both rock types was not observed (Fig 12c and Fig 13a). The formation is so far still unclear.

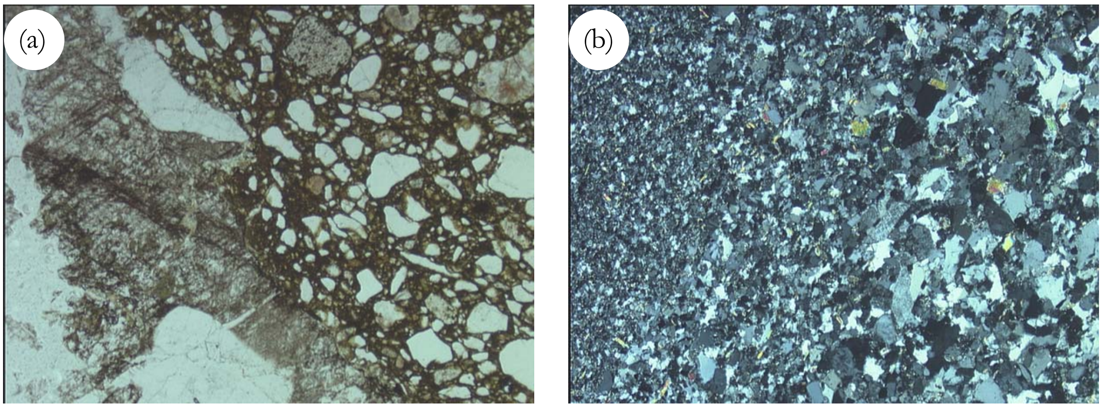


*Fig 13 – **(a)** Thin-section of the Pebble Dyke, rounded and angular grains in a fine matrix, wall rock on the left, no interaction visible (PPL, w.o.v. 4mm). **(b)** Thin-section of the Sandstone Dyke, evidence for recrystallization is visible. Signs for graded bedding can be observed as well (XPL, w.o.v. 4mm).*

Parts of the Pebble Dyke would suggest a fluvial deposition, while other parts would suggest a more glacial deposition. Combined, a deposition in a glacial environment with an impact of melt water rivers would be possible. A thin section of the Pebble Dyke (Fig 13a) shows angular, but also rounded to sub-rounded grains. A fine grained matrix surrounds all grains. Interaction with the wall rock is minimal; a sharp boundary between the dyke and the wall rock can be seen. The grains are dominated by quartz grains, but some feldspatic grains were identified as well and also clasts, which themselves were some kind of conglomerate. In contrast to that a thin part of the Pebble Dyke that doesn't contain any pebbles and is therefore referred as "sandstone" dyke, shows clear recrystallization textures (Fig 13b). Furthermore it shows some kind of graded bedding which is normally known from sedimentary rocks. No fine grained matrix between the grains is visible and the mineral content is dominated by quartz. To get another clue on the deposition environment a SEM analysis of the Pebbles was carried out. The main focus was the surface textures of the contained quartz grains since they already have been classified for the different environments (Krinsley und Doornkamp 1973).

For this investigation the pebbles were removed from the Pebble Dyke samples with great caution and immediately wrapped in tissues to prevent them from further damage on the surface, especially on the interesting part of the surface that still was enclosed with Pebble Dyke matrix. Damage from extraction was unavoidable since the pebbles had to be removed from a consolidated matrix, but it was carried out with as much caution as possible. In the laboratory they were cut in half to get a better view on possible internal structures and to prevent accidental interpretation of them as surface textures. Next step was the cleaning of the surface without affecting its texture. It wasn't clear how common brushes affect structures on the surface so it was thought about other methods, finally an ultrasonic-cleaning device was suggested. After 10 hours no more progress was visible, probably the dirt cover was removed as far as possible with this device. After the cleaning process the pebbles were dried and then mounted for SEM analysis. After another night in the cabinet drier the samples were sputtered with gold for 90 seconds. Along with the Pebbles from the dyke a clast from a tillite of this region was treated the same way and also put under the SEM to be able to draw comparisons between those two. Another sample was the fresh fracture surface of the sandstone dyke which is possibly connected to the Pebble Dyke. From thin-section analysis it is known that it consists mainly of quartz grains and therefore it would represent a perfect sample to compare the structures found with the ones already described by Krinsley & Doornkamp (1973).

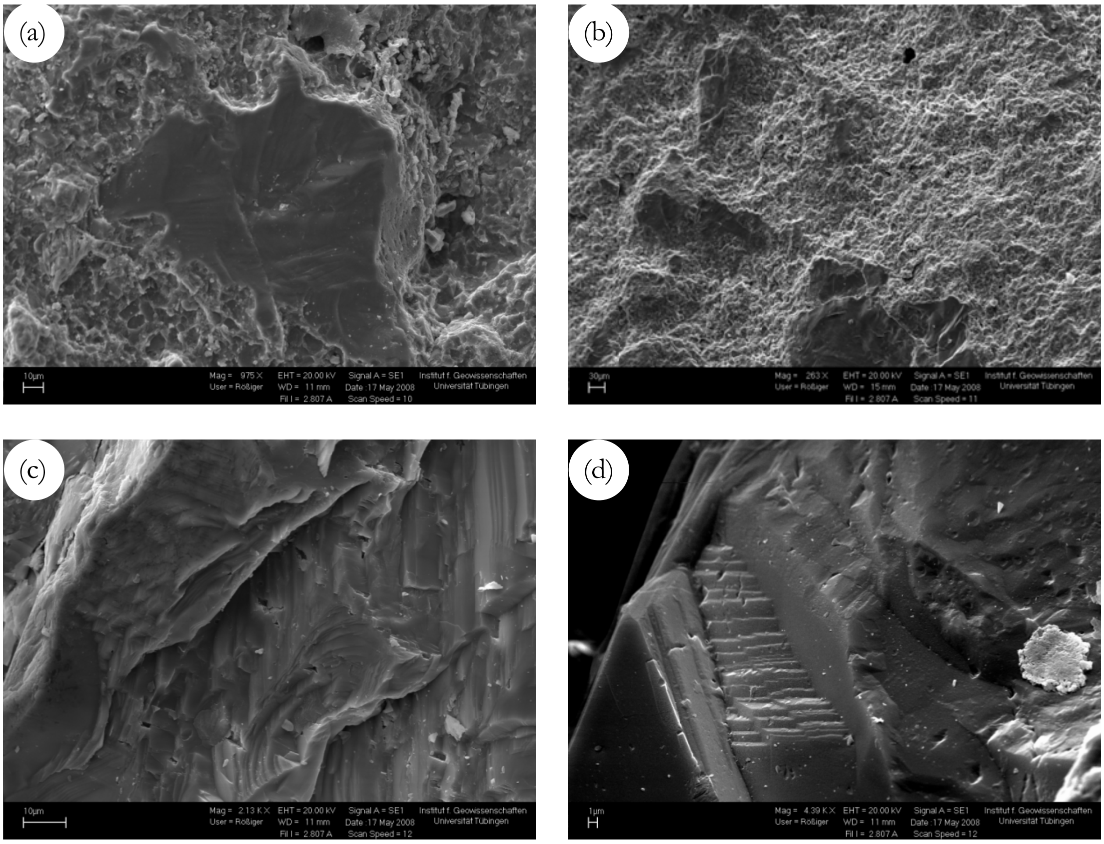


*Fig 14 – **(a)** The structure of the Pebble Dyke surface shows conchoidal fractures as expected from glacial environments but also from simple fracturing that may have occurred from extracting the pebbles from the matrix (scale: 10µm). **(b)** Surface of the tillite clast at lower magnification shows the inhomogeneity and probably the effect of solution and precipitation (scale: 30µm). **(c)** View on a fresh fracture surface of a Sandstone Dyke sample (scale: 10µm). **(d)** Detailed view on the surface of the Sandstone Dyke with visible solution pits (scale: 1µm).*

SEM investigation didn't reveal as many evidences as thought. Probably because all studies about surface textures were carried out on distinct quartz grains, but we investigated pebbles from the Pebble Dyke that derived from other lithological units in the area and therefore don't consist of pure quartz grains. Many clasts, also the clast we investigated, contain many quartz grains themselves, but since they are contained in other material, identification, especially under SEM is more complicated. The mechanisms for formation of the surface textures are probably different from those on small distinct quartz grains. Nevertheless we found some details on the surface that would suggest glacial deposition (Fig 14a). At some spots conchoidal fracturing occurred, which is common in glacial environments. It is thought that those textures occurred on top of the quartz grains contained in the pebbles. Since they mark the highest points in the relief of the pebbles the chance that those marks derived from deposition and not from extraction is higher. The general surface of the pebbles is more undifferentiated and shows inhomogeneity which is probably in part the effect of solution and precipitation. In comparison to the clast from the tillite (Fig 14b), both looked similar but less features were observed on the surface of the tillite clast. A possible reason for that is, that they consist of different materials and the tillite clast doesn't contain as many quartz grains as the clast from the Pebble Dyke. Third sample under investigation was a fresh fracture surface of the Sandstone Dyke which is thought to be connected to the Pebble Dyke. Conchoidal fractures in that samples are most probably related to fracturing (Fig 14c) and are not related to deposition. This is amongst other things suggested by a more detailed view on the surface of quartz grains in the Sandstone Dyke (Fig 14d). The pits on this picture are probably solution pits, but could also have derived from recrystallization of the quartz grains. Where grain boundaries merge together, sometimes a hole or inclusion is left, because all pathways are cut off by the grains themselves. Recrystallization would have destroyed any information on deposition textures.

4 STRUCTURES

4.1 PRE-DELAMERIAN

Since the Radium Creek Metamorphics are the oldest rocks in the area, it was obvious to study them to get hand on the oldest preserved structures. In outcrop deformation is visible as a strong, layer-parallel foliation. It is usually best expressed by aligned biotite crystals. This foliation was defined as S_m, the main foliation, and was mapped throughout the area. In some outcrops, especially in the Black Biotite Schist it can be seen, that the main foliation is crenulated by a subsequent event. There was little evidence for earlier deformation events in hand specimen, but a few Black Biotite Schist samples revealed that the main foliation itself is a crenulation foliation preceded by at least one more foliation-forming event. It was impossible to find any evidence for this S_{m-1} event in outcrop, but with further investigation in thin-sections the missing evidence was found.

Along with investigation of the porphyroblasts in chapter 5.1 (Fig 19a) small domains of S_{m-1} were observed. The orientation of the biotite crystals in this domain is almost perpendicular to the main foliation which proves that S_m has to be a far developed crenulation foliation which destroyed almost every information of earlier events (Passchier und Trouw 2005). Apart from Black Biotite Schist samples, foliation was also observed in some thin-section of the RCM. The biotite crystals are usually aligned parallel to S_m but quartz, feldspar and other minerals show only little evidence for such a strong foliation that had to take place because of the information seen in outcrop and the BBS samples. Grain boundaries are relatively smooth and only a few subgrains are visible. This indicates that the deformation was followed by a thermal overprint which induced static recrystallization of some minerals and annealed most of the microstructure.

As already mentioned in chapter 3.1.1, additional to the foliation in the sediments there is also a mineral stretching lineation visible parallel to the main foliation. In some samples of the RCM, porphyroblasts of magnetite with pressure shadows of fibrolite were found (Fig 4b). The fibrolite grew parallel to the main foliation which makes them contemporaneous and the porphyroblast precedes the formation of S_m.

From other work it is possible to give a broad time-frame in which this deformation had to take place. The main foliation is truncated by the Adelaidean Sequence at Nooldoonooloona waterhole (Elburg, et al. 2001), which defines the minimum age of the deformation to approximately 800Ma. In the same work evidence was found, that the Mt. Neill granite itself is foliated by S_m. The deformation therefore has to be younger than the Mt. Neill granite intrusion, which defines the maximum age to approximately 1575Ma.

4.2 DELAMERIAN

The Delamerian deformation is best observed in the Adelaidean Sequence, because it didn't experience any of the previous deformation events. As already said above, the main foliation visible in the RCM is truncated by the Adelaidean Sequence, which proves the younger age. The Flinders Ranges are characterized by large, upright folds of Delamerian age that deform the Adelaidean rocks. The southern part of the Mt. Painter Inlier is formed by two of those large folds (Yankaninna and Radium Ridge Anticline). They have a subhorizontal fold axis dipping to the west and steep axial planes trending NE-SW to E-W.

The Mt. Painter Inlier is outcropping in the eastern part of the core of these anticlines. In the mapping area the MPI itself has folds that show a slight N-verging trend. That would indicate that the main antiformal hinge is located in the north of the mapping area. They also show a steep axial plane and a subhorizontal E-W trending fold axis (Fig 15). This folding is consistent with the general Delamerian folding and therefore assigned to this event. In the field those folds were mainly traced by the QFG and BBS layers within the RCM (Fig 16). For the cross section along NS-line 0340500E in appendix IV, the western part has been used for extrapolation, because folds here are much more regular than in the eastern part of the mapping area. It is thought that irregularities are caused by interference between Delamerian and Proterozoic folding.

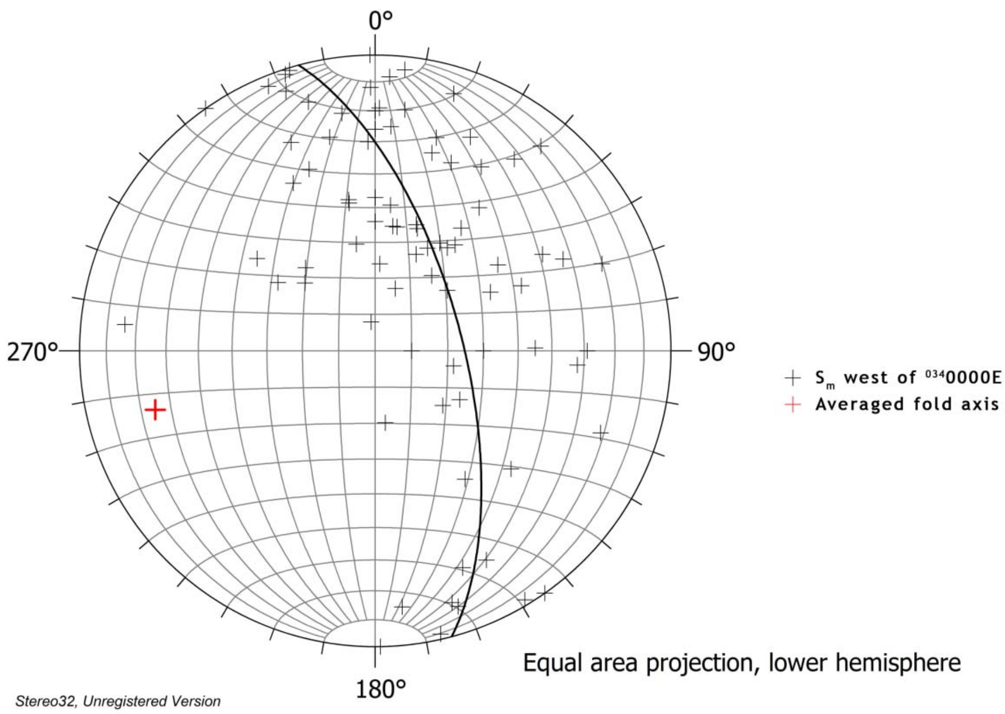


Fig 15 – 102 S_m foliation plane measurements west of 0340000E have been plotted as normal vectors. The western part of the mapping area is most suitable because it is least affected by PPG metasomatism and Delamerian folding is best visible. All measurements (black crosses) broadly lie on a great circle which defines a shallow dipping fold axis to the west (red cross).

As already stated in chapter 3.1.3, the main foliation observed in outcrop is crenulated again and this crenulation is thought to be a result of the Delamerian deformation. But the crenulation is usually not well developed and rarely produced a clear axial planar cleavage.

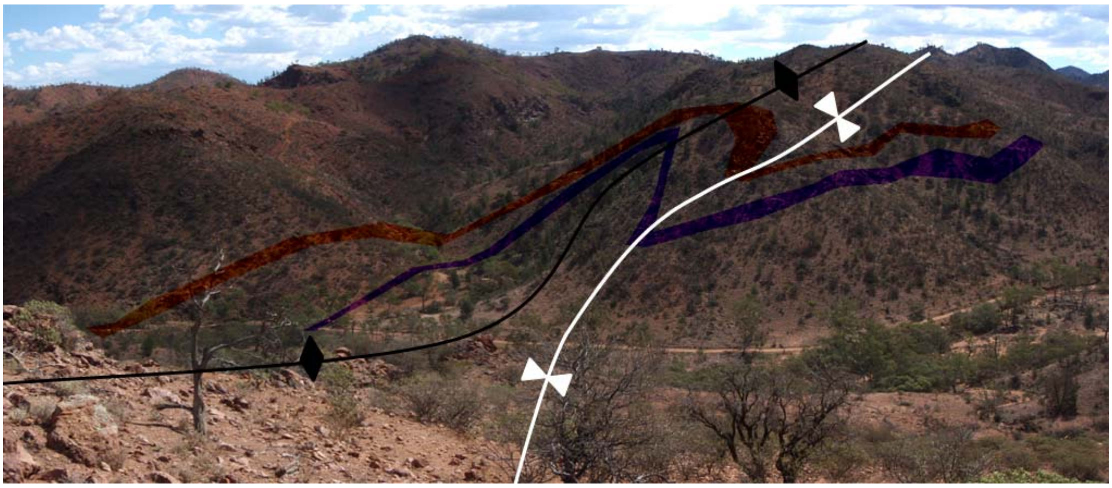


Fig 16 – View from #6 workings to the west. Delamerian folding in the MPI traced by the QFG layers (colored) within the RCM.

The metamorphic grade during the Delamerian orogeny must have reached at least the amphibolite facies, because andalusite-bearing biotite schists can be found in the lower Adelaidean units (Mildren and Sandiford 1995). The age of minerals in the inlier is hard to determine, since proterozoic metamorphism already produced the same minerals. However, the thermal overprint that annealed most of the microstructure might be of Delamerian age.

4.3 POST-DELAMERIAN

Recent work split the Delamerian event into two events (Elburg, et al. 2003). According to their work the Delamerian metamorphic and mostly ductile event was followed 60 Ma later by another, mostly brittle event. That indicates that the Delamerian event was followed by exhumation and around 440 Ma the ambient temperatures decreased below 300°C.

So far it is thought that several metasomatic-hydrothermal events are associated with that event. Probably the first one was a widespreaded potassium metasomatism in the inlier and the immediate overlying cover rock. The rock type that is derived from that alteration, the Pink Pegmatitic "Granite", shows no signs of folding and foliation and therefore has to postdate the Delamerian deformation. Occasional vague foliation is visible, but it is thought that those are remnants of the earlier rock type which was completely transformed into the Pink Pegmatitic "Granite". Some pegmatites can also be found which don't show any evidence for deformation and therefore postdate the Delamerian event as well. Association with the diopside-titanite veins in Radium Creek suggests connection to the 440 Ma event (Bons and Rößiger 2008).

4.3.1 Breccia zones

The potassium metasomatism is in part contemporaneous, but in general it is followed by a large brecciation that formed the system of breccia zones found in the mapping area. The timing is suggested by clasts of Pink Pegmatitic "Granite" that were found inside the breccia zones and they therefore have to postdate the potassium metasomatism. Pegmatites are associated with the breccia zones and suggest a more contemporaneous formation.

Evidence for tectonic movement along the breccia zones is very rare and no evidence has been found for any offset along the breccia zones. Contrariwise, fold hinges were observed in the south of the mapping area, which continue straight across major breccia zones. That rebuts movement along breccia zones, otherwise the fold hinges would have shown displacement. This all indicates that the breccias are not tectonic, but the result of hydrothermal activity.

The breccias form steep zones that form two sets, one more E-W trending which might connect the Radium Ridge prospect to the west with the East Painter prospect to the east and one more NE-SW trending which might connect the Armchair-Streitberg prospect in the northeast with #6 in the southwest (Fig 17). According to drill-core data from Marathon the major ore body is suspected beneath Mt. Gee which lies on the intersection between those two sets of breccia zones. It is suggested, that the intersection provided additional pathways for fluids and therefore the major ore body and maybe even Mt. Gee formed at this location.

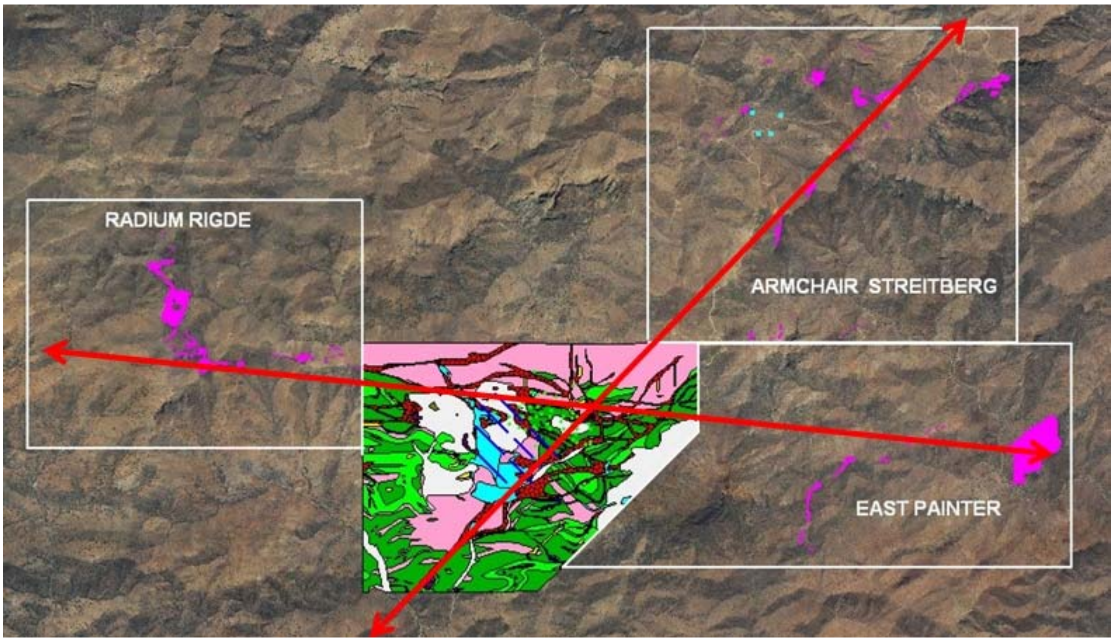


Fig 17 – Satellite picture of the area with the mapping area and Mt. Gee in the center and the trends of the two sets of breccia zones and their possible extension.

In the mapping area, the hematite bearing breccias are in general concentrated on the E-W running system and are focused on the center of the area. Additional to the vertical structures that are related to the breccia zones, there are also indications that there was some lithological control that developed more horizontal structures. Because of the Delamerian deformation in this area, those structures are related to folds. Right beneath Mt. Gee on the western side, one prominent structure can be seen, the Boomerang. Its shape reminds of a synclinal structure which is consistent to the Delamerian syncline that was mapped at this location. There is another evidence for synclinal control of the hematite breccia deposition, #6 in the southwest of the mapping area, also the only hematite breccia deposition which is related to the NE-SW running system, shows synclinal character as well, with a fold axis running right through its center. The hematite content decreases to the edges of the mapping area, but as said above there might be a continuation in the surrounding prospects.

4.3.2 Pebble Dyke

The Pebble Dyke in general shows no indications for brecciation itself, except next to Mt. Gee. Furthermore it shows no sign for folding or other sorts of deformation, it cuts through all lithologies without being cut, except from the Mt. Gee unit and the veining that is related to Mt. Gee. Therefore the Pebbly Dyke must be of younger age than the Delamerian orogeny in this area. Furthermore, it must be older than the Mt. Gee unit and its veins because this is the only unit that cuts the Pebble Dyke instead of being cut.

4.3.3 Mt. Gee Unit

Mt. Gee appears to be mainly composed of MGU material. In outcrop that might vary from place to place, but in general the appearance in the field is the same. In the north there is a sharp boundary were the MGU suddenly stops, next to a suspected breccia zone. In the south the MGU extends to Radium Creek, which also follows a suspected breccia zone. At one point the MGU extends across Radium Creek and forms a waterfall of ten meter height. The extension is very soon continued by PPG and RCM rocks. On the western side the MGU shows a sharp boundary and on the bottom side it stands in contact to RCM and PPG material. Combination of observations from all sides of Mt. Gee suggest, that the whole mountain is formed by a big sheet of MGU dipping with an angle of approximately 37° to the north east. Successive sheets are suggested by observations from the south (Fig 18). According to that, the MGU would be expected at about 200-300 meters below the surface in the middle of the Frying Pan (Bons and Rößiger 2008).

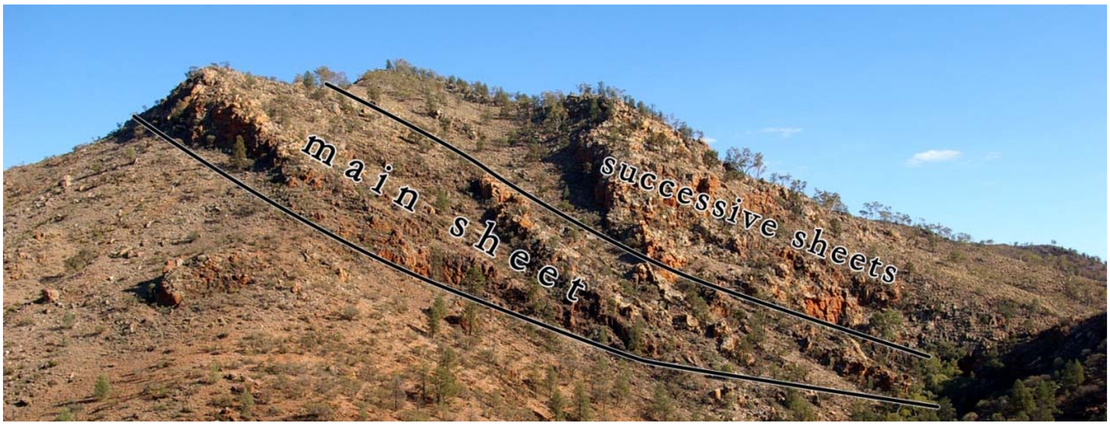


Fig 18 – View from the south on Mt. Gee where the sheeted structure can be seen.

5 METAMORPHISM

5.1 PORPHYROBLASTS IN THE BBS

A closer look on the porphyroblasts was performed in thin-section. Main intention was to reveal some of the relationships between the different minerals that form these blasts and from that try to build a timeline of overgrowing and substitution events that may have occurred. Additional thin-sections form M. A. Elburg were used to expand the sample quantity and thereby increase the chance to see clear relationship textures. However, those weren't from the mapping area, but from surrounding areas in the MPI.

In general the following minerals occur as porphyroblast. Spinel, most of the time in green colors, is common, as well as corundum in two phases, the first one translucent white corundum, the second one blue, more sapphire like corundum, and sapphirine, usually forming long blades and even twin crosses. The porphyroblasts are surrounded by biotite as we've only observed them in the biotite schists so far, but also chlorite and iron oxide. Both probably evolved at some stage of alteration and overprint. As accessory mineral, högbomite has been observed in some thin-sections, but those weren't from the mapping area itself and thus högbomite won't be taken into detailed consideration in this study. However högbomite has also been found in the immediate surroundings of Mt. Painter (Teale 1980).

What has been observed in these thin-sections as well, were remnants of an earlier crenulation structure that still was preserved as small domains with different biotite crystal orientations (Fig 19a). That evidence actually led to a redefinition of the main foliation from our field observations to S_2, since the remnants were obviously older and therefore S_1. The crenulation observed in outcrop (Fig 19b) probably crenulated S_m, but didn't develop any visible foliation in thin-section and is therefore referred as D_{m+1}.

In some, mostly spinel porphyroblasts, an internal structure of small biotite crystal inclusions was observed, that probably originated from the S_{m-1} and S_m crenulation discussed above (Fig 19h). By time of formation of the spinel, that crenulation thus already had to be present, and was incorporated and preserved. But spinel is not the first phase forming porphyroblasts. In Fig 19c it can obviously be seen, that green spinel, together with blue, sapphire like corundum, belongs to the second growth phase after white corundum in the core. Much more opaques, probably magnetite and hematite, are associated with that second growth.

At least in all thin-sections analyzed, no older phase than the white corundum could be identified, and it is assumed that it was the first one. At higher magnifications an interesting detail about the boundary between spinel (green) and corundum (blue) is revealed. They almost never stand in direct contact to each other (Fig 19d). Most of the time there is a thin band, made of iron oxides and biotite present between the two mineral phases. This is interpreted as instability between those two minerals, and wherever they stand in direct contact they react and form other minerals.

As a last growth phase sapphirine was observed (Fig 19f). Large crystals of sapphirine overgrow essentially everything else. Fig 19g shows a part of Fig 19f at a larger magnification. The sapphirine crystal overgrows the biotite crystal perpendicular to its c-axis and even further along fractures. In the upper left the last remnants of a corundum crystal (dark brown in this XPL picture) intergrown with chlorite (bright blue) were identified. However those are not the only examples of sapphirine overgrowing corundum, in the whole thin section small islands of corundum surrounded by sapphirine can be seen.

The latest event seen in the thin sections is an almost brittle deformation, at least brittle for sapphirine, but not necessarily for biotite. The crossed sapphirine twin in Fig 19e shows two endings that broke off and were tilted towards the horizontal axis through the center of the cross. The incorporated S_m foliation of biotite inclusions in those endings is tilted as well and thus shows that this deformation had to be later than the sapphirine growth.

One additional growth phase was identified in several thin sections. Actually that one has nothing to do with the porphyroblasts, it is a recrystallization of biotite. Former small and oriented biotite crystals are overgrown by big biotite crystals without any preferred orientation. In some thin-sections this event destroyed every information of S_m and pre-S_m. The timing of that recrystallization is probably simultaneous and to the sapphirine growth.

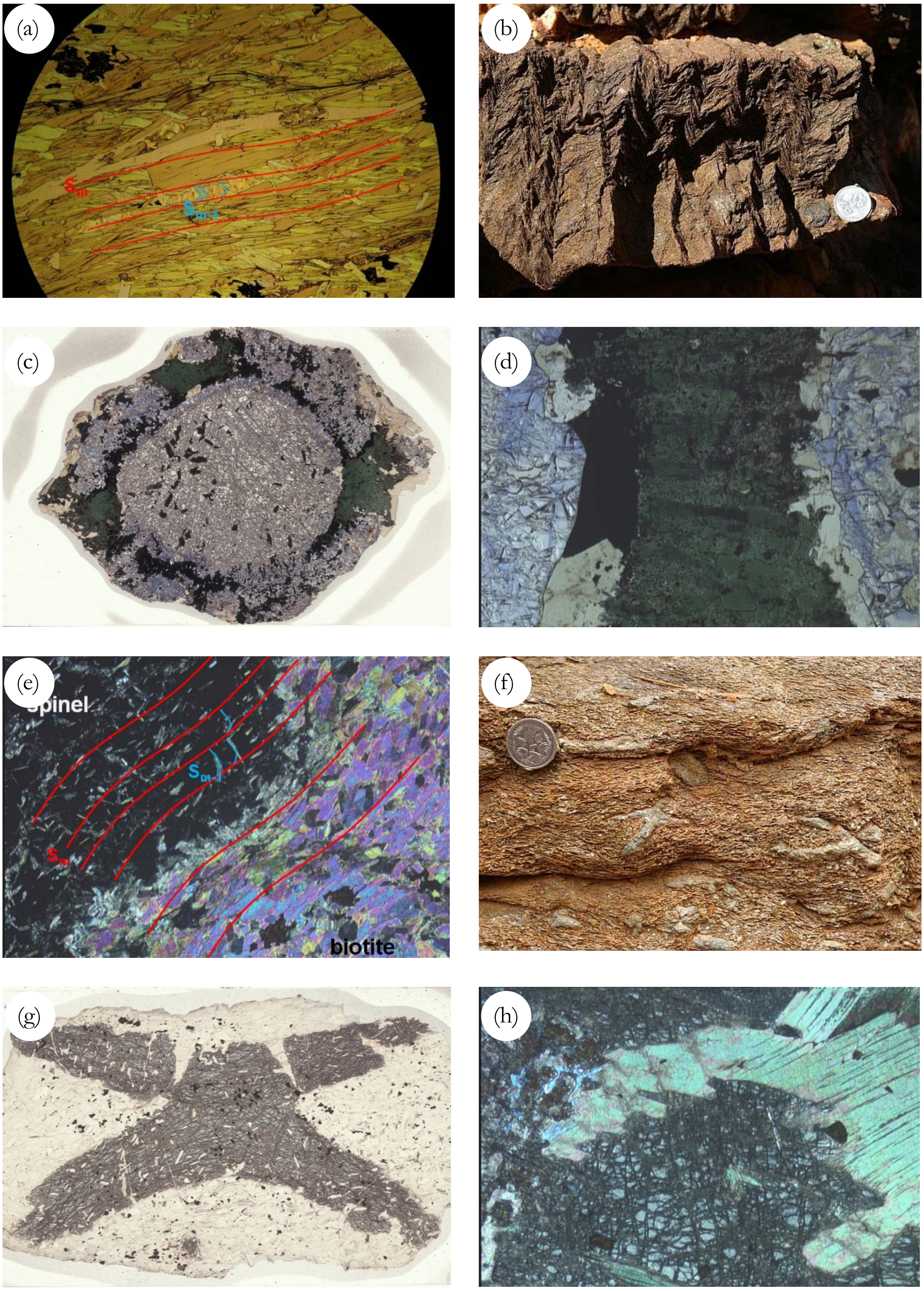


Fig 19 – ***(a)*** *Remnants of* S_{m-1} *foliation as small domains in* S_m *dominated biotite schist (PPL, w.o.v.: 8mm).* ***(b)*** *Crenulation in the BBS as observed in outcrop.* ***(c)*** *Complete thin-section of a corundum porphyroblast. Two growth generations with white corundum in the core and green spinel, blue corundum as second growth generation (w.o.v.: 30mm).* ***(d)*** *Detail of the boundary of spinel and corundum in (c) with a thin band of iron oxide and biotite in between (w.o.v.: 4mm).* ***(e)*** *Spinel porphyroblast with incorporated* S_m *foliation and* S_{m-1} *domains (XPL, w.o.v.: 4mm)* ***(f)*** *Sapphirine twin crosses in outcrop.* ***(g)*** *Sapphirine blades in thin-section as the latest phase (w.o.v.: 30mm).* ***(h)*** *Detail of sapphirine overgrowing biotite and corundum in (g) (XPL, w.o.v.: 4mm).*

6 PINHOLES

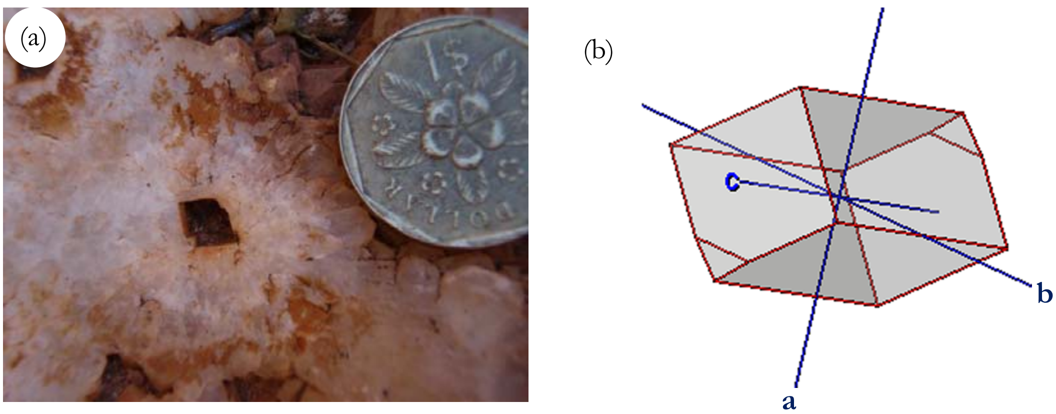


*Fig 20 – **(a)** Pinhole in the center of a quartz cluster. **(b)** Schematic view of an idiomorphic laumontite crystal with its crystallographic axes. It is elongated along its c-axis which fits well to observations from the field.*

One distinct feature of Mt. Gee veins are the pinholes in the center of every crystal cluster. Most of the time these holes are empty and the mineral that once filled them is dissolved. But at a few locations away from Mt. Gee, a mineral was still in place, questionable whether it is the original one or not. With XRD analysis the character of this mineral was identified as laumontite, a mineral of the zeolithe group. Since laumontite always and in every pinhole investigated crystallized with its c-axis parallel to the pinhole, and since the cross section of laumontite perpendicular to its c-axis fits very well to the cross section of the pinholes (Fig 20a and Fig 20b), it can be assumed that laumontite is the original mineral of in the pinholes and in some way acted as crystallization seed for the quartz clusters. Once specialty observed in some pinholes, was the formation of twins parallel to the c-axis (Fig 20a). The formation of laumontite under excess water and SiO_2, which can be assumed for this system, is suggested to be between 100°C – 200°C and 1 bar – 3 kbars (Liou 1971). Laumontite is meta-stable under surface conditions and since zeolithes don't belong to one of the most stable mineral groups it is possible that it got leached out from weathering. However, since laumontite was only found further away from Mt. Gee and around Mt. Gee all the pinholes were empty, it is more probable that laumontite got dissolved by fluid activity after the quartz clusters had formed.

7 FLUORESCENCE

Another interesting fact is the fluorescence of some minerals of the research area. First it was found in a form of opal, called hyalite from the slopes of Mt. Painter on the edge of the research area. Following that first opal sample, we conducted further search on all other samples as well and studied them, both with short- and long-wave UV lamps. In literature fluorescence in MPI was mentioned (Wilkins 1999). However, after further study of that article the conclusion was that it only contained insufficient information about fluorescence minerals in the research area and further search has been conducted. Finally minerals showing red fluorescence colors near the Pinnacles were mentioned (Forster 1996), and a detailed study of the uranium minerals in the Mt. Painter area was already carried out (Brugger, et al. 2003).

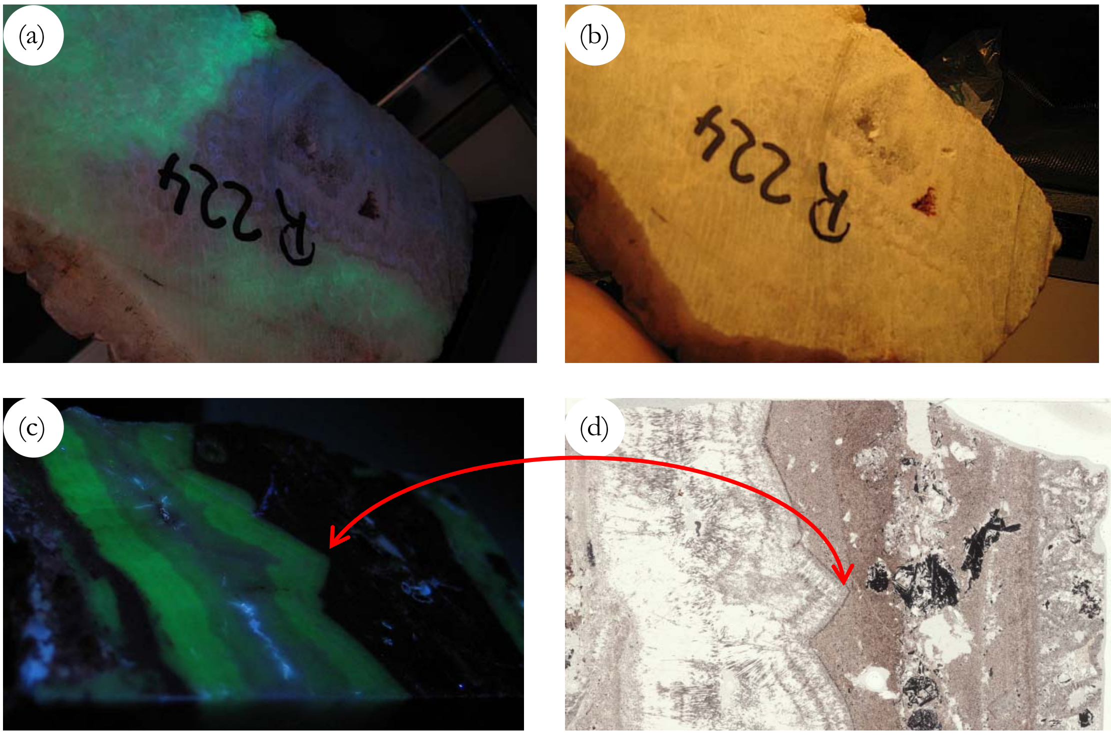
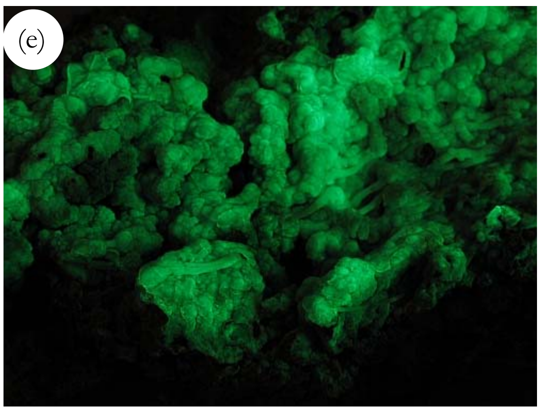


*Fig 21 – **(a)** Mt. Gee type quartz crystals under short wave UV. Note that the center doesn't show any fluorescence (w.o.v.: 20cm). **(b)** Same as (a) under normal light. **(c)** Quartz vein sample from the research area under short wave UV. Note, that the core doesn't show as bright fluorescence colors as the rim (w.o.v.: 3cm). **(d)** Thin section from the sample of (c). **(e)** Supergene opal & cristobalit formation which showed the brightest fluorescence colors under short wave UV (w.o.v.: 15cm).*



Main fluorescence color under short-wave UV light was light-green, which could be seen in many of the different quartz samples, but not in all quartz layers (Fig 21a to d). That observation alone already suggests that fluorescence could be an interesting new method to distinguish between different quartz generations. After detailed studies we came to the conclusion that the opal sample showed the strongest fluorescence (Fig 21e). It is suggested by different sources that the light-green fluorescence colors under short-wave UV derive from the uranyl ion. Since there is evidence for higher uranium contents in the MPI it would be possible that the uranyl ion is included in fluid inclusions in the quartz layers. That led to the conclusion about the possibility to date the quartz formation. Since no detailed information about the amount of uranyl ions necessary to produce bright fluorescence colors like the ones that have been observed has been found, a XRF analysis has been carried out. A sample of the opal which showed the brightest fluorescence colors and one of the Mt. Gee quartz were analyzed. 600 ppm uranium was measured in the opal sample, but only 3-4 ppm in the quartz. The uranium content in the quartz sample was too low to conduct further investigation and a possible dating. The opal sample however almost reached ore grade. Since almost no lead was detected in the opal, a more supergene formation, similar to the secondary uranium minerals is suggested. However more detailed work is needed to confirm this.

Two other fluorescence colors showed up in the samples. First one was dark-violet and mainly showed up in the fluorite samples under long-wave UV. It has to be said, that fluorescence is common in fluorite minerals and therefore wasn't unexpected. Second was bright-orange in one carbonate sample under short-wave UV. Since fluorescence in calcite is not very common further search has been conducted about that. Similar fluorescence is mentioned in the carbonates of the Beltana Willemite deposit approximately 100 km to the west (Groves, et al. 2003). It is also described, that the carbonate showing that fluorescence contains much manganese and is referred as manganocalcite.

All samples showing fluorescence are summarized in appendix I as basis for further investigation.

8 DISCUSSION

8.1 PINK PEGMATITIC "GRANITE"

Although the Pink Pegmatitic "Granite" unit looks like common granite in the field, most of it may not be of igneous origin. Like in other parts of the Mt. Painter Inlier and the overlying Adelaidean, this might very well be feldspar impregnation caused by the massive fluid flow events in this area. In the field this hypothesis is obviously confirmed along fractures (Fig 7c). Fractures through Radium Creek Metamorphics often look like there was a fluid flowing through these fractures that replaced the host rock with feldspar. The color and appearance of that mineral is very similar to the Pink Pegmatitic "Granite" unit. These veins can show different appearance throughout the area. Some show a following quartz precipitation event in the core of the joints, some not. Evidence for that kind of alteration in the Adelaidean units can be found near Arkaroola Waterhole, Mt Neill Granite and Paralana Quartzite (Bons and Rößiger 2008)

It is thought that the potassium metasomatism leached other elements like Mg and Na simultaneously and therefore lead to intensive actinolite, scapolite and tremolite alteration in the overlying Adelaidean sediments (Elburg, et al. 2003). The iron which was probably leached as well, could in part have lead to the formation of magnetite in the breccia zones which was later on oxidized to hematite.

8.2 HEMATITE BRECCIA

Based on the observations from thin section and SEM analyses of the hematite breccia samples, it is suggested that there had to be some kind of oxidizing fluid which on the one hand oxidized the magnetite and probably also chalcopyrite to hematite but on the other hand it probably reduced another mineral. One suggestion was that the dissolved uranium got reduced and precipitated as primary uranium minerals. Later on these minerals were partly remobilized and precipitated as torbernite and autunite in higher levels.

Neither SEM nor reflected light work revealed any primary uranium mineral. Other work suggests that the primary mineralization is mainly composed of monazite and a solid solution between ishikawaite and Fe-rich samarskite (Brugger, et al. 2003). However, all monazites measured in this work were thorium dominated.

It was thought about a possible source of the uranium, and so far the observations are consistent with the model already mentioned in literature (Elburg, et al. 2003). From Paralana Hotsprings it is known that the outcropping granites there show exceptionally high uranium contents. This location is also the deepest structural outcrop of the Mt. Painter Inlier, which in general lies in the core of a big anticline (Yankaninna – Radium Ridge anticline). The anticline could have acted as focusing structure, while the granites acted as source of the uranium. So far all significant uranium deposits known in the MPI lie in the hinge zone of that anticline, which would support that theory.

Furthermore it was thought about a possible linkage to other breccia type deposits. Olympic Dam was suggested because it is a breccia type deposit as well which is situated in a granitic host rock. That would be similar to the breccias in the research area. However Olympic Dam contains not only elements like uranium and iron, it also contains gold, silver and a high amount of REE (Reeve, et al. 1990) which weren't observed in the Mt. Painter Inlier at all. Furthermore the formation age is quite different. While it is thought that Olympic Dam formed about 1590 Ma ago (Campbell, et al. 1998), the breccia zones in the mapping area are approximately 440 Ma old and probably associated with the diopside-titanite veins (Backer and Elburg 2006), which can be found south of the research area. The sandstone-hosted breccia deposits in the Athabasca Basin, northern Saskatchewan, Canada don't show any linkage to the Mt. Painter Inlier as well, since they show the same age as Olympic Dam. Furthermore it is thought that these two deposits are linked, since Australia and Canada were probably close to each other during time of formation (Lorilleux, et al. 2002). Although there might be a potential link to the Beltana Willimite deposit (Groves, et al. 2003). It is thought that this deposit is formed about 435 Ma ago, which would broadly be the same age as the breccia zones in the mapping area. A maganocarbonate is also described which shows strong orange fluorescence colors. One sample from the mapping area shows those colors as well, and since fluorescence is not in all common in carbonate rocks, both carbonates might have derived from the same fluid.

8.3 PEBBLE DYKE

Several processes were already suggested for the formation of this enigmatic dyke but none has been proven. One possible process would be a hydrothermal or tectonic breccia, which would indicate a similar formation process as the breccias in our area. Rounded clasts are possible if internal milling took place during the brecciation. But there are several observations that don't support this theory. First one is the matrix structure in thin-section. In every other breccia sample we analyzed in thin-section even the finest minerals were still recognizable. The Pebble Dyke has such a fine matrix that it couldn't be identified in thin-section. And the overall impression of the samples is not like the grains are cemented together by precipitation of minerals, more like they are cemented by very fine abraded material like in a tillite. Second observation that stands in conflict to a brecciation event is that the Pebble Dyke contains clasts, not only from the immediate surrounding units, but also from units that are only known from much further away. Normally a breccia wouldn't contain such kind of clasts except this unit would have been cut by the breccia somewhere at depth.

Second possible process to form such a dyke are deep fractures formed during glaciations and material from above filled those fractures (Preiss, pers. com.). It is known that such fractures are possible, since large cavities were found during the drilling program from Marathon Resources even at greater depth. A natural blowhole in the area was discovered by Reginald Sprigg. It somehow has to be connected to the plains in the east via underground tunnels, since the barometric pressure in the plains is a bit higher due to lower elevation levels. That forms a constant air flow through the underground system with an outlet in the mapping area. A similar system might have been developed during glaciation times. Tillite material from the glaciers and conglomerate material from melt water rivers got washed in or fell down from above and filled those cracks and tunnels. Best guess for the glaciation that formed the Pebble Dyke would be the Permian glaciation, since the Pebble Dyke has to be younger than all the breccias and lithologies in the area, but older than the Mt. Gee unit and veins. Because it is thought that the brecciations took place about 440 Ma and Mt. Gee developed around 210 Ma, the only glaciation available is in the Permian.

From analysis of the samples no hard evidence was found for that theory, only additional suggestions. But the fact that the Pebble Dyke separates the brecciation event and the formation of Mt. Gee alone is very valuable, since so far it was thought that both units formed at the same time. Now it is clear that both units formed from separate fluids and at different points in time, only the pathways the fluids used were possibly the same.

8.4 SEQUENCE OF EVENTS

Detailed mapping and classification of the various lithologies, as well as analyses of overprinting relationships in the field and in thin sections can be used to unravel the sequence of events (Fig 22).

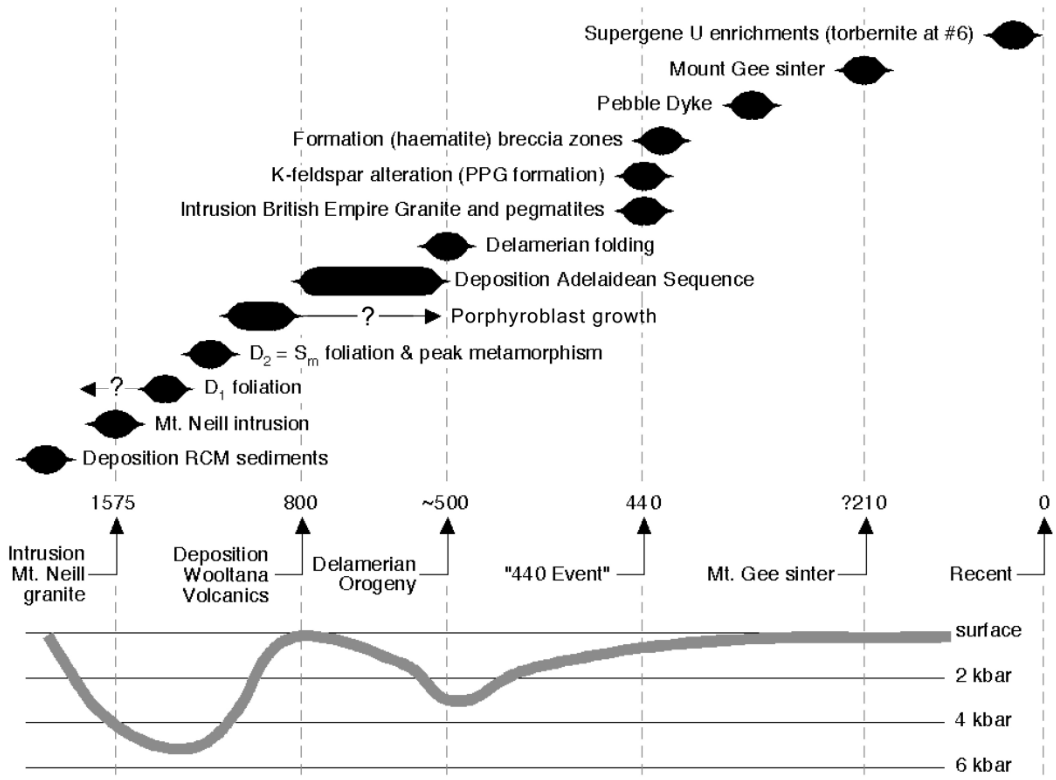


Fig 22 - Sequence of events in the mapping area and surrounding area, as well as a schematic graph of pressure the rocks experienced. (after Bons & Rößiger 2008)

9 CONCLUSIONS

Summarized the following main conclusions can be drawn from this research project.

- Magnetite and sulphides in the core of hematite crystals are evidence for an oxidizing fluid which possibly led to the precipitation of uranium.
- The Pebble Dyke clearly divides the formation of the breccia zones from the formation of Mt. Gee. Its age has been constrained to the Permian since the only possible glaciation is known during that time. However its glacial genesis is still not certain, but based on observations it is the most plausible model.
- The PPG unit is not a granite. In the field it looks like one, but observations suggest that it is derived from potassium metasomatism of other lithologies.
- Laumontite as former pinhole mineral has been identified.
- Porphyroblast growth in the BBS has been age constrained.
- Fluorescence in some Mt. Gee quartz has been discovered.

10 FURTHER QUESTIONS

Since this study is a regional overview of the area around Mt. Painter, not every detail could have been analyzed in detail. There are still open questions which need clarification in further work:

- Nature of the Black Biotite Schist and its relation to the amphibolites found in the area.
- The timing and setting of precipitation of the different minerals in the breccias. Relation of the different hematite generations.
- Origin of the brecciating fluids. Was it just one source and fluid that formed the whole breccia zones and precipitated the minerals or were there several?
- Tectonic process that triggered the 440 Ma event and the formation of Mt. Gee around 210 Ma.
- Detailed study on the focusing structures of the hematite breccias and source of the uranium.

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12 REFERENCES

Backer, Ronald J., and Marlina A. Elburg. "A magmatic-hydrothermal transition in Arkaroola (northern Flinders Ranges, South Australia): from diopside-titanite pegmatites to hematite-quartz growth." *Contrib Mineral Petrol*, 2006: 541-569.

Bons, Paul, and Jens Rößiger. *The Geology of the Mt. Gee area, Mount Painter Inlier, South Australia.* Mineralogy and Geodynamics, Institute for Geosciences, Tübingen: Eberhard-Karls University, 2008.

Brugger, J., S. Ansermet, and A. Pring. "Uranium minerals from Mt Painter, Northern Flinders ranges, South Australia." *Australian Journal of Mineralogy*, 2003: 15-31.

Campbell, I. H., D. M. Compston, J. P. Richards, J. P. Johnson, and A. J. R. Kent. "Review of the application of isotopic studies to the genesis of Cu-Au mineralisation at Olympic Dam and Au mineralisation at Porgera, the Tennant Creek district and Yilgarn Craton." *Australian Journal of Earth Sciences*, 1998, 48 ed.: 201 - 218.

Coats, R.P., and A.H. Blissett. *Regional and economic geology of the Mount Painter province.* Vol. 43. Adelaide: Department of Mines, Geological Survey of South Australia, 1971.

Drexel, J.G., W.V. Preiss, and A.J. Parker. *The geology of South Australia.* Vol. 54. Adelaide: Geological Survey of South Australia, 1993.

Elburg, M. A., P. D. Bons, J. Foden, and J. Brugger. "A newly defined lated Ordovician magmatic-thermal event in the Mt. Painter Province, northern Flinders Ranges, South Australia." *Australian Journal of Earth Sciences*, 2003: 611-631.

Elburg, M.A., P.D. Bons, J. Dougherty-Page, C.E. Janka, N. Neumann, and B. Schaefer. "Age and metasomatic alteration of the Mt. Neill Granite at Nooldoonooldoona Waterhole, Mt. Painter Inlier, South Australia." *Australian Journal of Earth Science*, 2001: 721-730.

Flöttmann, T., P. James, J. Rogers, and T. Johnson. "Early Paleozoic forland thrusting and basin reactivation at the palaeo-Pacific margin of the southeastern Australian Precambrian Craton: a reappraisal of the structural evolution of the southern Adelaide Fold Thrust Belt." *Tectonophysics*, 1994: 95-116.

Foden, John, Marlina A. Elburg, Jon Dougherty-Page, and Andrew Burtt. "The Timing and Duration of the Delamerian Orogeny: Correlation with the Ross Orogen and Implications for Gondwana Assembly." *The Journal of Geology*, 2006: 189-210.

Forster, J. R. "The Oodnadata Track." *Fluorescent Mineral Society*, 1996: 8-9.

Groves, I. M., C. E. Carman, and W. J. Dunlap. "Geology of the Beltana Willemite Deposit, Flinders Ranges, South Australia." *Economic Geology*, 2003: 797–818.

Johnson, David. *The geology of Australia.* Cambridge University Press, 2005.

Krinsley, D. H., und J. C. Doornkamp. *Atlas of quartz sand surface textures.* Cambridge: University Press, 1973.

Liou, J. G. "Stilbite-Laumontite Equilibrium." *Contributions to Mineralogy and Petrology*, 1971: 171--177.

Lorilleux, G., M. Jébrak, M. Cuney, and D. Baudemont. "Polyphase hydrothermal breccias associated with unconformity-related uranium mineralization (Canada): from fractal analysis to structural significance." *Journal of Structural Geology*, 2002, 24 ed.: 323-338.

Mildren, S., and M. Sandiford. "Heat refraction an dlow-pressure metamorphism in the northern Flinders Ranges, South Australia." *Australian Journal of Earth Sciences*, 1995, 53 ed.: 677-695.

Passchier, C.W., und R.A.J. Trouw. *Microtectonics.* Berlin: Springer, 2005.

Paul, E., T. Flöttmann, and M. Sandiford. "Structural geometry and controls on basement-involved." *Australian Journal of Earth Sciences*, 1999: 343–354.

Pidgeon, R.T. "Report on the U-Pb age of monazite samples 930, 931 and 932 (from the Mt. Painter area)." *South Australian Department of Mines and Energy Open File Envelope*, 1979.

Preiss, W.V. "The Adelaide Geosyncline: Late Proterozoic stratigraphy, sedimentation, palaeontology and tectonics." *Geological Survey of South Australia*, 1987: Bulletin 53.

Reeve, J.S., K.C. Cross, R.N. Smith, and N. Oreskes. *The Olymic Dam copper-uranium-gold-silver deposit, South Australia.* Vol. 14, in *Geology of the mineral deposits of Australia and Papua New Guinea*, by Hughes F.E., 1009-1035. Australasian Institute of Mining and Metallurgy, 1990.

Teale, G.S. "The occurrence of högbomite and taaffeite in a spinel-phlogopite schist from the Mount Painter Province of South Australia." *Mineralogical Magazine*, 1980, 43 ed.: 575-577.

Teale, G.S. *Mount Painter and Mount Babbage Inliers.* Vol. 1, in *The Geology of South Australia*, by J.F. Drexel, W.V. Preiss and Parker A.J., 93-100,149-156. 1993.

Veevers, J.J. "Australia in Pangea & Gondwanaland." In *Billion-year earth history of Australia and neighbours in Gondwanaland*, by J.J. Veevers, 9-11. Sydney: Gemoc Press, 2000.

Wilkins, A. *UV Systems.* 1999. http://uvsystems.com/articles/uvlightandfluorescentminerals.pdf (accessed 5 2008).

13 APPENDIX

I. SAMPLE TABLE

A list of all samples along with fluorescence description and a map of the thin section locations.

II. OUTCROP TABLE

A list of all outcrops with GPS data.

III. MAP

Lithological and structural map of the mapping area (MGA Zone 54, GDA94)

IV. CROSS SECTION

Along ^{034}0500E through the mapping area (MGA Zone 54, GDA94)

APPENDIX I

SAMPLE TABLE

sample	thin section	box	fluorescence	outcrop	geologist
10	t,c	4		10	JR
34				34	JR
68 a	t,c	4		68	JR
77		3		77	JR
110	t,c	4		110	JR
111	t,c	4			JR
131		3		131	JR
133 a	t,c	4	orange contact qtz/hem	133	JR
b		3			JR
135	t,c	4	lt green in qtz	135	JR
140	t,c	4		140	JR
150	t,c	4		160	JR
151		2		161	JR
153	t,c	4		163	JR
156		3		166	JR
157	t,c	4		167	JR
181				191	JR
186				196	JR
196 a	t,c	4		206	JR
b					JR
219 a	t,c	4	st green in crust	229	JR
b	t,c	4			JR
233	t,c	2	lt green in qtz	243	JR
234	t,c	4		244	JR
240	t,s	4		250	JR
266		3		266	JR
267	t,c	4	light in PPG?	267	JR
274	t,c	4		274	JR
277	t,c	4		277	JR
279		4		279	JR
280 a		4	(Paralana Hotsprings granite)	280	JR
b			(Paralana Hotsprings granite)	280	JR
283		4	(Paralana Hotsprings granite)	283	JR
284		2	(tillite from Stubs waterhole)	297	JR
DC1 MN95	t,c,r	4	bei 78m		
240 A		2		240	PDB
241		3		241	PDB
256	t,c	4		256	PDB
276		1		276	PDB
280 A	t,s	4		280	PDB
B		1			PDB
296		3		296	PDB
300		1		300	PDB
304 A	t,c	4	orange dots	304	PDB
B		1			PDB
320 A		1		320	PDB
B					PDB
C		1			PDB
D					PDB
E					PDB
338		1		338	PDB
340	t,c	4		340	PDB
345	t,c	4		345	PDB
350	t,c	4		350	PDB
361 A	t,c	4		361	PDB

sample	thin section	box	fluorescence	outcrop	geologist
B		1			PDB
362	t,c	4		362	PDB
364		1		364	PDB
369		3		369	PDB
391 A		1		391	PDB
B	t,c	4	orange calcite, green dots		PDB
C		1			PDB
395 A	t,c	4		395	PDB
B		1			PDB
397 A		1		397	PDB
B		1			PDB
C		1			PDB
400	t,c	2		400	PDB
402	t,c	4	green qtz, purple fluorite	402	PDB
413	t,c	4	green, 1st gen, 2nd not	413	PDB
430		1		430	PDB
436				436	PDB
443	t,c	4		443	PDB
452	t,c	4	green vein, purple stuff	452	PDB
458				458	PDB
459				459	PDB
462 A				462	PDB
B					PDB
480 A		1		480	PDB
B	t,c	4	green dots		PDB
C		1			PDB
504		2		504	PDB
523		3		523	PDB
525 A	r	4		525	PDB
B	t,s	4			PDB
526	t,s	4		526	PDB
527 A	r	4		527	PDB
B	t,s	4			PDB
532		3		532	PDB
536 A		2		536	PDB
B					PDB
C					PDB
545 A		2	green impregnation, green qtz bands	545	PDB
B	t,c	4			PDB
546 A		1	fluorite in vein core?	546	PDB
B		1			PDB
C	t,c	1,4			PDB
D	t,c	4			PDB
567	t,c	4	rim of the sapphirine	567	PDB
575 A		2		575	PDB
B		2			PDB
580 A	t,c	2,4		580	PDB
B		2			PDB
C		2			PDB
592		2		592	PDB
593		2		593	PDB
619	t,c	4	green + orange	619	PDB
631		1		631	PDB
643		1		643	PDB
646 A		1		646	PDB

sample	thin section	box	fluorescence	outcrop	geologist
B		1			PDB
C					PDB
651		2		651	PDB
661	t,c	2,4		661	PDB
676	t,c	4		676	PDB
682		3		682	PDB
687 A	t,c	4	lt green	687	PDB
B	t,c				PDB
689		3		689	PDB
711 A	t,c	4		711	PDB
B	t,c	4			PDB
C		3			PDB
714		2		714	PDB
716				716	PDB
721	t,c	4		721	PDB
723	t,c	4	green	723	PDB
724	t,c	4	st green	724	PDB
725	t,c	4	green	725	PDB
746	t,c	4		746	PDB
749	t,c			749	PDB
786	t,c	4		786	PDB
788		1		788	PDB
789		1		789	PDB
791				791	PDB
793	t,c	4		793	PDB
794		1		794	PDB
796	t,c	4		796	PDB
802 A	t,c	4		802	PDB
B	t,c				PDB
C		1			PDB
D		1			PDB
E		1			PDB
809	t,c	4		809	PDB
863		3		863	PDB
875 A		3		875	PDB
B					PDB
876		3		876	PDB
890		3		890	PDB
891		3		891	PDB
893 A		1		893	PDB
B		1			PDB

Shortcuts:

t = thin secion
r = reflected light section
c = counterpart (from thin section making)
s = SEM sample

APPENDIX II

OUTCROP TABLE

outcrop	geologist	easting	northing	elevation	date	photos	sample	rocktype	description PPG=pink pegmatitic granite, RCM=radium creek metamorphics, GEE=Mt. Gee Quarz, MNG=Mt Neil granite, BBS=black biotite shist, CON=Boundary/contact, HBR=hematitic breccia, GBR=granitic breccia, SBR=sedimentary breccia, MBR=mixed breccia, QTZ=quartzite, FLU=flourite, PEB=pebble dyke, UNK=unknown, UNC=unclear.
0	JR	0339616	6654325	426	22.10.2007			REF	Watertank Mt Painter Camp
0	JR	0339614	6654326	423	22.10.2007			REF	Watertank Mt Painter Camp
1	JR	0339643	6654404	421	22.10.2007	167,168		RCM	Radium Creek Metamorphics on the track north of the camp
2	JR	0340398	6654867	581	22.10.2007	175		CON	Contact between Mt Gee and the Stuff below
3	JR	0340387	6654872	582	22.10.2007			PPG	Pink pegmatitic granite (PPG)
4	JR	0340375	6654873	569	22.10.2007			RCM	shists just next to the granite
5	JR	0340349	6654861	571	22.10.2007			QFC	shearzone in a granite
6	JR	0340336	6654864	573	22.10.2007			PPG	less deformed zones in a PPG granite
7	JR	0340326	6654877	557	22.10.2007			BBS	could be related to the corundum shist, some blasts in it
8	JR	0340290	6654910	528	22.10.2007			BBS	bt shist with foliation and crenulation
9	JR	0340267	6654911	526	22.10.2007	187		PPG	PPG blob surrounded by BBS
	JR	0340702	6655291	532	23.10.2007			FLU	flourite vein
	JR	0340678	6655291	520	23.10.2007			FLU	flourite vein (more accurate)
	JR	0340845	6655291	486	23.10.2007			PEB	peppble dyke
	JR	0353353	6665363	257	24.10.2007			GRD	Grabbro oder Granodiorite at Parlana Hotsprings up the creek
10	JR	0340766	6654695	472	25.10.2007	060-072		MGU	Waterfall
11	JR	0340811	6654711	456	25.10.2007			CON	contact between Mt Gee and the Stuff east to it
12	JR				25.10.2007			QFC	harnish planes, which side moved up?
13	JR	0340955	6654756	479	25.10.2007			MBR	brecciated stuff
14	JR	0340920	6654826	478	25.10.2007			QZV	quartz vein surrounded by PPG
15	JR	0340909	6654858	468	25.10.2007	076		GBR	PPG breccia band ~10m wide
16	JR	0340946	6654971	464	25.10.2007			PPG	mostly PPG less brecciated
17	JR	0340943	6654983	474	25.10.2007			BBS	BBS with strong crenulation, mixed with PPG
17	JR	0340944	6654982	469	25.10.2007			BBS	
18	JR	0340986	6655170	481	25.10.2007			MBR	different suff, seems to be mostly altered sediments and brecciated PPG
19	JR	0340909	6655257	465	25.10.2007			BBS	fine grained BBS in Metasediments
20	JR	0340924	6655262	490	25.10.2007			PEB	pebble dyke in the creek of Mt Gee east
21	JR	0340971	6655421	496	25.10.2007			GBR	brecciated granite
21	JR	0340997	6655453	482	25.10.2007	086,087		MGU	brecciated PPG only due to Mt Gee quartz
22	JR	0341029	6655516	497	25.10.2007	088		PPG	paler PPG, bigger qtz and fld crystals
23	JR	0341075	6655497	497	25.10.2007			MGU	like outcrop 21, but the PPG clasts are paler
23	JR	0341080	6655497	480	25.10.2007	089		PPG	like 22, in between the breccia von 23
24	JR	0341106	6655547	494	25.10.2007	091,092		QZV	vein, one direction growth, cracked up in the middle and clear qtz percipitated
25	JR	0339840	6653943	418	26.10.2007	094		BBS	BBS and QTZ layer, dextral sos?
26	JR	0339876	6653942	431	26.10.2007			PPG	NE end of the PPG blob
26	JR	0339869	6653932	426	26.10.2007			PPG	SW end of the PPG blob
27	JR	0339925	6653926	423	26.10.2007			BBS	other layers seem to follow the BBS layer
28	JR	0339966	6653923	441	26.10.2007			UNC	
29	JR	0340034	6653918	463	26.10.2007			RCM	in the south more or less the same dip
30	JR	0340026	6653960	479	26.10.2007			BBS	almost no change in dip from WP29 by walking along contour lines
31	JR	0339957	6653964	441	26.10.2007			BBS	
32	JR	0339410	6653974	422	26.10.2007			BBS	about the end of the BBS layer in the creek.
33	JR	0339879	6653937	411	26.10.2007			RCM	layers seem to have bound around, quartzitic layer
34	JR	0339842	6654015	400	26.10.2007		34	BBS	
35	JR	0339796	6653999	396	26.10.2007			BBS	on the northern end of the PPG blob, no real foliation visible
36	JR	0339785	6654021	407	26.10.2007			PPG	south end
36	JR	0339782	6654059	408	26.10.2007			PPG	north end

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37	JR	0339791	6654086	402	26.10.2007			RCM	also Lm
38	JR	0339780	6654114	423	26.10.2007			RCM	also Lm and crenulation
39	JR	0339801	6654142	441	26.10.2007	102		RCM	also crenulation with vergence north
40	JR	0339801	6654151	430	26.10.2007			PPG	~20-30° to the south
41	JR	0339955	6654278	471	26.10.2007			RCM	also streching lineation?
	JR	0339843	6653940	411	26.10.2007			UNK	
	JR	0339873	6653931	418	26.10.2007			UNK	
42	JR	0340358	6653986	420	27.10.2007	116,118,119		PPG	with shear bands, could be sinistral, no real lineation visible.
43	JR	0340314	6653930	416	27.10.2007			RCM	different dips here, could be start of brecciation
44	JR	0340259	6653881	401	27.10.2007	120		RCM	sinistral? Because of some clasts, but vague
45	JR	0340151	6653900	426	27.10.2007			RCM	together with quartzite
46	JR	0340170	6653877	457	27.10.2007	121		QTZ	more quartzitic RCM
47	JR	0340146	6653907	461	27.10.2007			RCM	
48	JR	0340124	6653953	482	27.10.2007	122		RCM	quartzitic with Mt. Gee
49	JR	0340105	6654028	489	27.10.2007	123		CON	contact between HBR and RCM
50	JR	0340111	6654040	491	27.10.2007			RCM	
51	JR	0340082	6654067	494	27.10.2007			RCM	with qtz veins, possible lineation
52	JR	0340156	6654119	495	27.10.2007			PPG	brecciated from the track to the west, fault breccia?
53	JR	0340129	6654194	503	27.10.2007			BBS	quartzitic BBS layer? Brecciated here and there
54	JR	0340181	6654147	490	27.10.2007			QTZ	quartzitic layer just below the granite WP52
55	JR	0340191	6654137	447	27.10.2007	126		CON	between QTZ breccia and PPG (stronly altered) - GPS unsure
		0340057	6654159	502	27.10.2007			UNK	
	JR	0340210	6654145	472	27.10.2007			UNK	
56	JR	0340296	6655419	479	28.10.2007	128-130		CON	Mt Gee suddenly stops. Maybe fault zone. Different dips
57	JR	0340280	6655384	583	28.10.2007	169		MGU	looking NW might be an anticline in radium ridge.
58	JR	0340365	6655471	642	28.10.2007	170		PPG	Mt Gee seems to follow structures in the original rock
59	JR	0340320	6655579	673	28.10.2007			PPG	could be foliation in a PPG granite, banding
60	JR	0340292	6655588	670	28.10.2007		paul	PPG	shearzones in the PPG, different orientations.
61	JR	0340203	6655569	671	28.10.2007			HBR	the HBR seems to lie on top of the granite. Way more brecciated host rock around the breccia.
62	JR	0340086	6655650	699	28.10.2007			QFC	main foliation on top of radium creek.
63	JR	0339914	6655593	686	28.10.2007			HBR	HBR and GBR around it.
64	JR	0339827	6655575	673	28.10.2007	paul	paul	GBR	associated with baryte, blady overgrowth
65	JR	0339751	6655561	684	28.10.2007			QFC	HBR seems to stop here, banding planes visible in the granite
66	JR	0339737	6655514	671	28.10.2007			BBS	granite seems to stop right below radium ridge, BBS pops in.
67	JR	0340924	6655262	490	29.10.2007	189-191,193,194		PEB	pebble dyke in the creek, the granite around it dosen't seem to be affected.
68	JR	0340845	6655291	486	29.10.2007	195	68a	PEB	dug out by the Sprigg family
68	JR	0340846	6655295	488	29.10.2007			PEB	
68	JR	0340858	6655293	489	29.10.2007			PEB	
69	JR	0340745	6655333	499	29.10.2007			PEB	in the creek, but not a very clear outcrop
70	JR	0340782	6655269	501	29.10.2007			PEB	small pieces of pebble dyke
71	JR	0340678	6655291	520	29.10.2007			FLU	vein of fluorite, mostly PPG gravel around.
72	JR	0340592	6655341	532	29.10.2007			PPG	foliated PPG or brecciated with HBR?
73	JR				29.10.2007	201		PPG	PPG with little hematite content
74	JR				29.10.2007	202		HBR	only very little hematite content
75	JR	0340577	6655362	539	29.10.2007	203		PEB	two pieces in the field, no green matrix anymore, more pinkish.
76	JR	0340560	6655253	564	29.10.2007	204		GBR	quartz has also been brecciated
77	JR	0340434	6655341	612	29.10.2007	206	77	PEB	Pebble dyke on the track, about 3m wide, strike ~280

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77	JR	0340487	6655326	582	29.10.2007			PEB	follow up outcrops on the way down
77	JR	0340501	6655335	575	29.10.2007			PEB	follow up outcrops on the way down
77	JR	0340512	6655336	575	29.10.2007			PEB	(follow up outcrops on the way down)
77	JR	0340532	6655323	576	29.10.2007			PEB	follow up outcrops on the way down
77	JR	0340666	6655337	525	29.10.2007			PEB	follow up outcrops on the way down
78	JR				29.10.2007			QFC	deformed granite, dosn't look brecciated, but GEE veins and older qtz veins.
	JR	0340828	6655290	483	29.10.2007			UNK	
79	JR	0339937	6655087	484	30.10.2007			RCM	foliation a bit odd
80	JR	0339933	6655105	495	30.10.2007		paul	RCM	foliation with 2 crenulations on it. Turmalines that don't disturb the foliation.
81	JR	0339879	6655006	509	30.10.2007	217		CON	contact between granite and RCM, looks like dextral SOS
82	JR	0339922	6654918	502	30.10.2007	218,219	paul	QFC	compared to WP81 it looks sinistral here…, looking east at pic 219
83	JR	0339949	6654895	494	30.10.2007			QFC	~5m QTZ blob and sediments next to the granite
84	JR	0339918	6654842	509	30.10.2007			QFC	foliated granite that may form an anticline here… pegmatitic veins inside
85	JR	0339949	6654790	490	30.10.2007			QFC	more steep foliations here, might be after the anticline? -> foliation measured in the RCMs?
86	JR	0339929	6654695	511	30.10.2007			RCM	pegmatitic veins inside the sediments. Strongly sheared
87	JR	0339946	6654646	504	30.10.2007			PPG	also some even more pegmatitic stuff
88	JR	0341129	6655192		01.11.2007			RCM	crenulated RCMs in the little creek, fluorite around.
89	JR	0341205	6655245		01.11.2007	368-370		GBR	brecciation without the hematite, only little Mt Gee impregnation. (shearplane)
90	JR	0341217	6655297	476	01.11.2007			RCM	looks like impregnation of granite along veins
91	JR	0341371	6655187	523	01.11.2007	371		PPG	pic to the east, PPG Band down the hill, BBS band where more vegetation is?
92	JR	0341360	6655250	511	01.11.2007	372	P350	PEB	thin pebble dyke that kincks (more orientations)
93	JR	0341368	6655243	514	01.11.2007			RCM	
94	JR	0341409	6655313	546	01.11.2007			RCM	BBS rich here
95	JR	0341391	6655284	546	01.11.2007			RCM	altered RCM with feldspar impregnation along veins
96	JR	0341418	6655356	531	01.11.2007			RCM	could also be MNG
97	JR				01.11.2007			QFC	
98	JR	0341370	6655305	508	01.11.2007			UNC	faultzone?
99	JR	0341271	6655327	521	01.11.2007			PPG	brecciated PPG, without HBR, but some Mt Gee
100	JR	0339551	6654293	414	02.11.2007	375		BBS	BBS with some PPG impregnation behind the shed
101	JR				02.11.2007	376		RCM	elongated qtz crystalls, lineation
102	JR	0339601	6654423	434	03.11.2007			RCM	greatly disturbed Metasediments, Sm not sure…
103	JR	0339584	6654569	466	03.11.2007	386		RCM	granitic dyke that looks like it has been intruded by a more PPG like fluid… also brecciated stuff and Mt Gee --> transfered to RCM after outcrop
104	JR	0339638	6654631	489	03.11.2007			RCM	clear RCMs, but strange orientation, lineation and vague sinistral SOS
105	JR	0339598	6654707	492	03.11.2007			QFC	layered granite with thick qtz veins, alteration along cracks.
106	JR	0339614	6654774	546	03.11.2007			RCM	even BBS at some points.
107	JR				03.11.2007	389		QTZ	quartzitic layer with some feldspar, might have been PPG
108	JR	0339678	6654817	534	03.11.2007			RCM	impregnation along fractures, crenulation available
109	JR	0339666	6655064	564	03.11.2007			BBS	well foliated BBS, some old qtz veins, brecciated PPG aside?
110	JR	0339643	6655207	557	03.11.2007	390		HBR	looking west, looks like a band of hematite breccia with this 3 blobs and a thick band on the other side of the vally
111	JR	0339706	6655289	594	03.11.2007			RCM	with BBS layers
112	JR	0339687	6655145	582	03.11.2007			PPG	sheared, layerd looking PPG
113	JR	0339854	6655282	544	03.11.2007			MBR	seems to be a layered breccia (fault zone), could also be RCMs --> addition after outcrop 125
114	JR	0339855	6655084	535	03.11.2007			BBS	strongly altered BBS, crenulations
115	JR	0339742	6655060	561	03.11.2007			QTZ	metamorphic overprinted quartzite
116	JR	0339730	6655032	560	03.11.2007			BBS	thin BBS layer, very dark, big turmalines
117	JR	0339744	6654875	523	03.11.2007			QFC	layered granite
118	JR	0339773	6654836	518	03.11.2007			BBS	

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119	JR				04.11.2007			RCM	quarzitic with some Mt Gee veins
120	JR	0340099	6655402	547	04.11.2007	401		PEB	sedimentary looking sandstone with "veins" of granite in it about 2m wide, strikes 080
121	JR				04.11.2007	402,403		RCM	heavily altered sediments, also bleached out
122	JR	0340022	6655428	560	04.11.2007			QFC	the more brecciated the steeper the zone seems to be… (shear planes)
123	JR	0339945	6655448	600	04.11.2007	410		CON	contact between sediments and granites, foliation from the sediments.
124	JR				04.11.2007			RCM	quarzitic metasediments here.
125	JR	0339904	6655286	539	04.11.2007	411,412		RCM	very altered and bleached out sediments in the creek.
126	JR				04.11.2007			HBR	pieces of HBR, south of it more quartzitic stuff.
127	JR	0339747	6655349	603	04.11.2007			MBR	broken up on the large scale --> many different orientations around here
128	JR	0340337	6655427	598	05.11.2007	442		MGU	big boulders from the top, fracture seem to follow Mt Gee.
129	JR	0340301	6655346	581	05.11.2007	443,444,446		CON	contact between Mt. Gee and below, sheared?
130	JR	0340322	6655347	577	05.11.2007	447,448-452		CON	contact between the pebble dyke and Mt. Gee
131	JR	0340342	6655338	594	05.11.2007	453,456,458-4	131	CON	still pebble dyke, looks like the Mt. Gee unit has moved. Zone of the pebble dyke seems to cut through Mt Gee
132	JR	0340394	6655308	605	05.11.2007			CON	contact of Mt Gee looks rather brecciated here
133	JR	0340429	6655159	589	05.11.2007	461-463	133a,b	MBR	strange breccia around. Looks like everything, even Mt Gee, has been broken up again in a very brittle stage.
134	JR	0340430	6655201	571	05.11.2007	464,465		CON	right below Mt. Gee --> brecciated stuff with hematite alteration.
135	JR	0340448	6655122	595	05.11.2007	466	135	CON	brecciated contact, but same direction
136	JR	0340452	6655080	594	05.11.2007	467		HBR	HBR between two layers of GEE?
137	JR	0340438	6655045	608	05.11.2007			HBR	some HBR right above the boomerang. Different look than from WP136
138	JR	0340408	6654948	594	05.11.2007	473,474		HBR	above the boomerang is granite --> rather steep than shallow structure?
139	JR	0340453	6654961	599	05.11.2007	475		HBR	strange anticlynal structure made of HBR
140	JR	0340458	6654876	628	05.11.2007		140	MGU	breccia inside Mt. Gee
141	JR	0340456	6654928	614	05.11.2007	476		HBR	faultzone in Mt. Gee made of HBR?
142	JR	0340409	6654883	605	05.11.2007	477		MGU	some theories about fault zones releated to Mt. Gee
143	JR	0340400	6654884	583	05.11.2007			CON	granite underlying Mt. Gee
144	JR	0340455	6654807	608	05.11.2007	480		CON	granite underneath Mt. Gee, small breccia zone in between
145	JR	0340480	6654717	591	05.11.2007			PPG	granite on top of Mt. Gee
146	JR				05.11.2007	488		HBR	hematitic sill?
147	JR	0340847	6654642	515	06.11.2007	498-502		QFC	view on Mt. Gee from the south 2nd viewpoint.
148	JR	0340712	6654889	551	06.11.2007	506,507		MGU	brecciated GEE stuff, small GEE veins even after the brecciation
149	JR	0340618	6654896	576	06.11.2007	508		GBR	granite breccia on top of Mt. Gee without any hematite
150	JR	0340521	6654990	605	06.11.2007	511-513		GEE	breccias lying around, big boulders of hematite stuff on top of Mt. Gee
151	JR	0340485	6654985	601	06.11.2007	514-516,520		MGU	strange rocks on top of Mt. Gee. Needle like, sinter hematite. 520-> Mt. Gee looks steeper here than tought
152	JR				06.11.2007	529		MGU	again it looks like a thrust like movement
153	JR				06.11.2007			MGU	different models on Mt. Gee
154	JR	0340986	6654666	493	06.11.2007			QFC	foliated granite with PPG veins… --> unsure measurement
155	JR	0340991	6654596	509	06.11.2007			RCM	mostly RCMs with a few small blobs of PPG
156	JR	0340965	6654546	523	06.11.2007			BBS	BBS layer between the granites.
		0336045	6649879	401	07.11.2007			BBS	corundum shist?
157	JR	0340722	6655549	521	10.11.2007	725		MBR	mixed breccia, or slump? Different types
158	JR	0340756	6655654	559	10.11.2007			PPG	
159	JR	0340708	6655753	606	10.11.2007	727-731		PPG	fracture plane, strange looking
160	JR	0340674	6655724	592	10.11.2007	732,733	150	PPG	shear zones and fractures in the granite, alteration along fractures
161	JR	0340477	6655630	608	10.11.2007			QFC	looks a bit like Mt. Gee in outcrop, but granite
162	JR	0340628	6655599	578	10.11.2007	735		QFC	altered granite, white bleached, normal vein alteration, looks a bit more quarzitic here
163	JR	0340495	6655475	555	10.11.2007		153	QFC	altered granite, "breccia zone" parallel to the track
164	JR	0340374	6655580	662	10.11.2007	738		QFC	not brecciated more the impression of pressure release fractures

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165	JR	0340393	6655637	652	10.11.2007	752-755		GBR	very well foliated breccia on top of radium ridge
166	JR	0340954	6655693	657	10.11.2007		156	HBR	Mt. Gee in the MNG, HBR after the Mt. Gee. Mt. Gee more common higher up
167	JR	0340494	6655721	639	10.11.2007		157	RCM	small band of metasediments together with hematite in the granite
	JR	0340657	6655717	613	10.11.2007	733		QFC	probably the strange granite dam
	JR	0340763	6655707	576	10.11.2007			QFC	rounded boulder on radium ridge? --> pebble dyke?
168	JR	0340448	6654311	421	11.11.2007			QFC	partly broken up MNG on the entrance to the creek bed
169	JR	0340484	6654333	415	11.11.2007	792		RCM	boulder in the creek bed shows the transformation of RCMs into PPG…
170	JR				11.11.2007			RCM	RCMs above the MNGs from WP158
171	JR	0340543	6654331	416	11.11.2007			BBS	also some brecciation in the RCM band
172	JR	0340475	6654351	420	11.11.2007			BBS	almost migmatitic looking BBS, the stuff above more granitic
173	JR	0340581	6654438	468	11.11.2007			PPG	granite, intact, impregnated here and there. Some old qtz veins.
174	JR				11.11.2007			RCM	sediments that look more in place here, further away from the creek. Dextral, sigma clasts
175	JR	0340676	6654449	451	11.11.2007			SBR	brecciated RCMs, seem to follow the creek, overlein by granites
176	JR				11.11.2007			MGU	looking towards the Mt. Gee, there are at least veins before the main Mt. Gee starts
177	JR	0340826	6654595	504	11.11.2007			RCM	sediments with vague foliation, more quarzitic, almost orthogneissic…
178	JR	0340828	6654580	500	11.11.2007			BBS	also crenulation
179	JR	0340881	6654483	486	11.11.2007			RCM	
180	JR	0340898	6654472	493	11.11.2007			BBS	
181	JR	0340897	6654415	474	11.11.2007			RCM	
182	JR	0340946	6654256	440	11.11.2007			MBR	breccia band in the creek south of the track, seems to be offseted here
183	JR	0340939	6654236	445	11.11.2007			BBS	
184	JR	0340972	6654185	515	11.11.2007			BBS	also crenulation
185	JR	0341035	6654141	501	11.11.2007			RCM	broad layer
186	JR	0341112	6654131	503	11.11.2007			QFC	layered granite, some Mt. Gee veins through.
187	JR				11.11.2007			RCM	migmatitic, some layers already startet to melt
188	JR	0341152	6654172	544	11.11.2007			RCM	migmatitic, molten up parts look like PPG impregnation
189	JR	0341255	6654301	549	11.11.2007			QFC	foliated granite
190	JR	0340981	6654451	501	11.11.2007			BBS	start of the sediments by going north
191	JR	0340979	6654515	529	11.11.2007	797,798	181	MGU	GEE with HBR, another mineral overgrowing the GEE
192	JR	0340477	6654167	430	12.11.2007	801		PPG	pale colour, pegmatitic, broken up at some points.
193	JR	0340504	6654215	438	12.11.2007			QFC	foliated granite, intruded along fractures into the sediments
194	JR	0340489	6654284	432	12.11.2007			RCM	with BBS, lineation & crenulation not really measureable
195	JR	0340625	6654309	428	12.11.2007			RCM	
196	JR	0340573	6654172	439	12.11.2007		186	GEE	Mt. Gee right next to PPG. GEE overgrowing PPG?
197	JR	0340637	6654130	428	12.11.2007			RCM	sediments, strongly foliated
198	JR	0340721	6654070	437	12.11.2007			RCM	well foliated, also BBS, fibrolite linieation
199	JR	0340722	6654105	465	12.11.2007	802		QTZ	quartzitic band going up the hill, connect with the PPG?
200	JR	0340747	6654199	487	12.11.2007			QFC	foliated granite --> imgregnated RCMs?
201	JR	0340824	6654153	494	12.11.2007	803,804		RCM	transition between RCM and MNG??? Or begin of brecciation?
202	JR	0340849	6654090	506	12.11.2007			BBS	to the north mostly granite, turmaline blobs in the BBS
203	JR	0341026	6654064	519	12.11.2007			BBS	BBS layer next to an quartzitic layer
204	JR	0340916	6654012	540	12.11.2007	807		RCM	the striking of the whole ant crest is the same, layers dip once more to the south once more to the east.
205	JR	0340884	6653992	534	12.11.2007	806		RCM	isoclinal fold
206	JR	0340860	6653963	529	12.11.2007	808,809	196a,b	RCM	impregnation along fractures: qtz->fld->qtz
207	JR	0340793	6653963	513	12.11.2007	811,812		RCM	RCMs, with older qtz veins. Also MBR around (812)
208	JR	0340749	6654016	481	12.11.2007			RCM	like everywhere along the slope, patches that look a bit more like PPG --> impregnation?
209	JR	0340613	6653950	469	12.11.2007			QTZ	quartzitic overprinted RCMs

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210	JR	0340567	6653961	457	12.11.2007			RCM	
211	JR	0340525	6654005	472	12.11.2007			QTZ	
212	JR	0340472	6654000	438	12.11.2007			RCM	
213	JR	0340333	6653908	398	12.11.2007	814		RCM	clast that show sinistral or dextral movment. Pen to the west.
214	JR	0340226	6653941	434	12.11.2007			RCM	deformed and slightly brecciated
215	JR	0340150	6653980	463	12.11.2007	819		QTZ	RCMs with QTZ overprint
216	JR	0340316	6654261	437	12.11.2007			RCM	fault is really a fault? Because also RCMs here, no granites.
U1	JR	0340929	6655188	486	13.11.2007			RAY	sediments on the track
U10	JR	0340905	6655146	485	13.11.2007			RAY	
U11	JR	0340937	6655108	486	13.11.2007			RAY	
U12	JR	0340943	6655091	480	13.11.2007			RAY	
U13	JR	0340970	6655185	485	13.11.2007			RAY	
U14	JR	0341029	6655204	484	13.11.2007			RAY	
U15	JR	0341039	6655187	485	13.11.2007			RAY	
U16	JR	0341039	6655218	490	13.11.2007			RAY	
U17	JR	0341032	6655250	488	13.11.2007			RAY	
U18	JR	0340957	6655270	491	13.11.2007			RAY	
U19	JR	0340794	6655363	505	13.11.2007			RAY	
U2	JR	0340908	6655204	487	13.11.2007			RAY	chloritic alteration
U20	JR	0340736	6655230	503	13.11.2007			RAY	
U21	JR	0340664	6655259	521	13.11.2007			RAY	
U22	JR	0340636	6655259	528	13.11.2007			RAY	
U23	JR	0340610	6655198	526	13.11.2007			RAY	
U24	JR	0340572	6655071	546	13.11.2007			RAY	
U25	JR	0340519	6655164	564	13.11.2007			RAY	
U26	JR	0340522	6655268	582	13.11.2007			RAY	
U27	JR	0340487	6655292	594	13.11.2007			RAY	
U28	JR	0340416	6655389	598	13.11.2007			RAY	
U29	JR	0340384	6655354	614	13.11.2007			RAY	
U3	JR	0340902	6655266	482	13.11.2007			RAY	creek crossing -> sediments
U30	JR	0340358	6655415	625	13.11.2007			RAY	
U31	JR	0340362	6655445	638	13.11.2007			RAY	in granite
U32	JR	0340364	6655453	636	13.11.2007			RAY	granite? Fault zone? No hematite…
U33	JR	0340344	6655456	617	13.11.2007			RAY	
U34	JR	0340381	6655468	615	13.11.2007			RAY	
U35	JR	0340288	6655467	626	13.11.2007			RAY	
U36	JR	0340366	6655496	642	13.11.2007			RAY	
U37	JR	0340359	6655532	651	13.11.2007			RAY	
U38	JR	0340327	6655579	667	13.11.2007			RAY	
U39	JR	0340313	6655584	673	13.11.2007			RAY	
U4	JR	0340888	6655301	487	13.11.2007			RAY	on the patch
U40	JR	0340413	6655675	671	13.11.2007			RAY	
U41	JR	0340609	6655663		13.11.2007			RAY	
U42	JR	0340674	6655451	525	13.11.2007			RAY	
U43	JR	0340648	6655476	521	13.11.2007			RAY	
U44	JR	0340528	6655490	520	13.11.2007			RAY	
U45	JR	0340530	6655433	531	13.11.2007			RAY	

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U5	JR	0340910	6655332	490	13.11.2007			RAY	on the old track
U6	JR	0340854	6655214	499	13.11.2007			RAY	
U7	JR	0340823	6655194	497	13.11.2007			RAY	the "higher" readings seem to follot the rocks on the ground
U8	JR	0340835	6655157	494	13.11.2007			RAY	
U9	JR	0340862	6655129	489	13.11.2007			RAY	
217	JR	0340226	6654070	463	14.11.2007			BBS	BBS layers between granite blobs? Could have any orientation
218	JR				14.11.2007			RCM	impregnated sediments
219	JR	0340128	6653894	464	14.11.2007	830-834		QTZ	looking from #6 east
220	JR	0340638	6653918	464	14.11.2007	836		QTZ	pic
221	JR	0340493	6653849	440	14.11.2007			RCM	granitic impregnation in the sediments
222	JR	0340757	6654022	478	14.11.2007			RCM	probaply the fold axis cleavage, could also be Sm
223	JR	0342169	6655376	529	15.11.2007	848		BBC	RCM with BBS, also crenulation visible in the BBS
224	JR	0342167	6655351	519	15.11.2007			QTZ	fortified RCMs, also Mt. Gee inside
225	JR	0342205	6655350	520	15.11.2007			RCM	altered sediments, Mt Gee impregnation looks a bit broken up
226	JR				15.11.2007			RCM	dip is variable
227	JR				15.11.2007			QTZ	quartzitic layer with some Mt. Gee
228	JR	0342192	6655432	551	15.11.2007			QFC	here it looks more like an MNG, no QTZ anymore. Completely transformed?
229	JR	0342249	6655537	564	15.11.2007	849-853	219a,b,paul	CON	contact between altered granites and L-tectonite of MNG
230	JR				15.11.2007			RCM	
231	JR	0342142	6655437	527	15.11.2007			QFC	foliated granite
232	JR	0342134	6655437	524	15.11.2007			CON	between PPG and MNG
233	JR	0342073	6655472	556	15.11.2007			BBS	big patch of BBS, porphyroblasts of corundum...
234	JR	0342056	6655486	591	15.11.2007			MGU	Mt. Gee breccia with feldspatic patches
235	JR	0342041	6655517	567	15.11.2007			QFC	foliated granite
236	JR	0341906	6655596	618	15.11.2007			QTZ	a more quartzitic band, but consists of old qtz, not really GEE type. It is below the Gee breccia.
237	JR	0341916	6655549	310	15.11.2007			BBS	a more biotitic layer within the granite, orientatin ? Could just be a clast.
238	JR	0341938	6655457	585	15.11.2007			PPG	quiet pegmatitic, with large crystals. Also a few sediment pieces
239	JR	0341929	6655407	576	15.11.2007	865		FLU	a fluorite vein, seems to be a larger amount of fluorite.
240	JR	0342024	6655442	562	15.11.2007			QFC	foliated granite to the south of the brecciated band in the valley.
241	JR	0342032	6655443	555	15.11.2007			RCM	variation in foliation... This one seems to be most clear of all.
242	JR	0341981	6655399	552	15.11.2007			RCM	alsmost a bit migmatitic
243	JR	0341895	6655399	558	15.11.2007		233	QZV	strange bubble like qtz like it can be found around Mt. Painter
244	JR	0341911	6655312	317	15.11.2007		234	RCM	sediments with GEE veins and also feldpatic alteration.
245	JR				15.11.2007			QTZ	sediments, but more quartzitic here, less GEE.
246	JR	0340159	6654020	464	17.11.2007			BBS	the BBS layer below the quartzitic one, hinge of the syncline?
247	JR	0340115	6653875	479	17.11.2007			QTZ	impregnated sediments, almost looks like on the other side of the track
248	JR	0340185	6654227	491	17.11.2007			PPG	more quartzitic looking PPG
249	JR	0340073	6654066	481	17.11.2007			RCM	quartzitic RCM, also some biotite
250	JR	0339989	6654022	462	17.11.2007	903,904	240	HBR	hematitic rocks with clasts of feldspar.
251	JR	0339965	6653975	442	17.11.2007			RCM	partly biotite bearing, in other places more quartzitic, granitic
252	JR	0339801	6653762	452	17.11.2007	911		RCM	migmatitic layers, strike 344-350
253	JR	0339741	6653744	482	17.11.2007	912-916		QTZ	the rest of that layer could be the upper quartzitic layer. It looks a bit more granitic tough
254	JR	0339668	6653800	481	17.11.2007			QTZ	
255	JR	0339613	6654460	420	23.11.2007			CON	between RCM&PPG
256	JR	0339613	6654496	446	23.11.2007			CON	PPG&RCM up the hill
257	JR	0339698	6654522	456	23.11.2007			BBS	
258	JR	0339619	6654537	464	23.11.2007			RCM	quartzitic also lineation

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258	JR	0339621	6654587	470	23.11.2007			RCM	same as above
259	JR	0339684	6654604	475	23.11.2007			CON	PPG&QTZ
259	JR	0339646	6654583	475	23.11.2007			CON	same as above
260	JR	0339651	6654597	483	23.11.2007	1139		RCM	quartzitic RCM layer, isoclinal folds inside. Also some BBS layer below it.
261	JR	0339641	6654642	505	23.11.2007			RCM	porphyroblast that looks like Augengneissm also lineation of these blasts
262	JR	0339636	6654666	513	23.11.2007			QFC	the BBS layer seems to transform into a quartzitic layer here. To the NE there is PPG, to the E there is more quartzitic stuff.
263	JR	0339660	6654645	495	23.11.2007			CON	QTZ to the PPG above
263	JR	0339662	6654671	506	23.11.2007			CON	same as above
263	JR	0339641	6654682	514	23.11.2007			CON	same as above
264	JR	0339615	6654762	541	23.11.2007			CON	between PPG and QTZ, contact strikes 060, also lineation.
265	JR	0339627	6654775	538	23.11.2007			PPG	PPG band up the hill
266	JR	0339647	6654808	543	23.11.2007		266	QTZ	vein oder layer?
267	JR	0339661	6654811	542	23.11.2007		267	RCM	impregnated by PPG
268	JR	0339776	6654795	520	23.11.2007		Paul 786	QTZ	quartzitic layer gradually transforms into more foliated granite type.
269	JR	0339773	6654820	531	23.11.2007			QTZ	
270	JR	0339721	6654833	539	23.11.2007			RCM	
271	JR	0339761	6654839	526	23.11.2007			RCM	almost vertical gneisses with turmaline porphyroblasts and fibrolite in pressure shadow
272	JR	0339795	6654828	531	23.11.2007			CON	RCM and PPG, strike ~ 160
273	JR	0339877	6654824	526	23.11.2007			QTZ	
273	JR	0339889	6654813	521	23.11.2007			QTZ	
273	JR	0339696	6654657	489	23.11.2007			QTZ	
273	JR	0339707	6654634	482	23.11.2007			QTZ	
273	JR	0339724	6654624	473	23.11.2007			QTZ	
273	JR	0339764	6654593	450	23.11.2007			QTZ	
274	JR	0339896	6654788	516	23.11.2007		274	RCM	alsmost migmatitic, some Bt left.
275	JR	0339845	6654767	486	23.11.2007			PPG	along the slope
276	JR	0339709	6654727	501	23.11.2007			PPG	same as above
277	JR	0339637	6654607	480	23.11.2007		277	QTZ	QTZ rich layer
278	JR	0339864	6654557	462	23.11.2007			RCM	with several small turmalines, hill with the gum trees
279	JR	0348300	6659560	200	24.11.2007	1164		GRT	granite aside of the creek
280	JR	0350021	6661237	199	24.11.2007	1159	280a	MNG	migmatitic granite
280	JR	0350021	6661237	199	24.11.2007	1160	280b	MNG	migmatitic granite with more red looking "veins"
281	JR	0349969	6661202	200	24.11.2007	1161, 1165		PPG	more pegmatitic rocks, big feldspars, etc. but strong variation inside the rocks --> fieldbook sketch
282	JR	0349865	6661088	196	24.11.2007	1166		UNK	completly consisty of QTZ and BT
283	JR	0349857	6661068	202	24.11.2007			UNC	looks like a sedimentary rock, maybe gneiss or fine migmatite.
284	JR	0346265	6646355	189	24.11.2007		289	TIL	Tillite from stubbs waterhole - comparison to the pebble dyke.
285	JR	0339739	6654485	442	25.11.2007			PPG	band from the creek
285	JR	0339906	6654553	475	25.11.2007			PPG	
285	JR	0339916	6654704	517	25.11.2007			PPG	blob on top of the ridge
285	JR	0339663	6654954	570	25.11.2007			PPG	
285	JR	0339687	6654734	515	25.11.2007			PPG	on the far west ridge
286	JR	0339740	6654510	430	25.11.2007			RCM	fine grained, unter the PPG
287	JR	0339747	6654532	435	25.11.2007			QTZ	
287	JR	0339855	6654527	463	25.11.2007			QTZ	more granitic
287	JR	0339878	6654554	470	25.11.2007			QTZ	much QTZ in the granite
287	JR	0339923	6654596	493	25.11.2007			QTZ	
287	JR	0339939	6654613	503	25.11.2007			QTZ	boundary PPG/QTZ

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287	JR	0339907	6654748	513	25.11.2007			QTZ	
287	JR	0339668	6654877	552	25.11.2007			QTZ	all the way from WP289, GPS068 the same, around #8 a bit broken up
287	JR	0339651	6654884	557	25.11.2007			QTZ	
287	JR	0339649	6654803	545	25.11.2007			QTZ	
287	JR	0339686	6654672	501	25.11.2007			QTZ	fit in double folding?
288	JR	0339800	6654555	440	25.11.2007			RCM	under the QTZ, evtl altered QTZ?
288	JR	0339929	6654627	502	25.11.2007			RCM	banded, with turmaline prophyroblasts, possibly only a small lense
289	JR	0339927	6654690	518	25.11.2007			QFC	foliated granite, followed by RCM
289	JR	0339911	6654731	512	25.11.2007			RCM	sediments again
289	JR	0339903	6654767	518	25.11.2007			RCM	same as above
289	JR	0339895	6654789	524	25.11.2007			QFC	granite again -> sketch in fieldbook
290	JR	0339678	6655041	577	25.11.2007			RCM	nicley foliated, could be augengneiss
291	JR	0339685	6654985	574	25.11.2007			CON	sketch in fieldbook, CON between MNG/RCM
291	JR	0339696	6655016	570	25.11.2007			CON	same as above
291	JR	0339680	6654934	561	25.11.2007			CON	same as above
292	JR	0339653	6654828	552	25.11.2007			RCM	almost migmatitic, could connect to the RCM at the gum trees, steep E-W striking
293	JR	0339688	6654689	504	25.11.2007			RCM	not really outcroping, lying around
293	JR	0339700	6654638	484	25.11.2007			RCM	same as above
293	JR	0339758	6654645	459	25.11.2007			RCM	same as above
293	JR	0339747	6654643	465	25.11.2007			RCM	same as above, BBS layer
294	JR	0339799	6654698	475	25.11.2007			QFC	as a rubble pile between the two creeks
295	JR	0339680	6654430	431	25.11.2007			RCM	like on the track from the camp on the 2nd day
296	JR	0335762	6659910	651	26.11.2007		Paul 875	PPG	alteration of sheared Mt Neil to PPG and finally QTZ vein with hematite and qtz
297	JR	0335377	6649738	563	26.11.2007			QFC	readings at Nooldoonooldoona, Mt Neil strongly sheared
297	JR				26.11.2007			QFC	less deformed
297	JR				26.11.2007			PPG	real pegmatite
297	JR				26.11.2007			UNC	sediments/background
298	JR	0342304	6655709	635	28.11.2007			REF	start of the steps at Split Rock Lookout
298	JR	0340801	6655234	501	28.11.2007			REF	tree at the middle patch of the Frying Pan
298	JR	0340135	6655007	475	28.11.2007			REF	Rock north of the lower patch at Mt Gee west (trailerpark)
298	JR	0340395	6654103	412	28.11.2007			REF	Mt. Gee west turnoff
298	JR	0340047	6653637	399	28.11.2007			REF	Painter Camp turnoff
0	PDB	339622	6654327	421	22.10.2007				Watertank Mt Painter Camp
233	PDB	339638	6654392	416	22.10.2007			RCM	sheared RCM + pegmatite boudins
234	PDB	340394	6654863	582	22.10.2007			MGU	contact RCM and MtGee unit
234b	PDB	340394	6654869	582	22.10.2007			SBR	contact RCM and MtGee unit
235	PDB	340390	6654877	595	22.10.2007			QFG	QFG with pink pegmatite
236	PDB	340376	6654884	589	22.10.2007			RCM	contact RCM and PPG
237	PDB	340350	6654860	577	22.10.2007			QFG	well foliated orthogneiss
238	PDB	340341	6654868	572	22.10.2007			QFG	variable intensity foliation
239	PDB	340324	6654882	570	22.10.2007			BBS	schist with TRM
240	PDB	340285	6654921	529	22.10.2007		240A	BBS	same BBS with p'blasts. NW-verence of crenulation
241	PDB	353352	6665364	253	23.10.2007		241	GRD	pale granodiorite
242	PDB	340770	6654697	483	25.10.2007			MGU	MGU at waterfall
243	PDB	340820	6654706	484	25.10.2007			MBR	some GEE veins in breccia
244	PDB	340952	6654753	481	25.10.2007			SBR	brown, fine grained brecciated RCM
245	PDB	340926	6654824	480	25.10.2007			RCM	large (2x2 m) old quartz vein

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246	PDB	340920	6654866	482	25.10.2007			GBR	10 m wide band (000/90) of PPG breccia with some GEE vugs
247	PDB	340941	6654968	478	25.10.2007			RCM	coherent-looking PPG (prob RCM) wit some BT-schist & old q-veins
248	PDB	340960	6654996	481	25.10.2007			RCM	green crenulated bt-schist. HM xx.
249	PDB	340982	6655171	479	25.10.2007			GBR	very fubra granite breccia, more intact at N end of outcrop
250	PDB	340908	6655246	482	25.10.2007			RCM	fine green biotite schist, crenulated
251	PDB	340919	6655259	486	25.10.2007			PEB	strike of pebble dyke is 300-310°
252	PDB	340873	6655279	493	25.10.2007			PEB	same pebble dyke
253	PDB	340915	6655263	495	25.10.2007			PEB	same pebble dyke
254	PDB	340926	6655257	489	25.10.2007			PEB	same pebble dyke
255	PDB	340975	6655413	502	25.10.2007			GBR	poor outcrop, maybe some RCM (breccia)
256	PDB	341002	6655453	0	25.10.2007		256	GBR	PPG with MGQ, no haematite
257	PDB	341027	6655512	505	25.10.2007			PEG	coarse PPG pegmatite, NW-SE strike, steep.
258	PDB	341076	6655501	509	25.10.2007			GBR	PPG with MGQ, no haematite, NW-SE striking
259	PDB	341102	6655540	505	25.10.2007			GBR	PPG-MGQ breccia with MGQ-vein with filed needles
260	PDB	339840	6653942	420	26.10.2007			BBS	BBS+ TRM on boundary with white-grey quartzite. SOS ?
261	PDB	339876	6653942	429	26.10.2007			BBS	north end of same BBS layer in RCM
262	PDB	339872	6653938	432	26.10.2007			BBS	SE end of same BBS
263	PDB	339928	6653925	431	26.10.2007			BBS	BBS on contact qtzitic RCM
264	PDB	339964	6653922	450	26.10.2007			RCM	normal RCM, bit wavy, bt+q±fsp
265	PDB	340034	6653919	483	26.10.2007			RCM	q+bt±sill RCM followed from 264
266	PDB	340041	6653972	464	26.10.2007			BBS	probably not same BBS as before
267	PDB	339949	6653960	434	26.10.2007			BBS	same BBS as 266
268	PDB	339912	6653977	418	26.10.2007			BBS	same BBS as 266-267, thinning
269	PDB	339883	6653971	416	26.10.2007			RCM	looks broken up?
270	PDB	339853	6654015	422	26.10.2007			BBS	
271	PDB	339799	6654005	411	26.10.2007			BBS	contact BBS(north) and PPG (south)
272	PDB	339789	6654023	413	26.10.2007			RCM	contact RCM and PPG
272b	PDB	339789	6654029	413	26.10.2007			PPG	contact RCM and PPG
273	PDB	339782	6654068	422	26.10.2007			PPG	contact RCM and PPG
273	PDB	339782	6654074	422	26.10.2007			RCM	contact RCM and PPG
274	PDB	339783	6654091	429	26.10.2007			RCM	some BT-schist, mostly q-bt-fsp ±sill schist
275	PDB	339785	6654116	420	26.10.2007			RCM	crenulated schist
276	PDB	339801	6654146	436	26.10.2007		276	RCM	sill-bt schist with q-fsp-bt pegmatite, crenulation N-vergent
277	PDB	339858	6654154	430	26.10.2007			PPG	10-15 m thick PPG band, orient ±180/25
278	PDB	339968	6654290	473	26.10.2007			PPG	same PPG lens in RCM schists
279	PDB	340352	6654280	419	27.10.2007			GBR	PPG breccia and fault (orient 035/75)
280	PDB	340390	6654327	430	27.10.2007		280A,B	MGU	well-layered Mgee unit breccia, haem + q
281	PDB	340376	6654336	438	27.10.2007			PPG	about 10x10 m blob of PPG granite
282	PDB	340305	6654223	458	27.10.2007			PPG	N-end of PPG patch with some MGQ
283	PDB	340296	6654247	450	27.10.2007			MBR	non-mineralised breccia of RCM & PPG, possibl extension of #280
284	PDB	340262	6654241	462	27.10.2007			PPG	foliated PPG, somewhat fractured & altered (Sm may be fracture-S)
285	PDB	340119	6654349	448	27.10.2007			PPG	here fracture-like S in PPG (same S as in #284?)
287	PDB	340089	6654493	455	27.10.2007			RCM	contact RCM(W) and PPG (E)
288	PDB	340109	6654468	458	27.10.2007			PPG	weakly foliated PPG, some RCM inclusions
289	PDB	339976	6654372	497	27.10.2007			RCM	some RCM in PPG, dark fine Bt-schist
290	PDB	340009	6654285	467	27.10.2007			BBS	same layer as #289, here with p'blasts and coarse crens
291	PDB	340046	6654270	467	27.10.2007			PPG	well-foliated PPG, wavy fol & foliation boudinage

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292	PDB	340069	6654173	514	27.10.2007			RCM	foliated feldspathic RCM, some bt-schist
293	PDB	340157	6654115	501	27.10.2007			GBR	granite breccia, 5 m-wide, prob from #281, cont to #6 mine
294	PDB	340042	6654211	505	27.10.2007			PPG	contact of broken PPG with RCM fsp-bt-sill gneiss
295	PDB	340098	6654217	0	27.10.2007			RCM	end of lens of RCM between PPG
296	PDB	340153	6654221	0	27.10.2007		296	HBR	pale quartzitic breccia
296	PDB	340311	6655425	436	28.10.2007			MGU	layerd MGU at N-end of Mt Gee. Fault-bounded
297	PDB	340333	6655410	629	28.10.2007			HBR	massive black breccia, specular hameatite on NE corner of Mt Gee
298	PDB	340361	6655482	648	28.10.2007			PPG	PPG with MGQ in vugs parallel to foliation/cleavage (comp. Banding)
299	PDB	340331	6655590	669	28.10.2007			PPG	PPG with compositional banding at angle to fracture cleavage of #298
300	PDB	340279	6655593	681	28.10.2007		300	GBR	Fault zone in granite on Radium Ridge
301	PDB	340203	6655569	679	28.10.2007			GBR	brownish breccia with MGQ in pinkish PPG. Some hameatite breccia
302	PDB	340093	6655663	698	28.10.2007			PPG	PPG variably fractured, fol is compositional banding
303	PDB	339914	6655590	688	28.10.2007			PPG	PPG with subhorizontal comp foliation
304	PDB	339823	6655576	681	28.10.2007		304A,B	GBR	PPG breccia with HBR and barite veins
305	PDB	339748	6655555	701	28.10.2007			GBR	same as #304, again with barite. Compositional banding in PPG
306	PDB	339731	6655517	679	28.10.2007			RCM	RCM on contact (brecciated) with PPG. Some BBS
307	PDB	340164	6655043	478	29.10.2007			QTZ	QTZ and PPG // bedding. Sm = bedding
308	PDB	340064	6655081	510	29.10.2007			QTZ	same quartzite layer as #307
309	PDB	340013	6655101	526	29.10.2007			QTZ	contact quartzite & PPG granite (N)
inf	PDB	340013	6655112	0	29.10.2007			PPG	dummy outcrop between #309 & 310
310	PDB	340014	6655124	534	29.10.2007			BBS	contact BBS (N) and PPG granite (S)
311	PDB	339990	6655152	547	29.10.2007			SBR	BBS altered to breccia with some haematite
312	PDB	339985	6655178	556	29.10.2007			SBR	Quartzite breccia with haematite
313	PDB	339985	6655205	0	29.10.2007			GBR	Granite breccia (mostly) with some haematite
314	PDB	339993	6655300	564	29.10.2007			GBR	N-end of breccia zone, here haematite-rich
315	PDB	340034	6655274	542	29.10.2007			MBR	mixed RCM and granite breccia, with some haematite
316	PDB	340064	6655215	534	29.10.2007			SBR	Quartzite breccia with haematite
317	PDB	340136	6655255	548	29.10.2007			PEB	pebble dyke in contact with quartzite and some schist
319	PDB	340102	6655284	525	29.10.2007			PEB	pebble dyke in contact withgreenish biotite schist
320	PDB	340103	6655296	537	29.10.2007		320A-E	PEB	pebble dyke contact with "normal" more angular breccia
321	PDB	340122	6655301	548	29.10.2007			PEB	somewhat foliated pebble dyke
322	PDB	340127	6655313	0	29.10.2007			PEB	mix of pebble dyke and granite breccia
323	PDB	340159	6655263	525	29.10.2007			PEB	pebble dyke with very large clasts in creek bed
324	PDB	340298	6655215	545	29.10.2007			PEB	shallow dipping pebble dyke (1-2 m wide) in strongly altered granite breccia
325	PDB	340308	6655256	557	29.10.2007			GBR	foliated altered granite
326	PDB	340172	6655370	555	29.10.2007			GBR	heavily altered PPG
327	PDB	340168	6655395	567	29.10.2007			HBR	5x20 m patch black haematite breccia inside GBR
329	PDB	340278	6655402	0	29.10.2007			GEE	Mt Gee Q in contact with GBR
330	PDB	340288	6655381	602	29.10.2007			GEE	haematite-rich layered (084/33) Mt Gee Unit
331	PDB	340318	6655339	590	29.10.2007			PEB	pebble dyke in contact with Mt Gee Q & haem breccia
332	PDB	340323	6655270	586	29.10.2007			GBR	very altered breccia, possibly pebble dyke
333	PDB	340282	6655165	568	29.10.2007			PEB	pebble dyke blocks (m-size), questionably in-situ. Matrix strongly altered breccia
334	PDB	340256	6655199	526	29.10.2007			RCM	very altered clay-rich RCM schists
335	PDB	340135	6655210	514	29.10.2007			HBR	EW-striking blob of brown-specular haem breccia
336	PDB	340124	6655264	531	29.10.2007			PEB	pebble dyke with big clasts
337	PDB	339945	6655083	495	30.10.2007			RCM	contact sill-fsp schist (N) to PPG (south)
338	PDB	339933	6655105	495	30.10.2007		338	BBS	RCM with crenulations and BBS to ?migmatite-like schists

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339	PDB	339883	6655010	507	30.10.2007			RCM	contact PPG (N) and metaseds (S): bt-q schists with pegm veins
340	PDB	339927	6654922	504	30.10.2007		340	PPG	blocky-weathering fine-grained PPG
341	PDB	339946	6654894	499	30.10.2007			PEG	undeformed-looking pegamtite between sheared ortho- & paragneiss
342	PDB	339912	6654839	504	30.10.2007			RCM	well-foliated schist with pegmatite lenses
343	PDB	339958	6654789	511	30.10.2007			PPG	granite (PPG or QFG), well foliated
344	PDB	339923	6654687	0	30.10.2007			PPG	sheared granite (PPG or GFG?)
345	PDB	341129	6655192	521	01.11.2007		345	BBS	crenulated dark coarse trm-biot-schist, loose piece with fluorite
346	PDB	341205	6655245	487	01.11.2007			GBR	locally brecciated & fractured (striations) PPG
347	PDB	341231	6655293	466	01.11.2007			RCM	heavily fsp-altered biotite schist
348	PDB	341340	6655179	472	01.11.2007			PPG	locally massive, not brecciated PPG
349	PDB	341340	6655211	519	01.11.2007			BBS	contact PPG (S) and BBS (N)
350	PDB	341350	6655242	507	01.11.2007		350	PEB	thin pebble dyke (ong. 340/88) in foliated PPG
351	PDB	341492	6655239	524	01.11.2007			RCM	RCM schist & biotite schist
353	PDB	341441	6655223	522	01.11.2007			PEB	40 cm wide pebble dyke in PPG
354	PDB	341463	6655202	522	01.11.2007			PEB	followed pebble dyke from 353
355	PDB	341426	6655262	513	01.11.2007			RCM	folded RCM with variable orient (030/79 & 231/57)
356	PDB	341414	6655311	554	01.11.2007			RCM	migmatitic biotite schist
357	PDB	341472	6655353	545	01.11.2007			QFG	laminated granite and unfoliated PPG. Mt Neill-like with q.augen
358	PDB	341381	6655339	551	01.11.2007			QFG	laminated migmatitic granite with folded foliation, bounded on S by brecciated PPG
359	PDB	341371	6655311	0	01.11.2007			GBR	conatc with breccia
360	PDB	341343	6655308	536	01.11.2007			GBR	hard, pale pink 2m wide brecciated & silicified PPG
361	PDB	341267	6655332	531	01.11.2007		361A-B	GBR	5km wide pale-pink PPG breccia, almost no haem, but some q
362	PDB	341145	6655186	507	01.11.2007		362	MBR	greenish breccia with granite clasts (amphibolite?)
363	PDB	341176	6655063	499	02.11.2007			GBR	haematite-impregnated PPG(?) breccia with strong fracture cleavage (178/76)
364	PDB	341203	6655198	538	02.11.2007		364	BBS	BBS with dark p'blasts showing SOS
366	PDB	341320	6655012	489	03.11.2007			GBR	brecciated PPG and sparse Mt Gee quartz
367	PDB	341378	6655009	485	03.11.2007			RCM	well-foliated paragneiss, with biot-fsp (possibly QFG?)
368	PDB	341493	6655077	500	03.11.2007			QFG	PPG-looking laminated migmatitic gneiss, grading into "normal" QFG to N
369	PDB	341535	6655071	504	03.11.2007		369	BBS	green-black biotite schist, with 1-2 cm p'blasts of ?sill
370	PDB	341498	6655133	493	03.11.2007			MBR	breccia of RCM, granite & PPG, some MGQ
371	PDB	341442	6655136	516	03.11.2007			BBS	greenish biotite schist with trm p'blasts
372	PDB	341373	6655068	509	03.11.2007			GBR	brecciated PPG with patches of MGQ
373	PDB	341421	6655110	527	03.11.2007			RCM	contact RCM-biot-schist to PPG
374	PDB	341390	6655166	535	03.11.2007			RCM	contact RCM (S) and PPG (N)
375	PDB	341372	6655136	530	03.11.2007			MBR	breccia of RCM, granite & PPG, some MGQ
376	PDB	341469	6655165	536	03.11.2007			BBS	strongly crenulated coarse biot schist
377	PDB	341610	6655087	523	03.11.2007			SBR	quartzite-like grey breccia with RCM clasts, minor haem. About 20 m wide
378	PDB	341650	6655091	539	03.11.2007			PPG	NE-SW striking PPG band, with MGQ
379	PDB	341721	6655103	540	03.11.2007			MBR	extension of same band, porous silicious RCM breccia, MGQ-rich
380	PDB	341682	6655115	540	03.11.2007			RCM	sillim-bearing para (?ortho?) gneiss, just N of breccia band
381	PDB	341545	6655203	514	03.11.2007			MBR	brecciated PPG with biot-schist chunks, no haem and not massive qtzite-like
381B	PDB	341545	6655213	0	03.11.2007			BBS	coarse dark biot schist with large trm p'blasts
382	PDB	341566	6655281	524	03.11.2007			GBR	pinkish fine, qtzite-like breccia with only PPG clasts inside PPG
383	PDB	341613	6655205	510	03.11.2007			PPG	sheared PPG, fracture-like shear planes
384	PDB	341663	6655151	520	03.11.2007			MBR	south edge of breccia with dispersed MGQ
385	PDB	341682	6655235	498	03.11.2007			RCM	biotite schist
386	PDB	341564	6655339	526	03.11.2007			QFG	contact PPG and laminated granite

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387	PDB	341514	6655398	530	03.11.2007			QFG	contact PPG and laminated granite
388	PDB	341735	6655446	566	03.11.2007			GBR	PPG breccia, hard, pale with MGQ
389	PDB	341645	6655375	553	03.11.2007			PPG	massive, pink PPG with straight long q-veins (342/90)
390	PDB	340127	6655321	551	04.11.2007			RCM	quartzitic RCM, with some biot schist patches and MGQ-vein
391	PDB	340101	6655395	571	04.11.2007		391A-C	PEB	sandstone dyke with angular PPG clasts
392	PDB	340067	6655382	576	04.11.2007			MBR	heavily bleached seds + breccia of RCM & PPG
393	PDB	340026	6655436	606	04.11.2007			PEB	1/2 m wide sandstone dyke inside PPG
394	PDB	339990	6655435	591	04.11.2007			PPG	south edge of Radium Ck granite (PPG) with foliation
395	PDB	339942	6655435	604	04.11.2007			RCM	contact RCM (S) and PPG (N), some alteration
395X	PDB	339942	6655470	0	04.11.2007		395A-B	PEB	sandstone dyke, 30-40 m N of location 395
396	PDB	339962	6655190	565	04.11.2007			RCM	5-10 m thick quartzite layer (Sm=bedding)
396	PDB	339944	6655238	542	04.11.2007			MBR	rusty haem-granite-metased breccia, about E-W, vertical
397	PDB	339909	6655281	547	04.11.2007		397A-C	SBR	very heavily altered white metaseds inside RCM
398	PDB	339849	6655283	0	04.11.2007			QFG	Mt Neill-like foliated gneiss. Old foliation sheared by shallow fabric
399	PDB	339827	6655165	553	04.11.2007			SBR	quartzite-like breccia, 10-20 m wide band
400	PDB	339731	6655283	585	04.11.2007		400	SBR	brecciated seds with some haem, MGQ & fluorite
401	PDB	339749	6655344	615	04.11.2007			RCM	metaseds + Mt-Neill-like gneiss
402	PDB	340300	6655430	616	05.11.2007		402	PEB	pebble dyke in PPG breccia
403	PDB	340351	6655368	0	05.11.2007			MGU	vaguely banded MGU (ca 035/50) near contact with PPG
404	PDB	340393	6655339	618	05.11.2007			MGU	normal MGU and (almost) pure haematite breccia
405	PDB	340416	6655332	0	05.11.2007			MGU	edge of layered MGU (ca 220/50)
406	PDB	340443	6655309	0	05.11.2007			PPG	hardly brecciated granite in contact with MGU
407	PDB	340456	6655283	619	05.11.2007			HBR	blob of 4-5 m haematiteb breccia, >90% brown black massive haematite
408	PDB	340476	6655253	0	05.11.2007			MGU	layered MGU (155/30)
409	PDB	340511	6655272	591	05.11.2007			MGU	brecciated MGU in contact with brecciated granite (N side down, normal)
410	PDB	340542	6655235	0	05.11.2007			MGU	q-rich MGU band, follwoed from 408
411	PDB	340536	6655205	577	05.11.2007			HBR	NE start of haematite breccia band, ca 15 m thick
412	PDB	340536	6655167	573	05.11.2007			MGU	broken-up MGU in contact with RCM breccia, sheared and bleached
413	PDB	340548	6655180	560	05.11.2007		413	HBR	5m wide haematite band, flanked by MGU and rubble
414	PDB	340494	6655187	582	05.11.2007			GBR	fresh PPG breccia, some MGQ veins
415	PDB	340465	6655190	602	05.11.2007			MGU	brecciated RCM against MGU almost on ridge
416	PDB	340428	6655161	606	05.11.2007			MGU	heavily sheared MGU, south down along EW-striking, steep plane
417	PDB	340538	6655057	577	05.11.2007			MGU	1m wide fracture zone (N down) in MGU (Sfrac = 322/76). Q-clasts in haem matrix
418	PDB	340557	6655002	577	05.11.2007			MGU	E-contact of MGU with rubble. Banding ca 211/22
419	PDB	340593	6654992	571	05.11.2007			MGU	E-contact MGU with many fractures in 2 sets
420	PDB	340654	6654996	565	05.11.2007			MGU	3-4 m wide MGU band in more-less brecciated fresh PPG
421	PDB	340659	6654802	572	05.11.2007			MGU	about E contact of MGU
422	PDB	340708	6654892	559	05.11.2007			MGU	contact MGU and granite
423	PDB	340731	6654921	549	05.11.2007			MGU	contact MGU and fresh brecciated PPG
424	PDB	340767	6654872	542	05.11.2007			MBR	chunky, angular breccia with weathered mixed clasts
425	PDB	340748	6654799	529	05.11.2007			MGU	25m wide vertical extrusion of heam-rich MGU (ca 020/90)
426	PDB	340722	6654720	507	05.11.2007			MGU	haem-rich MGU
427	PDB	340615	6654663	517	05.11.2007			MGU	5-10 m cliff in MGU with strong shearing fabric (cliff 244/90, shear 089/36, thrust)
428	PDB	340597	6654706	544	05.11.2007			MGU	pretty q-combs and cave
429	PDB	340197	6654455	425	06.11.2007			PPG	foliated PPG
430	PDB	340131	6654497	439	06.11.2007		430	PPG	foliated and folded PPG
431	PDB	340096	6654523	449	06.11.2007			PPG	sheared PPG with pegmatite veins

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432	PDB	340031	6654689	458	06.11.2007			RCM	biot-fsp gneiss (ortho?para?) with many pegmatite veins
433	PDB	340153	6654935	492	06.11.2007			PPG	slid, massive PPG with some bt-schist lenses
434	PDB	340172	6654944	493	06.11.2007			BBS	biot schist, from BBS to (migmatitic) bt-q-fsp schist
435	PDB	340191	6654959	488	06.11.2007			QTZ	quartzite band, looks like PPG at first sight
436	PDB	340221	6654933	509	06.11.2007		436	BBS	black schist, same as 434, with large p'blasts (<4 cm), fol wraps. Normal movement
437	PDB	340277	6654938	521	06.11.2007			QTZ	quartzite band, disappearing up hill
438	PDB	340357	6654896	570	06.11.2007			QTZ	same quartzite band as 437, poor exposure
439	PDB	340343	6654861	570	06.11.2007			QFG	laminated granite gneiss, red-pink & friable
440	PDB	340425	6654917	548	06.11.2007			RCM	rusty hameatite alteration of what looks like RCM at SE end of boomerang
441	PDB	340411	6654954	0	06.11.2007			RCM	host rock of boomerang here is biot schist
442	PDB	340346	6655008	556	06.11.2007			HBR	haematite breccia, quartzitic fine mass with occasionally large PPG clasts
443	PDB	340355	6655062	553	06.11.2007		443	HBR	haem breccia looks like qtzite with some dispersed haematite
444	PDB	340344	6655100	546	06.11.2007			RCM	mix of strong foliated PPG and biot schist
445	PDB	340265	6655039	523	06.11.2007			QFG	laminated granite with some PPG veins
446	PDB	340265	6655022	523	06.11.2007			QFG	same laminated granite
447	PDB	340237	6655055	0	06.11.2007			QFG	again laminated granite with some pale fsp-q schists
448	PDB	340188	6655075	496	06.11.2007			QFG	loose rubble of laminated granite & PPG
449	PDB	340253	6654842	532	06.11.2007			PPG	25m wide PPG band with some remnants of foliated RCM/laminated granite
450	PDB	340306	6654817	536	06.11.2007			RCM	fine greenish biot schist
451	PDB	340334	6654742	559	06.11.2007			PPG	same type of PPG lens as 449
452	PDB	340378	6654782	550	06.11.2007		452	PEG	coarse pegmatitic PPG with some MGQ veins
453	PDB	340400	6654774	589	06.11.2007			HBR	brown-black haematite-quartzite, some remnant foliations
454	PDB	340420	6654754	0	06.11.2007			RCM	contact psammitic schist and PPG with MGU
455	PDB	340393	6654635	571	06.11.2007			PPG	pink friable pegmatitic PPG, vague foliation (?263/08)
456	PDB	340327	6654597	529	06.11.2007			RCM	fine-grained greenish biot schist, surrounded by PPG and QFG
457	PDB	340297	6654586	516	06.11.2007			QFG	QFG-PPG with biot schist (could also be RCM)
458	PDB	313690	6613443	518	08.11.2007		458	Adelaidean	Adelaidean seds with folds along creek to Copley
459	PDB	264963	6620049	352	08.11.2007		459	Adelaidean	?Tapley Hill Fm with antitaxial fibrous veins
460	PDB	270670	6615129	385	08.11.2007			Adelaidean	Red Gorge on Moolooloo Station - fracture propagation structures and petroglyphs
461	PDB	345274	6647342	380	09.11.2007			Humanity Sea	Kineia-like structures on sandstone surface in Barrarana Gorge
462	PDB	345256	6647554	380	09.11.2007		462A-B	Humanity Sea	?crack structures on sandstone surface in Barrarana Gorge
463	PDB	340862	6655408	507	10.11.2007			PPG	coarse PPG with cm-size Q-patches, no foliation, not brecciated
464	PDB	340885	6655389	510	10.11.2007			GEE	NE end of Mt Gee quartz blob (no haem) in fresh PPG
465	PDB	340869	6655358	503	10.11.2007			GEE	SE end of MT Gee quartz blob in more brecciated PPG
466	PDB	340846	6655351	498	10.11.2007			GEE	3x3 m blob of clear Mgee quartz, pretty, no nail holes
467	PDB	340845	6655289	490	10.11.2007			PEB	pebbly dyke in Sprigg's trench
468	PDB	340816	6655320	501	10.11.2007			PPG	PPG, increasingly fresh towards N
469	PDB	340859	6655222	494	10.11.2007			GBR	friable ferrugenous breccia, mostly of PPG
470	PDB	340885	6655254	492	10.11.2007			PEB	pebble dyke in breccia of PPG-granite and biotite schist
471	PDB	340888	6655305	490	10.11.2007			SBR	altered greenish dark fine biot schist
472	PDB	340957	6655278	494	10.11.2007			RCM	green crenulated bt schist
473	PDB	341025	6655230	498	10.11.2007			SBR	contact brecciated RCM (S) and PPG (N)
474	PDB	341007	6655222	490	10.11.2007			RCM	fine brown-green biotite schist
475	PDB	341261	6655192	526	10.11.2007			PEG	pegmatitic PPG with minor thin MGQ
476	PDB	341271	6655196	524	10.11.2007			BBS	dark biote schist
477	PDB	341298	6655197	0	10.11.2007			BBS	same BBS as 476 at contact with PPG to south
478	PDB	341300	6655218	537	10.11.2007			BBS	contact biotite schist (S) and alternating QFG-PPG to north

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479	PDB	341145	6655354	553	10.11.2007			PPG	unclear whether aplite/granite intrusion of alteration
480	PDB	341240	6655390	0	10.11.2007		480A-C	GBR	aplite-pegm PPG breccia band with vage remnant of QFG-type foliation. Loc infrerred
481	PDB	341306	6655357	542	10.11.2007			QFG	contact between LMG (S) and PPG (N)
482	PDB	341029	6655372	517	10.11.2007			GBR	pale pink breccia (5m wide, EW-steep) inside unfoliated PPG rubble
483	PDB	341043	6655430	512	10.11.2007			PPG	coarse pink PPG, somewhat brecciated, some MGQ veins
484	PDB	341051	6655446	509	10.11.2007			QFG	LMG-like, but with pinkish alteration. Some MGQ veins
485	PDB	341083	6655477	510	10.11.2007			PEG	porous NW-striking pegmatite with MGQ veins
486	PDB	341213	6655536	528	10.11.2007			PEG	extension of pegmatite from 485, pale pink-yellow, some MGQ veins
487	PDB	341187	6655606	525	10.11.2007			PEG	same pegmatite still
488	PDB	341297	6655582	536	10.11.2007			GBR	pale breccia band
489	PDB	341265	6655633	556	10.11.2007			GBR	heavily brecciated PPG, prob. Same band as 488
490	PDB	341258	6655695	567	10.11.2007			GBR	brecciated PPG with minor MGQ veining
491	PDB	341237	6655744	0	10.11.2007			PPG	"normal" PPG west of breccia zone, in pink veins (S=303/22)
492	PDB	341211	6655826	578	10.11.2007			PPG	PPG porous/brittle, but seems not brecciated
493	PDB	341391	6655892	617	10.11.2007			BBS	BBS lens inside PPG
494	PDB	341425	6655871	620	10.11.2007			BBS	BBS lens inside PPG
495	PDB	341338	6655962	576	10.11.2007			PPG	PPG with vage LMG-like banding
496	PDB	341272	6655947	546	10.11.2007			GBR	altered and sheared ?PPG
497	PDB	340992	6655941	532	10.11.2007			GBR	brecciated PPG with MGQ veins
498	PDB	341068	6655876	554	10.11.2007			PPG	end of MGQ veining inside PPG
499	PDB	340427	6654306	425	11.11.2007			QFG	laminated gneiss with coarse gneissic foliation, some brecciation
500	PDB	340479	6654318	418	11.11.2007			SBR	bt-schist clasts in breccia, fsp impregnation
501	PDB	340541	6654328	421	11.11.2007			BBS	BBS with large ?spinel p'blasts
502	PDB	340459	6654252	432	11.11.2007			GBR	PPG breccia with some foliation (115/35)
503	PDB	340643	6654341	430	11.11.2007			SBR	breccia of dark biot schists
504	PDB	340739	6654355	438	11.11.2007		504	BBS	BBS with p'blasts and some migmatitic layers
505	PDB	340666	6654443	438	11.11.2007			MBR	heavily brecciated RCM and PPG
506	PDB	340732	6654586	444	11.11.2007			GBR	brecciated PPG with first MGQ veins
507	PDB	340735	6654538	0	11.11.2007			GBr	sheared and brecciated PPG
508	PDB	340742	6654510	459	11.11.2007			BBS	crenulated BBS
509	PDB	340764	6654437	468	11.11.2007			RCM	fsp-biot schist with small patch of MGQuartz
510	PDB	340786	6654498	447	11.11.2007			RCM	fine-grained biot schist and normal RCM
511	PDB	340793	6654377	0	11.11.2007			SBR	dark olive-brown breccia with some PPG
512	PDB	340779	6654348	435	11.11.2007			RCM	well-layered fine biotite schist with some BBS
513	PDB	340761	6654331	434	11.11.2007			RCM	migmatitic biotie schist
514	PDB	340868	6654291	444	11.11.2007			RCM	migmatitic biot-sill-fsp schist
515	PDB	340947	6654261	455	11.11.2007			PEG	pegmatitic breccia next to BBS
516	PDB	341002	6654164	454	11.11.2007			BBS	crenulated black coarse biot schist
517	PDB	341155	6654138	454	11.11.2007			PEG	pale yellowish pegmatite with shear fabric. Isolated MGQ veins
518	PDB	341152	6654148	528	11.11.2007			RCM	migmatitic paragneiss and some BBS
519	PDB	341163	6654176	0	11.11.2007			RCM	same as 518
521	PDB	341255	6654302	546	11.11.2007			QFG	laminated granite, bit PPG like, some BBS pieces
522	PDB	340986	6654457	518	11.11.2007			BBS	biotite schist and some yellowish pegmatite
523	PDB	340976	6654512	531	11.11.2007		523	MGU	small blob of MGU, include haem. Crusts of ?stilbite
525	PDB	339995	6655224	560	12.11.2007		525A-B	HBR	highest reading haematite breccia
526	PDB	340337	6655410	628	12.11.2007		526	HBR	low-reading haematite breccia
527	PDB	340360	6655015	569	12.11.2007			HBR	highest-reading haematite breccia in boomerang

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528	PDB	340674	6654249	478	13.11.2007			PPG	orange-weathering PPG, some MGQ
529	PDB	340743	6654249	468	13.11.2007			PPG	PPG with fracture-like foliation
530	PDB	340771	6654268	471	13.11.2007			RCM	RCM with PPG lenses
531	PDB	340801	6654279	0	13.11.2007			RCM	PPG lens in RCM schists
532	PDB	340830	6654286	0	13.11.2007		532	RCM	fsp-sil schist
533	PDB	340912	6654323	451	13.11.2007			BBS	BBS with N-vergent parasitic folds
534	PDB	340910	6654384	473	13.11.2007			QFG	LMG with isoclinal folds of pegmatite
535	PDB	340996	6654406	487	13.11.2007			QFG	fold hinge in biotite schists
536	PDB	340894	6654463	482	13.11.2007		536A-C	BBS	biotite schist with green-white weathering 2cm p'blast sigma-clasts (sin)
537	PDB	340878	6654507	487	13.11.2007			BBS	BBS and fsp-sil gneiss
538	PDB	340823	6654553	500	13.11.2007			RCM	biotite schist + paragneiss
539	PDB	340827	6654582	507	13.11.2007			RCM	biotite schist + paragneiss
540	PDB	340840	6654488	484	13.11.2007			QFG	PPG grading into LMG
541	PDB	340794	6654469	483	13.11.2007			BBS	BBS with p'blasts, could be same layer as 536
542	PDB	340842	6654426	465	13.11.2007			RCM	fine-grained greenish biotite schist
543	PDB	341053	6654445	526	13.11.2007			PPG	shallow S-dipping PPG sheet
544	PDB	341157	6654393	534	13.11.2007			RCM	fine-grained greenish biot schist and PPG-like sheets
545	PDB	341257	6654348	532	13.11.2007		545A-B	PEG	white strange sugary (?altered) material
546	PDB	341271	6654372	537	13.11.2007		546A-C	SBR	pink breccia with large biotite clasts and some MGQ net veins
547	PDB	341305	6654390	543	13.11.2007			RCM	biotite paragneiss (bit LMG like)
548	PDB	341430	6654406	544	13.11.2007			MGU	big cave in ridge of MGU of Mt. Painter
549	PDB	341452	6654445	544	13.11.2007			PPG	heavily altered ?PPG just underneath MGU of Mt. Painter
550	PDB	341376	6654526	544	13.11.2007			MGU	haematite-rich 10 m wide MGU band, with around it heavily altered PPG
551	PDB	341358	6654486	545	13.11.2007			SBR	pale white breccia with biot schist clasts
552	PDB	341203	6654397	518	13.11.2007			PPG	poor outcrop, all rubble PPG, but vague LMG-like foliation
553	PDB	341148	6654485	523	13.11.2007			RCM	dark fine biotite schist near contact with PPG. Foliation or not sure
554	PDB	341190	6654543	495	13.11.2007			MGU	haematite MGQ band, about 10 m wide
555	PDB	341224	6654646	500	13.11.2007			RCM	biotite schist/paragneiss and migmatite
556	PDB	340165	6654017	469	14.11.2007			MBR	breccia hosted by metasediments, but with lost of PPG alteration and some MGQ
557	PDB	340284	6653860	427	14.11.2007			QTZ	heavily Q-impregnated breccia of biot schist
558	PDB	340318	6653924	416	14.11.2007			BBS	contorted BBS with normal RCM
559	PDB	340482	6653957	452	14.11.2007			QTZ	quartz-feldspathic gneiss (?)
560	PDB	340539	6654001	453	14.11.2007			QTZ	q-fsp paragneiss, sheared + boudinaged pegmatite veins
561	PDB	340687	6653970	486	14.11.2007			QTZ	same q-fsp band as before
562	PDB	340700	6653988	490	14.11.2007			QTZ	fold hinge
563	PDB	340632	6653922	0	14.11.2007			QTZ	same q-fsp layer
564	PDB	340541	6653899	471	14.11.2007			QTZ	same layer
565	PDB	340503	6653883	444	14.11.2007			QTZ	same layer
566	PDB	340461	6653890	0	14.11.2007			QTZ	same layer
567	PDB	340701	6654070	442	14.11.2007		567	BBS	BBS with cross-shaped saphirine(?) crystals. Migmatites
568	PDB	340813	6653997	440	14.11.2007			QTZ	second q-fsp layer
569	PDB	342158	6655375	526	15.11.2007			RCM	fsp-q-bt schist with some BBS
570	PDB	342215	6655341	525	15.11.2007			RCM	crappy altered quartzitic metasediments, some MGQ, some breccia
571	PDB	342245	6655358	535	15.11.2007			RCM	messy, yelowish metaseds, variable orient, but not quite breccia
572	PDB	342239	6655409	548	15.11.2007			QTZ	quartzitic red-weathering metaseds, some PPG-like bands, straight MGQ veins
573	PDB	342198	6655438	536	15.11.2007			QFG	laminated granite, fine lamination
574	PDB	342228	6655505	560	15.11.2007			PPG	pinkish normal PPG to yellowish pegmatite

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575	PDB	342244	6655534	560	15.11.2007		575A-B	RCM	L-tectonite on N side of contact with very altered PPG
576	PDB	342160	6655431	530	15.11.2007			QTZ	quartzitic RCM
577	PDB	342142	6655434	545	15.11.2007			RCM	same rock?
578	PDB	342118	6655432	451	15.11.2007			PPG	PPG with remnants of laminated gneiss - MGQ veins, some haem
579	PDB	342098	6655453	560	15.11.2007			BBS	BBS on NE side of MGQ patch
580	PDB	342074	6655470	575	15.11.2007		580A-C	BBS	BBS with large p'blasts, folded
581	PDB	342055	6655494	584	15.11.2007			SBR	pale-pinkish quartzitic breccia with MGQ. Straight zone through landscape
582	PDB	342043	6655512	588	15.11.2007			QFG	just across contact with laminated granite
583	PDB	341983	6655657	636	15.11.2007			PPG	PPG with fracture-like foliation in Radium Ridge
584	PDB	341918	6655599	638	15.11.2007			PEG	pegmatite in PPG host
585	PDB	341937	6655612	624	15.11.2007			GBR	PPG breccia with MGQ and minor haem. Long bands ends against Radium Ridge
586	PDB	342095	6655527	574	15.11.2007			GBR	south end of breccia + MGQ band
587	PDB	342118	6655457	561	15.11.2007			BBS	quite contorted metaseds
588	PDB	342134	6655495	551	15.11.2007			QFG	laminated granite (or PPG)
589	PDB	342083	6655572	576	15.11.2007			QFG	idem
590	PDB	342158	6655338	522	15.11.2007			BBS	quite coarse black biot schist + RCM
591	PDB	342105	6655328	546	15.11.2007			BBS	same bbs layer as 590
592	PDB	342070	6655337	521	15.11.2007		592	BBS	same bbs layer still, here with blue corundum
593	PDB	342011	6655316	532	15.11.2007		593	BBS	same bbs layer, here with white - pale pblasts
594	PDB	341971	6655316	550	15.11.2007			BBS	still on same BBS
595	PDB	341954	6655289	550	15.11.2007			BBS	same BBS, now bending to S? crenulated
596	PDB	341987	6655277	534	15.11.2007			BBS	same stuff, here with be and white p'blasts
597	PDB	342061	6655265	525	15.11.2007			BBS	may not be same BBS as before
598	PDB	342055	6655231	528	15.11.2007			RCM	dark biotite schist, not really BBS?
599	PDB	342031	6655209	512	15.11.2007			BBS	greenish BBS layer, next to quartzite layer to NE of it. To W migmatitic layers
600	PDB	342064	6655190	515	15.11.2007			RCM	sheared quartzitic RCM with MGQ veins
601	PDB	342026	6655422	557	15.11.2007			BBS	black schists
602	PDB	340998	6654843	499	16.11.2007			RCM	biot-qfsp-q-schist, soft brownish, altered. Some brecciation
603	PDB	340994	6654673	501	16.11.2007			MBR	more massive, poorly bedded, brownish breccia with PPG & metaseds
604	PDB	341089	6654616	510	16.11.2007			RCM	partly brecciated metaseds, here minor BBS
605	PDB	340951	6654590	520	16.11.2007			BBS	real BBS with dark p'blasts
606	PDB	340895	6654581	523	16.11.2007			GBR	>25m wide PPG-rich breccia zone, minor MGQ patches
607	PDB	340917	6654571	524	16.11.2007			BBS	BBS with tourmaline xx
608	PDB	340952	6654574	522	16.11.2007			BBS	same BBS
609	PDB	341000	6654594	526	16.11.2007			BBS	not 100% sure BBS, here 1-2m wide quartz blow
610	PDB	341056	6654605	528	16.11.2007			BBS	BBS just S of pinkish breccia of quartzite, metaseds & PPG
611	PDB	341062	6654572	523	16.11.2007			BBS	BBS layer apprears to swing to S (syncline)
612	PDB	341019	6654548	534	16.11.2007			BBS	BBS parallel to hardb PPG-qtzite like layer
613	PDB	340967	6654533	0	16.11.2007			BBS	same BS layer
614	PDB	340930	6654506	518	16.11.2007			BBS	end of following BBS layer
615	PDB	341065	6654533	524	16.11.2007			MGU	haematite + MGQ band, extending from NE
616	PDB	341221	6654501	511	16.11.2007			PPG	not-foliated PPG. Occasionally metaseds
617	PDB	341240	6654562	504	16.11.2007			RCM	mostly fine biot schist, some BBS-like lyaers with p'blasts
618	PDB	341289	6654598	497	16.11.2007			BBS	real BBS with blue corundum, thick >10m patch
619	PDB	341296	6654560	508	16.11.2007		619	PPG	yellowish PPG, some MGQ veins
620	PDB	341322	6654578	504	16.11.2007			BBS	perhaps same BBS as 618, variable orient, some crens
621	PDB	341376	6654602	501	16.11.2007			BBS	after fold hinge, BBS with trm & (ex-)?corundum?

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622	PDB	341341	6654663	496	16.11.2007			RCM	migmatitic gneiss & laminated gneiss
623	PDB	341413	6654680	505	16.11.2007			BBS	BBS south of quartzite
624	PDB	341446	6654685	500	16.11.2007			BBS	>5m thick real BBS with many cor/spinal xx
625	PDB	341421	6654697	504	16.11.2007			QFG	lost BBS in laminated, partly mylonitic gneiss
626	PDB	341390	6654748	517	16.11.2007			BBS	clear black BBS, but no cor. Linking 621 to 624 may be wrong
627	PDB	341379	6654766	525	16.11.2007			SBR	brecciated BBS, some MGQ patches and minor PPG-like breccia
628	PDB	341384	6654787	526	16.11.2007			GBR	10m wide band of pale haem-poor PPG breccia, quartzite-like
629	PDB	341427	6654815	540	16.11.2007			GBR	same breccia band as 628
630	PDB	341412	6654840	544	16.11.2007			MGU	same breccia widens to form real MGU-like breccia zone
631	PDB	341436	6654795	540	16.11.2007			MBR	side-shoot of pale breccia with metaseds + PPG. General host is RCM
632	PDB	341487	6654770	529	16.11.2007			SBR	2m wide qtzte breccia inside RCM and reddish laminated gneiss
633	PDB	341573	6654774	521	16.11.2007			QFG	reddish laminated gneiss - PPG
634	PDB	341394	6654707	513	16.11.2007			BBS	followed BBS from 626, here adjacent to LMG band to N. to S more normal RCM
635	PDB	341347	6654697	528	16.11.2007			QFG	hinge of laminated gneiss
636	PDB	341272	6654711	524	16.11.2007			MBR	breccia in RCM, showing progressive PPG alteration and brecciation
637	PDB	341172	6654631	491	16.11.2007			PPG	PPG granite, slightly LMG-like
638	PDB	341175	6654613	492	16.11.2007			MBR	pale breccia band again
639	PDB	341133	6654644	499	16.11.2007			RCM	RCM schists, partly PPG-altered. Poor outcrop
640	PDB	341063	6654624	528	16.11.2007			PPG	mostly PPG with some vage LMG remnants
641	PDB	341088	6654674	513	16.11.2007			RCM	fine biot-schist surrounded by undiff. RCM
642	PDB	341139	6654776	488	16.11.2007			GBR	PPG breccia with MGQ veins. Continuation of band to NE
643	PDB	340999	6654846	482	16.11.2007		643	QFG	laminated gneiss with clear foliation
644	PDB	341223	6654919	485	17.11.2007			RCM	RCM with biot schist
645	PDB	341267	6654979	515	17.11.2007			MBR	mixed breccia of PPG and RCM, 5-10m wide EW band, very minor MGQ
646	PDB	341334	6654927	505	17.11.2007		646A-C	BBS	BBS with evidence for alteration to PPG
647	PDB	341358	6654943	502	17.11.2007			BBS	clear BBS same layer as 646
648	PDB	341559	6655059	502	17.11.2007			BBS	BBS with some ?pblast & some toerm
649	PDB	341424	6654985	497	17.11.2007			BBS	BBS on track
650	PDB	341442	6655014	492	17.11.2007			QFG	LMG in creekbed
651	PDB	341470	6655013	492	17.11.2007		651	BBS	nicely kink-crenulated BBS with pale p'blasts
652	PDB	341498	6655157	501	17.11.2007			RCM	biotite schist, metapelites, migmatitic metaseds
653	PDB	341547	6655207	0	17.11.2007			BBS	small BBS outcrop with ?spinel p'blasts
654	PDB	341644	6655229	503	17.11.2007			BBS	minor BBS outcrop with PPG veins
655	PDB	341461	6655164	503	17.11.2007			BBS	large BBS outcrop with S-vergent crenulations
656	PDB	341421	6655132	507	17.11.2007			BBS	greenish BBS
657	PDB	341397	6655127	525	17.11.2007			BBS	BBS hits breccia zone
658	PDB	341350	6655142	534	17.11.2007			BBS	some pieces of coarse green biot schist, BBS - continuation?
659	PDB	341323	6655148	529	17.11.2007			BBS	BBS more clear here
660	PDB	341287	6655204	528	17.11.2007			BBS	well-developedblack-green BBS
661	PDB	341332	6655211	560	17.11.2007		661	BBS	followed BBS from 660. Well-developed with blue cor & white cores. S-vergent crens
662	PDB	341369	6655259	525	17.11.2007			RCM	at pebble dyke, bt schists continue, but crossed by pale PPG with schist patches
663	PDB	341352	6655268	528	17.11.2007			BBS	biotite schist, may be BBS, includes weakly foliated PPG
664	PDB	341220	6655214	512	17.11.2007			BBS	PPG or qtzite band next to BBS
665	PDB	341054	6655104	496	17.11.2007			PPG	heavily altered PPG, possibly brecciated. Poor outcrop
666	PDB	341016	6655094	487	17.11.2007			GBR	brownish PPG breccia
667	PDB	340966	6655094	0	17.11.2007			GBR	pale quartzite-like breccia zone
668	PDB	341003	6655018	500	17.11.2007			RCM	dark psammititic metaseds

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669	PDB	341006	6655015	0	17.11.2007			PPG	contact seds (N) and PPG (S)
670	PDB	341033	6655035	502	17.11.2007			GBR	PPG cut by PPG-like breccia
671	PDB	341130	6654979	497	17.11.2007			QFG	small LMG outcrop in are with no outcrop
672	PDB	341000	6654965	503	17.11.2007			BBS	patch of BBS with big trm xx, cannot follow far to N
673	PDB	341092	6654949	504	17.11.2007			BBS	follwoed same BBS to south
674	PDB	341074	6654936	497	17.11.2007			BBS	layer BBS bends to W?
675	PDB	341052	6654936	507	17.11.2007			SBR	quartzite-like breccia, pale pinkish
676	PDB	340999	6654904	0	17.11.2007		676	MBR	PPG-quartzite-like breccia, clasts of q & PPG in brownish matrix
677	PDB	341237	6654865	507	17.11.2007			RCM	fine biot schist on edge of breccia zone
678	PDB	341301	6654909	509	17.11.2007			QFG	laminated granite
679	PDB	341304	6654926	506	17.11.2007			BBS	BBS appears to cut laminated granite & PPG o either side. To south all LMG
680	PDB	341060	6655267	506	17.11.2007			BBS	many loose pieces of BBS, probably in situ
681	PDB	341011	6655283	502	17.11.2007			BBS	minor outcrop of BBS, lose piece of fluorite
682	PDB	342129	6655346	533	18.11.2007		682	QFG	looks like LMG is altered RCM
683	PDB	342095	6655321	564	18.11.2007			QFG	LMG alternatig with Bt schists, with LMG probably fsp infiltration
684	PDB	342078	6655352	562	18.11.2007			PPG	gradually getting into full PPG with only remnants of older foliation
685	PDB	342076	6655374	562	18.11.2007			RCM	Fsp-impregnated metasediments, cust by 2m wide breccia zone
686	PDB	342073	6655396	571	18.11.2007			RCM	clear fsp-sill-q-gneiss, follwoed from 684
687	PDB	342008	6655446	572	18.11.2007		687A-B	GBR	MGQ-rich (nail qtz) breccia zone with pink fsp(?), >10 m wide
688	PDB	341988	6655406	569	18.11.2007			RCM	q-fsp-gneiss, just S of >40 m breccia with MGQ
689	PDB	341925	6655316	567	18.11.2007		689	BBS	crenulated BBS adjacent to LMG wit q p'clasts
690	PDB	341876	6655303	550	18.11.2007			MBR	MGQ-rich breccia
691	PDB	341841	6655297	547	18.11.2007			MBR	more MGQ-rich breccia, zone splitting into 2
692	PDB	341807	6655289	535	18.11.2007			MBR	on main >20 m wide breccia zone
693	PDB	341794	6655263	521	18.11.2007			MBR	end of side shoot of pinkish quartzitic breccia, no more MGQ-veins
694	PDB	341805	6655234	527	18.11.2007			RCM	fine-grained schists
695	PDB	341822	6655196	539	18.11.2007			MBR	breccia band (with MGQ) inside mostly LMG, some schists
696	PDB	341811	6655182	537	18.11.2007			BBS	schists with some BBS, include trm and white p'blasts
697	PDB	341779	6655188	532	18.11.2007			BBS	same lithology as 696, losing BBS here
698	PDB	341833	6655180	535	18.11.2007			BBS	BBS band crosses quartzitic breccia zone here
699	PDB	341879	6655190	523	18.11.2007			BBS	BBS may be continuation from 698, surrounded by RCM
700	PDB	341917	6655180	516	18.11.2007			BBS	probably BBS, hard to follow
701	PDB	341877	6655128	516	18.11.2007			QFG	LMG with q augen
702	PDB	341795	6655026	505	18.11.2007			RCM	quartzitic and laminated RCM. Thin pegmatitic veins / leucosomes
703	PDB	341740	6654975	504	18.11.2007			RCM	again quartzitic rcm with biotite schist
704	PDB	341696	6655045	517	18.11.2007			QFG	whole hillside is pinkish laminated granite
705	PDB	341639	6655086	535	18.11.2007			SBR	>40m wide breccia zone, some biot schist pieces, increasing PPG alteration
706	PDB	341755	6655225	521	18.11.2007			BBS	BBS showing alteration to fsp
707	PDB	341744	6655233	521	18.11.2007			BBS	BBS (same as 706?) and small aplitic breccia zone
708	PDB	341727	6655221	512	18.11.2007			BBS	end of traceable BBS, rest strongly PPG-altered RCM
709	PDB	341721	6655298	521	18.11.2007			PPG	massive red PPG, no foliation
710	PDB	341762	6655300	527	18.11.2007			GBR	breccia band, quite thin, some MGQ
711	PDB	341819	6655339	521	18.11.2007		711A-C	PPG	whole hillside is RCM replaced by PPG. Some magnetite
712	PDB	341812	6655359	530	18.11.2007			BBS	some BBS, but not sure in situ
713	PDB	341877	6655394	581	18.11.2007			PPG	whole hillslope PPG, some loose pieces of BBS
714	PDB	341886	6655409	585	18.11.2007			GEE	1m2 blob of MGQ with rest-space filled with calcite
715	PDB	341919	6655460	592	18.11.2007			PEG	yellowish pegmatite - very coarse PPG alteration of orig. seds

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716	PDB	341886	6655542	591	18.11.2007		716	MBR	large MGQ+breccia band, some haem
717	PDB	341808	6655579	606	18.11.2007			PPG	somewhat broken PPG with thin MGQ-veins and vague remnant foliation
718	PDB	341765	6655691	648	18.11.2007			PPG	same band with thin MGQ dissol. Vugs. Also some Mt.Neill like LMG
719	PDB	341674	6655647	606	18.11.2007			GBR	inside PPG of Radium Ridge, patch of MGQ (no haem)
720	PDB	341738	6655467	578	18.11.2007			GBR	breccia of PPG with MGQ and specular haem
721	PDB	342044	6655514	592	18.11.2007		721	RCM	PPG-altered metased with large "eggs", just N of breccia zone
722	PDB	340657	6655498	566	19.11.2007			PPG	some non-foliated PPG on track - poor outcrop
723	PDB	340745	6655644	567	19.11.2007		723	PPG	PPG, clearly with fsp infiltration. No foliation, minor brecciation
724	PDB	340703	6655585	536	19.11.2007		724	GBR	increasing brecciation of PPG, here dark brown-black matrix
725	PDB	340813	6655526	525	19.11.2007		725	SBR	brecciated biot schist, brown altered, fine schist
726	PDB	340811	6655483	521	19.11.2007			PEG	yellow-orange-weathering pegmatite with graphic q
727	PDB	340870	6655412	508	19.11.2007			MBR	massive PPG-qtzite breccia, striking 80° continuing to E
728	PDB	340874	6655389	511	19.11.2007			GEE	ca 25x25 m blob of Mt Gee quartz, no haem, empty nail holes
729	PDB	339654	6654442	425	19.11.2007			PPG	S-dipping, 30-40 m thick band of coarse, no foliation PPG
730	PDB	339657	6654471	415	19.11.2007			QTZ	quartzitic RCM, foliated pale grey - pinkish
731	PDB	339687	6654486	434	19.11.2007			QTZ	same as 730, but more biotite. Some pegatite lenses
732	PDB	339755	6654512	433	19.11.2007			QTZ	mostly fine qtzitic RCM, some minor BBS
733	PDB	339806	6654567	441	19.11.2007			RCM	fine biot schist, after crossing 10 m PPG band
734	PDB	339802	6654669	452	19.11.2007			PEG	biot-bearing pegmatite (looks "old")
735	PDB	339794	6654713	469	19.11.2007			QTZ	LMG-like quartzite, same unit as before (730-732)
736	PDB	339741	6654787	523	19.11.2007			RCM	qtzitic LMG with "egges" (fsp-sill aggregates)
737	PDB	339745	6654828	534	19.11.2007			QTZ	LMG-like quartzite, crenulated
738	PDB	340763	6654086	484	22.11.2007			BBS	BBS-layer between migmatite, just N of qtzite lyer
739	PDB	340801	6654090	797	22.11.2007			BBS	same BBS as 738
740	PDB	340838	6654099	519	22.11.2007			BBS	probably continuation from 739. Orient my be wrong due to slope creep
741	PDB	340825	6654163	514	22.11.2007			BBS	BBS and qtzite
742	PDB	340842	6654139	512	22.11.2007			BBS	continuation from 741, surrounded by PPG rubble
743	PDB	340959	6654051	534	22.11.2007			QTZ	quartzitic RCM with pegmatite lenses
744	PDB	341039	6654092	532	22.11.2007			QTZ	continuation from 743, more PPG. Some chlorite alteration of biot schist
745	PDB	341104	6654115	534	22.11.2007			PEG	pegatite, grading into PPG. No foliation, some brecciation
746	PDB	341065	6654125	513	22.11.2007		746	BBS	BBS with fine-grained biot schist or amphibolite
747	PDB	341031	6654122	510	22.11.2007			BBS	fine-grained biot schist & BBS, continuation of 746
748	PDB	341012	6654126	502	22.11.2007			BBS	same layer as 747
749	PDB	340985	6654148	480	22.11.2007		749	BBS	looks like mafic dyke, ere with coarse ?PX gneiss
750	PDB	340981	6654184	442	22.11.2007			QFG	LMG-like RCM, maybe some BBS just south of it
751	PDB	340981	6654162	463	22.11.2007			BBS	following BBS from just south of 750
752	PDB	341008	6654163	483	22.11.2007			BBS	exactly same layer as 751
753	PDB	341084	6654175	496	22.11.2007			RCM	metaseds and LMG-like gneiss
754	PDB	341125	6654217	499	22.11.2007			MBR	quartzitic-pegmatitic breccia zone, straight, trending 100. Wall rock migmatitic RCM
755	PDB	341146	6654236	502	22.11.2007			RCM	q-fsp-sill gneiss
756	PDB	341138	6654270	505	22.11.2007			SBR	pale quartzitic breccia
757	PDB	341054	6654256	485	22.11.2007			RCM	RCM gneisses. Up slope mostly PPG
758	PDB	341052	6654211	475	22.11.2007			RCM	coarse RCM with much biot and pegmatite veins
759	PDB	340981	6654251	456	22.11.2007			RCM	same package of coarse RCM with biot & pegm veins
760	PDB	340949	6654228	449	22.11.2007			BBS	fine ?biot schist or mafic dyke, with some BBS
761	PDB	340875	6654286	453	22.11.2007			BBS	BBS and biotite-rich schist
762	PDB	340718	6654286	453	22.11.2007			RCM	blueish RCM, structurally above BBS

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763	PDB	339617	6654330	0	23.11.2007				water tank at Mount Painter Camp
764	PDB	339621	6654456	437	23.11.2007			RCM	RMC at contact with PPG to N
764b	PDB	339621	6654461	0	23.11.2007			PPG	PPG band in RCM
765	PDB	339623	6654492	458	23.11.2007			PPG	N-contact PPG to RCM
765b	PDB	339623	6654497	0	23.11.2007			RCM	RCM just north of contact
766	PDB	339611	6654520	462	23.11.2007			BBS	small BBS band (<0.5 m)
767	PDB	339613	6654540	465	23.11.2007			QTZ	Red LMG-like quartzite
768	PDB	339622	6654583	484	23.11.2007			QTZ	same striped, LMG-like quartzite
769	PDB	339651	6654572	479	23.11.2007			PPG	PPG band with shallower foliation than host qtzite
770	PDB	339655	6654592	474	23.11.2007			PPG	end of PPG band of 769
771	PDB	339653	6654606	482	23.11.2007			BBS	qtzitic RCM, with N-vergent folded pegamtite veins, above BBS
772	PDB	339650	6654630	503	23.11.2007			BBS	followed BBS from 771, next to beginning of PPG lens
773	PDB	339645	6654643	506	23.11.2007			BBS	BBS between gneiss with eggs
774	PDB	339638	6654666	517	23.11.2007			BBS	end of BBS into coarse pegmatite
774inf	PDB	339651,5	6654672	0	23.11.2007			PPG	PPG lens
775	PDB	339665	6654678	504	23.11.2007			QTZ	LMG-like RCM at other end of PPG lens
776	PDB	339661	6654642	501	23.11.2007			PPG	same PPG-QTZ contact
777	PDB	339648	6654638	502	23.11.2007			PPG	west edge of PPG blob
777b	PDB	339643	6654638	0	23.11.2007			QTZ	QTZ just W of PPG
778	PDB	339644	6654683	516	23.11.2007			PPG	N end of PPG blob
778b	PDB	339644	6654688	0	23.11.2007			QTZ	QTZ just north of PPG blob
779	PDB	339617	6654762	543	23.11.2007			BBS	BBS just north of PPG
780	PDB	339651	6654747	534	23.11.2007			BBS	followed BBS - RCM contact
781	PDB	339664	6654748	527	23.11.2007			PPG	10m wide PPG band flanked by PPG-ed RCM
782	PDB	339628	6654777	546	23.11.2007			PPG	followed PPG band from 781 up to ridge, always 10-15m wide
783	PDB	339649	6654813	0	23.11.2007			QTZ	reddish qtzitic RCM with some biot schist
784	PDB	339679	6654821	541	23.11.2007			QTZ	qtzitic schists with biotite, partly turned massive red with poor foliation
785	PDB	339694	6654810	539	23.11.2007			SBR	quartz lens with brecciation, traced from 783
786	PDB	339779	6654796	516	23.11.2007		786	QTZ	LMG-like quartzite with magnetite xx
787	PDB	339828	6654867	508	23.11.2007			QTZ	same qtzite + magnetite
788	PDB	339873	6654882	503	23.11.2007		788	QFG	qtz is now graded into q-fsp granite-like gneiss
789	PDB	339921	6654923	0	23.11.2007		789	QFG	gneiss with larger fsp and some biot. Ortho/paragneiss?
790	PDB	339953	6654905	500	23.11.2007			PEG	q-rich pegmatite blob 20x20 m
791	PDB	339960	6654876	485	23.11.2007		791	QFG	same QFG qtzite-geniss as 789
792	PDB	339986	6654840	475	23.11.2007			QFG	S-contact of ortho/paragneiss
793	PDB	340047	6654761	457	23.11.2007		793	PPG	lower edge of PPG, conatining some RCM with biotite
794	PDB	340039	6654731	0	23.11.2007		794	PPG	PPG with remnants of biotite (chlorite) schist
795	PDB	340041	6654715	453	23.11.2007			PPG	end of PPG, RCM to south
796	PDB	340029	6654644	0	23.11.2007		796	PPG	mostly PPG with remnants of schists
797	PDB	340011	6654572	465	23.11.2007			QTZ	first recognisable massive pink LMG-like quartzite
798	PDB	340029	6654541	450	23.11.2007			BBS	RCM and BBS above qtzite-layer. BBS with spinel/corundum
799	PDB	340023	6654526	466	23.11.2007			QTZ	LMG quartzite on contact with RCM, with qtzite more biot schist
800	PDB	340004	6654480	476	23.11.2007			PPG	E-edge of PPG band
801	PDB	340029	6654604	458	23.11.2007			QTZ	quartzite, turned into LMG-like gneiss
802	PDB	341042	6655232	493	24.11.2007		802A-E	SBR	fluorite in sed breccia, brown, soft, biot-chlor rich
803	PDB	340982	6655181	486	24.11.2007			RCM	somewhat brecciated, altered (PPG-like) crappy metaseds w. clay-calcite veins
804	PDB	340983	6655164	484	24.11.2007			MBR	breccia with pinkish matrix

outcrop	geologist	easting	northing	elevation	date	photos	sample	rocktype	description PPG=pink pegmatitic granite, RCM=radium creek metamorphics, GEE=Mt. Gee Quarz, MNG=Mt Neil granite, BBS=black biotite shist, CON=Boundary/contact, HBR=hematitic breccia, GBR=granitic breccia, SBR=sedimentary breccia, MBR=mixed breccia, QTZ=quartzite, FLU=flourite, PEB=pebble dyke, UNK=unknown, UNC=unclear.
805	PDB	340937	6655140	492	24.11.2007			BBS	relatively fresh BBS, wavy. Subhorizontal fol may ba falled slabs
806	PDB	340930	6655149	497	24.11.2007			BBS	same BBS as 805
807	PDB	340922	6655159	493	24.11.2007			BBS	same BBS as before
808	PDB	340894	6655199	496	24.11.2007			RCM	dark-brown weathering quartzitic bt schist, some brecciation
809	PDB	340851	6655224	492	24.11.2007		809	MBR	quartzitic breccia, but greenish when fresh
810	PDB	340905	6655216	491	24.11.2007			MBR	same breccia as 809
811	PDB	340998	6655206	494	24.11.2007			MBR	probably same breccia in dark greenish RCM
812	PDB	340871	6655252	504	24.11.2007			RCM	dark green.brown altered psammitic RCM
813	PDB	340776	6655227	505	24.11.2007			RCM	same weathered RCM (bt schist) with irregular PG infiltration
814	PDB	340824	6655217	496	24.11.2007			GBR	PPG-like breccia
815	PDB	340836	6655197	500	24.11.2007			RCM	dark altered RCM schists
816	PDB	340820	6655119	501	24.11.2007			GBR	PPG-quartz breccia with dark altered RCM on S-side
817	PDB	340825	6655171	500	24.11.2007			GBR	continuation of fresh pink breccia
818	PDB	340838	6655159	498	24.11.2007			GBR	same breccia, cutting BBS band
819	PDB	340857	6655144	485	24.11.2007			BBS	same BBS band next to breccia
820	PDB	340848	6655107	481	24.11.2007			MBR	brown PPG and RCM breccia
821	PDB	340918	6655097	479	24.11.2007			GBR	contination of breccia along creek
822	PDB	340808	6655122	485	24.11.2007			MBR	variably brecciated PPG with RCM clasts
823	PDB	340786	6654998	510	24.11.2007			PPG	mostly normal unfoliated PPG, with some brecciation and MGQ
824	PDB	340862	6654879	499	24.11.2007			MBR	mixed PPG and RCM breccia with minor MGQ
825	PDB	340854	6654847	500	24.11.2007			GBR	massive hard PPG breccia
826	PDB	340823	6654821	500	24.11.2007			MGU	band of MGU with rounded PPG clasts
827	PDB	340812	6654761	480	24.11.2007			MGU	south end of MGU band, in contact with brecciated PPG. Much haematite
828	PDB	340853	6654750	480	24.11.2007			SBR	chunky brown-weathering RCM
829	PDB	340938	6654873	480	24.11.2007			GBR	pink PPG breccia zone, 20 m wide normal to creek
830	PDB	340934	6654940	484	24.11.2007			QFG	LMG-like metaseds, reddish, bit broken-up, but visible lamination
831	PDB	340942	6654976	477	24.11.2007			RCM	PPG-infiltrated RCM, some biot schist and qtzite-like breccia
832	PDB	340962	6655014	482	24.11.2007			BBS	many loose BBS pieces, just N of PPG breccia cutting RCM
833	PDB	340736	6655267	512	24.11.2007			GBR	pink to dark PPG breccia
834	PDB	340752	6655368	497	24.11.2007			GBR	dark pink PPG breccia with some RCM clasts
835	PDB	340734	6655408	512	24.11.2007			MBR	N-contact of PPG breccia to RCM breccia
836	PDB	340697	6655421	531	24.11.2007			GBR	massive, smooth weathering PPG breccia
837	PDB	340584	6655415	554	24.11.2007			MBR	granular, quartzitic-looking breccia
838	PDB	340695	6655291	534	24.11.2007			MBR	fluorite veins in very altered pink-grey-white PPG breccia. Some foliated RCM
839	PDB	340639	6655215	536	24.11.2007			GBR	poor outcrop, some dark, red-brown weathering PPG breccia
840	PDB	340614	6655201	545	24.11.2007			MGU	MGQ with RCM clasts. Big nail hole quartz veins
841	PDB	340558	6655259	560	24.11.2007			GBR	reddish PPG breccia
842	PDB	340461	6655311	0	24.11.2007			SBR	breccia with recognisable biot schist patches
843	PDB	340426	6655354	605	24.11.2007			GBR	hard orange PPG breccia surrounded by soft altered breccia
844	PDB	340430	6655372	596	24.11.2007			GBR	massive, smooth weathering PPG breccia with some MGQ
845	PDB	340461	6655473	0	24.11.2007			PPG	no clear brecciation in PPG
846	PDB	340753	6655474	515	24.11.2007			PPG	chunky PPG, probably only minor brecciation
847	PDB	340784	6655222	502	24.11.2007			RCM	dark, fine biotite schist
848	PDB	340749	6655200	501	24.11.2007			GBR	PPG breccia in poor outcrop area
849	PDB	340732	6655203	0	24.11.2007			GBR	breccia may connect up to 839
850	PDB	340756	6655155	490	24.11.2007			RCM	only floats of greenish biot schist
851	PDB	341038	6654963	497	25.11.2007			RCM	heavily PPG impregnated RCM

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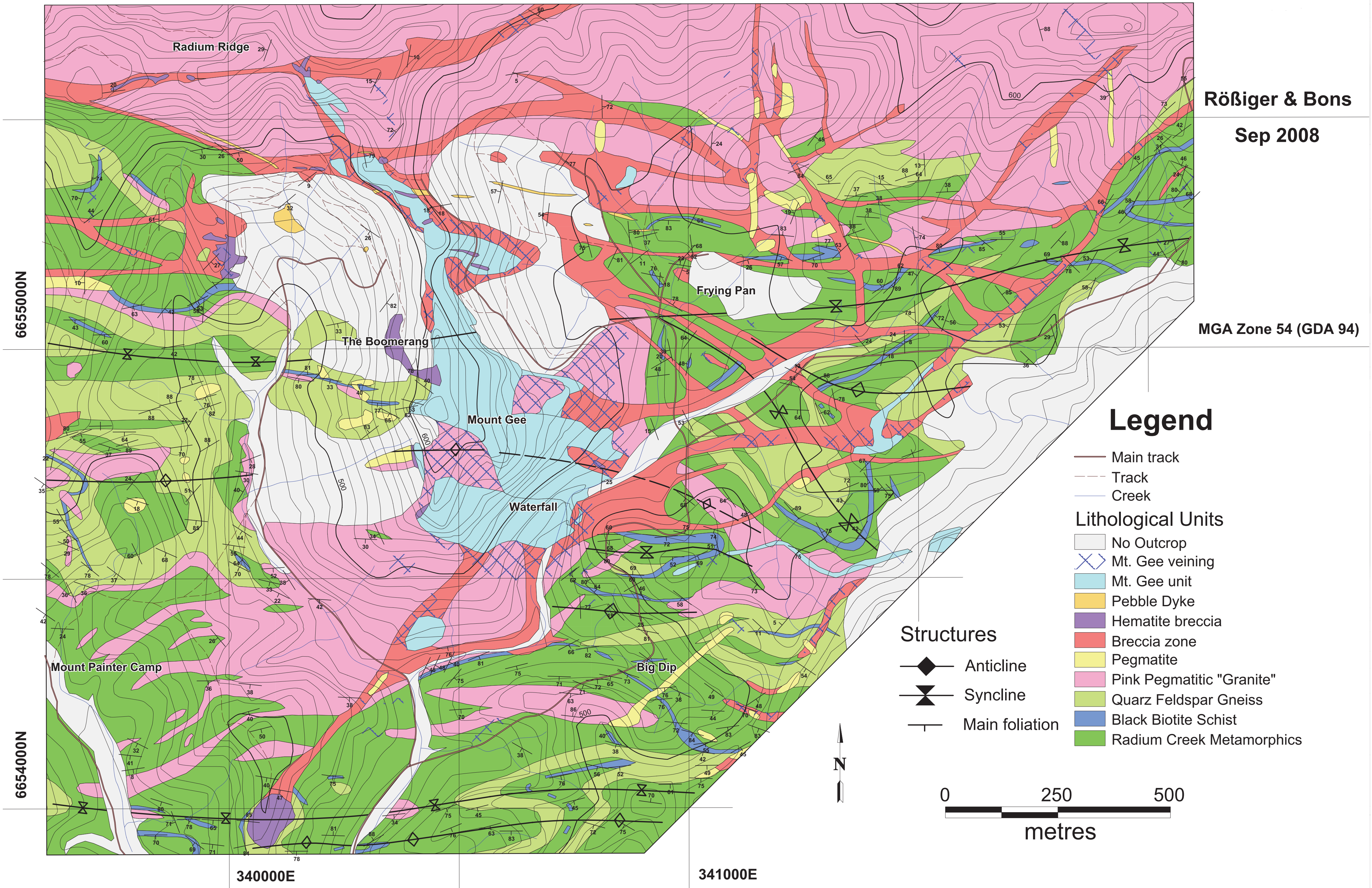
852	PDB	341095	6654920	481	25.11.2007			GBR	smooth weathering pink PPG band, SE of 2 bands
853	PDB	341002	6654794	481	25.11.2007				middle of Mt Gee East turn off from RTT
854	PDB	341232	6654947	491	25.11.2007			GBR	small breccia zone
855	PDB	341229	6654957	486	25.11.2007			MBR	grey qtzite-like breccia, strike 130, vertical
856	PDB	341264	6654895	507	25.11.2007			GBR	pale smooth-weathering PPG breccia, trend 120, steep
857	PDB	341317	6654887	513	25.11.2007			GBR	PPG breccia inside RCM. Breccia increasing to top hill w some MGQ
858	PDB	341285	6654857	514	25.11.2007			QFG	contact brown-weathering laminated qtzite LMG and RCM
859	PDB	341125	6655295	515	25.11.2007			GBR	PPG breccia, pink, massive almost pegmatitic
860	PDB	341223	6655207	514	25.11.2007			GBR	pink-grey PPG breccia cutting sediments with BBS
861	PDB	341293	6655180	534	25.11.2007			PPG	unbrecciated pink PPG, from fine-grained to pegmatitic
862	PDB	341365	6655330	540	25.11.2007			RCM	gneissic, ranite-looking PPG with ?magn patches
863	PDB	341301	6655359	528	25.11.2007		863	QFG	laminated gneiss is infiltrated and altered to PPG
864	PDB	341284	6655380	556	25.11.2007			RCM	brown-green fine biot schist. PPG to NW
865	PDB	341247	6655427	556	25.11.2007			RCM	metasediments, inclusing BBS
866	PDB	341275	6655460	558	25.11.2007			QFG	metasediments, mostly LMGlike and some PPG
867	PDB	341377	6655455	569	25.11.2007			PPG	crest is al PPG, massive pink fine grained. Some brecciattion
868	PDB	341443	6655413	562	25.11.2007			QFG	QFG laminated gneiss, almost PPG loking
869	PDB	341474	6655371	553	25.11.2007			QFG	clear, pale laminated gneiss
870	PDB	341502	6655363	547	25.11.2007			RCM	biotite schist
871	PDB	341546	6655328	531	25.11.2007			RCM	contact RCM (N) with PPG (S)
871b	PDB	341546	6655323	531	25.11.2007			PPG	contact RCM (N) with PPG (S)
872	PDB	341371	6655470	568	25.11.2007			GBR	PPG breccia on ridge, pink-grey, massive
873	PDB	340967	6655513	521	25.11.2007			RCM	rubble of brown-altered RCM
874	PDB	340908	6655479	510	25.11.2007			GBR	breccia zone in PPG with some haem and MGQ. Continues to E
875	PDB	335756	6659905	654	26.11.2007		875A-B	MNG	Mt Neill Gneiss E of Petalinka WF, with Kfsp alteration
876	PDB	335763	6659910	665	26.11.2007		876	MNG	unconf contact MNG with ?Shanahan conglomerate?
877	PDB	333964	6661569	507	26.11.2007			Adelaidean	fault-collapse structures in Tapley Hill formation
878	PDB	335314	6649746	504	26.11.2007			MNG	pegmatite intruding ex-MNG at Nooldoonooldoona WH
879	PDB	339970	6655139	508	27.11.2007			BBS	greenish BBS
880	PDB	339934	6655102	500	27.11.2007			BBS	same BBS
881	PDB	339861	6655088	509	27.11.2007			BBS	same BBS
882	PDB	339793	6655093	531	27.11.2007			BBS	same BBS
883	PDB	339752	6655122	555	27.11.2007			BBS	same BBS, then lost under pegmatite rubble
884	PDB	339699	6655177	584	27.11.2007			QTZ	quartzite north of large pegatite patch
885	PDB	339714	6655286	611	27.11.2007			BBS	BBS north of breccia zone
886	PDB	339680	6655327	0	27.11.2007			RCM	normal biotite schist in RCM
887	PDB	339696	6655347	6,7	27.11.2007			BBS	same strat level as 886, ere real BBS
888	PDB	339703	6655373	630	27.11.2007			QFG	quartzitic RCM
889	PDB	339719	6655410	635	27.11.2007			BBS	BBS pieces next to qtzitic gneiss (QFG)
890	PDB	339801	6655444	625	27.11.2007		890	RCM	fine black ?biotite schist or mafic dyke?
891	PDB	340504	6652883	372	27.11.2007		891	MAF	mafic dyke in Radium Creek
892	PDB	341032	6654142	508	28.11.2007			BBS	BBS-mafic association
893	PDB	341024	6654126	511	28.11.2007		893AB	BBS	BBS-mafic dyke association with coarse ?gabbro

APPENDIX III

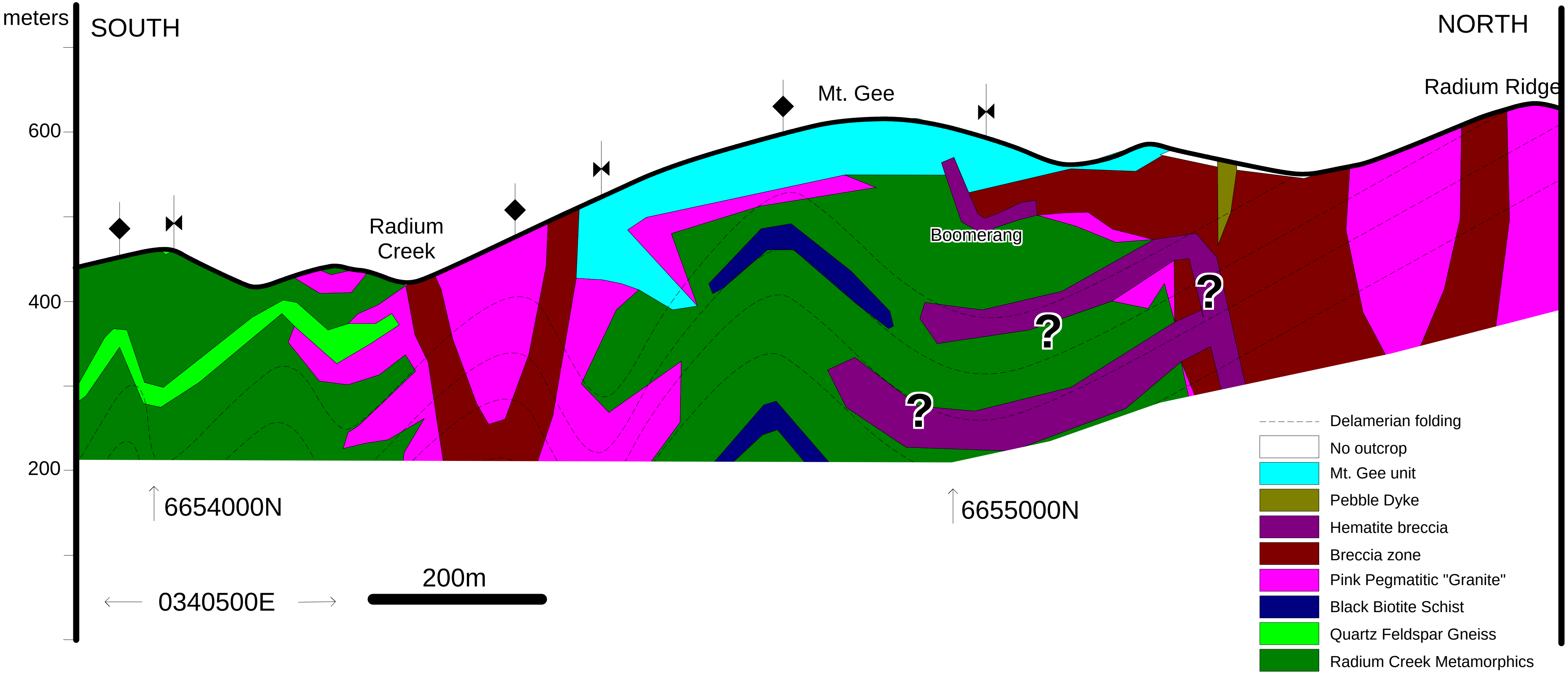
MAP

Geologic map of the Mt. Gee area, Mt. Painter Inlier, Flinders Ranges, SA



APPENDIX IV

CROSS SECTION



Appendix IV: Cross section along the NS-line 0340500E through the mapping area. For extrapolation the western part of the mapping area was used, because folding is more regular in that area. According to drill core data from Marathon Resources horizontal hematite structures can be found beneath the area around Mt. Gee. Therefore it was thought of possible synclinal structures at depth like the Boomerang is at the surface. Note that lenses of haematite breccia and Black Biotite Schist are drawn schematically to illustrate their typical occurrence and position in the stratigraphy, respectively.