ROCKS & LANDSCAPE NOTES

MT ARCHER & BERSERKER RANGE

by Simon Crouch

From a distance, Rockhampton seems to be dominated by a block of impressive mountainous country extending away to the north and east. Mount Archer rises steeply from the northern suburbs of the city itself, and the Berserker and Flat Top Ranges continue southwards to near the mouth of the Fitzroy River at Broadmount. Why are these mountains here, and what are they made of? For answers we must go back to ancient times, as far as the Permian period, about 255-280 million years ago.

How the Berserker Range was formed

In this region the early Permian was a time of extension (stretching) of the continental crust, which caused the area to sag, and subsequently fracture along major faults. The event caused two phenomena – 1) the subsidence of sea floor to form laterally restricted basins, and 2) the commencement of volcanism.

An extensive arc of volcanic mountains consequently developed offshore from the coastline, which at that time was probably much further west than at present. This gave rise to a package of volcanic and sedimentary rocks, whose remnants now form the mountainous terrain of the Berserker Range. Near Rockhampton the rocks have been divided into the *Berserker Group* (about 275 to 270 million years old) and *Warminster Formation* (255 million years old). They continue northwards as far as Mount Etna, and southwards to near Mount Larcom.

The rocks are believed to have been deposited on the continental shelf, in a marine environment with a depth of probably no more than 200 metres. This is based on the presence of fossilised marine fauna, such as molluscs, brachiopods and bryozoans which are indicative of this type of environment. The continental shelf to the west was formed on older rocks of Devonian to Carboniferous age.

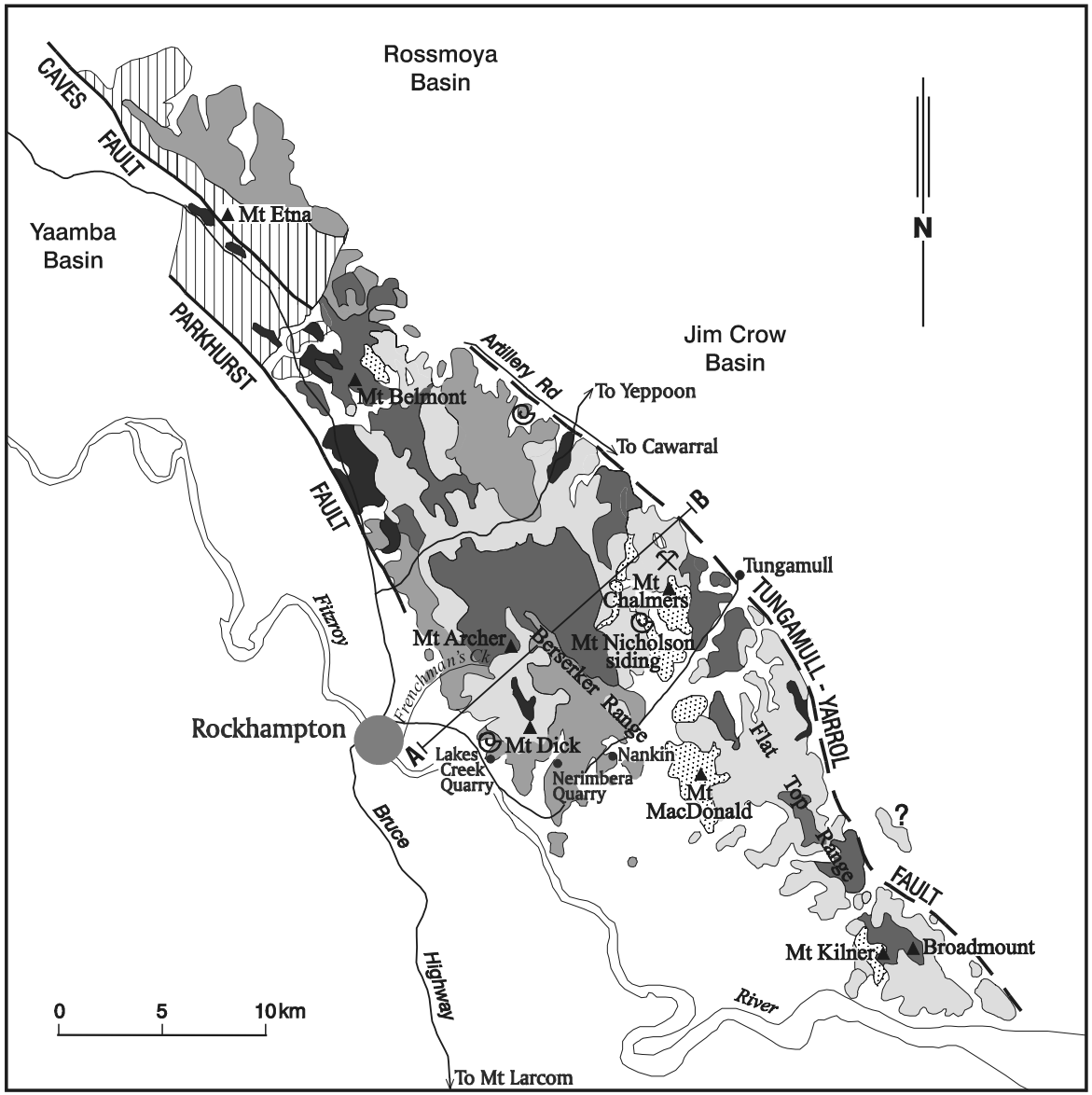
There are also masses of solidified magma which have intruded the volcanics and sediments, presumably under the flanks of the ancient volcanoes. The most extensive of these are the dark grey rhyolites and dacites which now form many of the mountains peaks in the area, for example, Mount Archer and Cabbage Tree Hill. Smaller, younger intrusions in the form of dykes and sills are found throughout the area with compositions including andesite, basalt, rhyolite, gabbro, and granite. Map 1 shows the geology of the area.

The rock types present

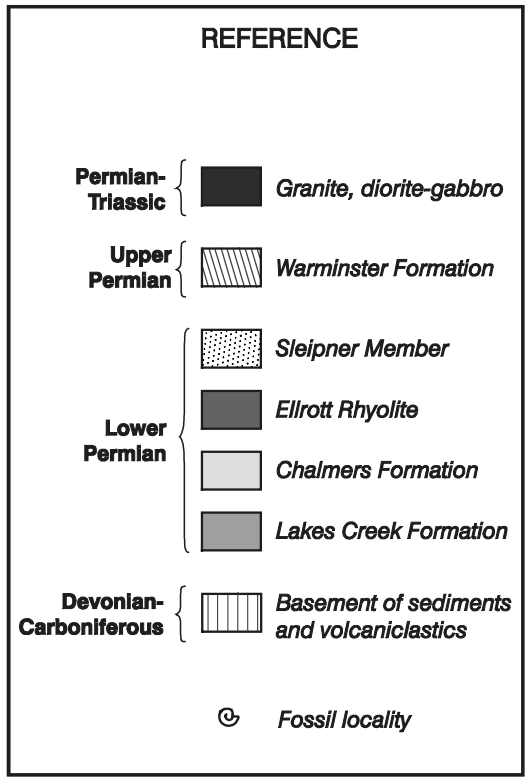
Two domains of volcanics and sediments evolved (Figure 1). The first represents areas where silts and fine to medium sands were deposited in the early restricted basins. These rocks are mapped as the *Lakes Creek Formation*, of the *Berserker Group*, and are found at the Lakes Creek Quarry and the Nerimbera Quarry, where they form a thick, monotonous sequence. These rocks also occur west of Artillery Road, and several kilometres east of Mount Etna.

The second domain has similar sediments but these are interbedded with volcaniclastic rocks sourced from eruptive centres in and around the area. This unit is named the *Chalmers Formation*, of the *Berserker Group*, and is the most widespread, being found from Mount Belmont south to the Fitzroy River. The primary volcaniclastic rocks are dominantly rhyolite and dacite pyroclastics (fragmental rocks from explosions). These rocks are relatively rich in silica, potassium and sodium, and poor in iron and calcium. There are also volcaniclastics derived from the reworking of the primary volcanics during the intervals between volcanism. They range from fine grained sands to pebble sized breccias. A unique green-grey unit called the *Sleipner Member* is dominated by pebble to boulder sized clasts of rhyolite, dacite, and andesite, and probably represents large mass movements of volcanic material down the slopes of volcanoes. This unit can be seen at Mount MacDonald, Mount Chalmers, Mount Belmont, and Mount Kilner.

The large rhyolite to dacite masses, defined as the *Ellrott Rhyolite* of the *Berserker Group*, intrude the other formations, and are the possible source material eroded to form the *Sleipner Member*. They are dark grey and tend to have a speckled appearance because of a fine groundmass with coarser crystals of feldspar. The rocks are very resistant to weathering and erosion, and are found throughout the Berserker Range at Mount Archer, Cabbage Tree Hill, Mount Nicholson, Badger Mountain, and Mount Sleipner; and Mount Belmont, Mount Kilner and Broadmount. Numerous, less pronounced bodies exist such as the outcrop on either side of Emu Park Road two kilometres south-west of Tungamull.



Map1 - Geology of the Berserker Range



Evidence of subsequent magma intrusion can be seen in the form of small andesite, rhyolite, and gabbro bodies. The latter is restricted to the eastern side of the Parkhurst Fault, a linear zone of weakness exploited by these gabbro intrusions. They commonly occur along the Bruce Highway, north of Rockhampton. One of these gabbro bodies is found at Mount Berserker. There are also rare, small bodies of granite which are rich in quartz, feldspar, and biotite. One example can be seen south-west of the Cawarral turnoff on the Rockhampton-Yeppoon Road.

Little is known about the *Warminster Formation* only to say that it is the youngest Permian unit in the area, is sedimentary and is sourced from volcanic rock. Situated 500 metres north of Mount Chalmers mine, it was deposited on the *Berserker Group* after a 15 million year hiatus. The unit's relationship with the intrusives is unknown.

Subsequent movements

In the middle to late part of the Permian period, (265 to 250 million years ago) major movements in the crust along the northeastern edge of the Australian continent saw the rocks of the volcanic arc hardened, compressed (folded), and thrust upwards to form mountainous terrain. The *Berserker Group* and *Warminster Formation* represent a large slice of these rocks which were thrust westward as a block between two major faults (breaks in the crust), the Parkhurst Fault to the west, and Yarrol-Tungamull Fault to the east.

There is no evidence of further activity until the Cretaceous to Tertiary periods, (less than 135 million years ago). At this time there appears to have been lateral movement along the Parkhurst and Tungamull-Yarrol Faults resulting in formation of the Jim Crow Basin to the east, and Yaamba and Rossmoya Basins to the north. These basins were subsequently filled with sediments. The elevated terrain of the Berserker Range may be due to a combination of the resistant rock types, and possible uplift of the region during the Cretaceous-Tertiary period.

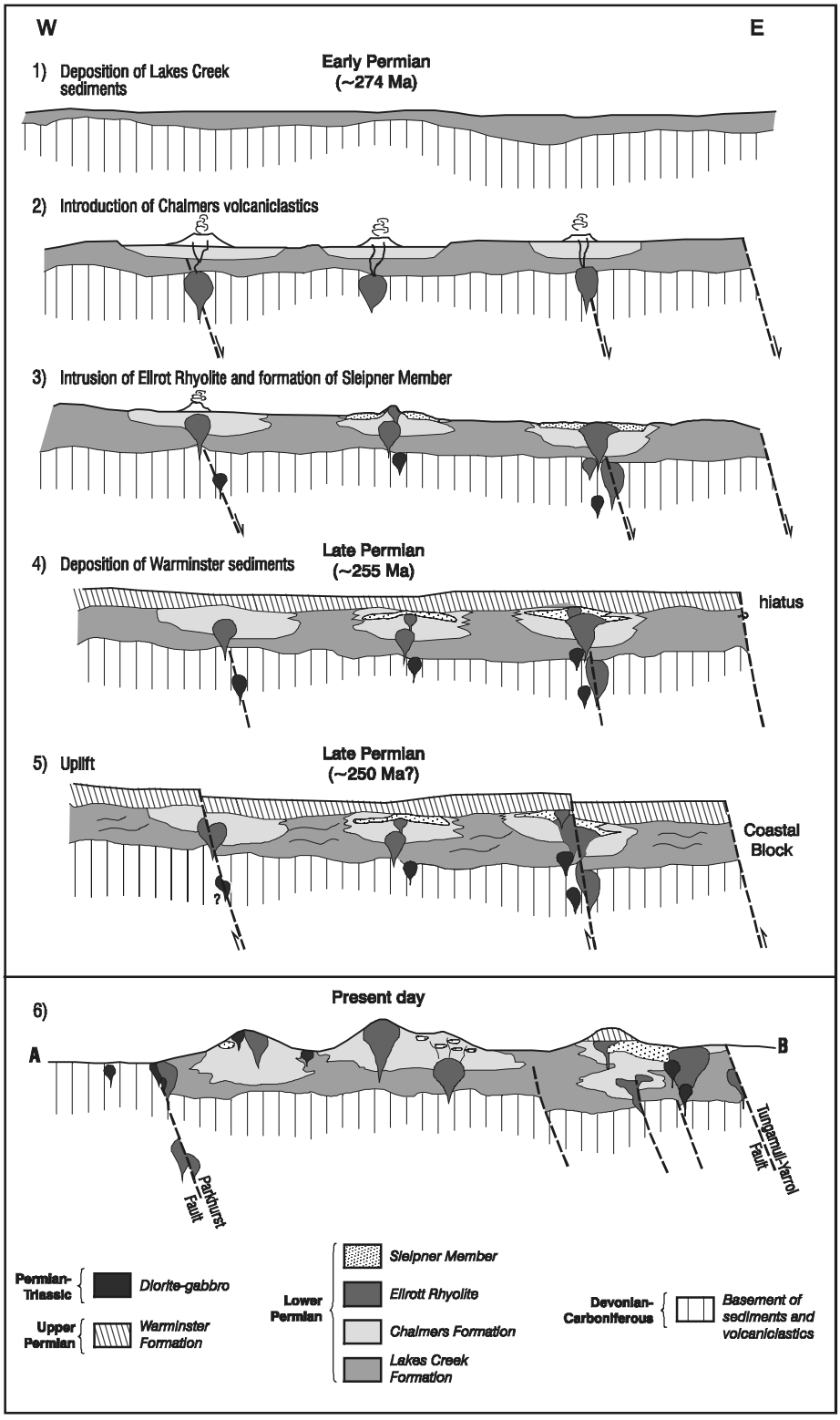


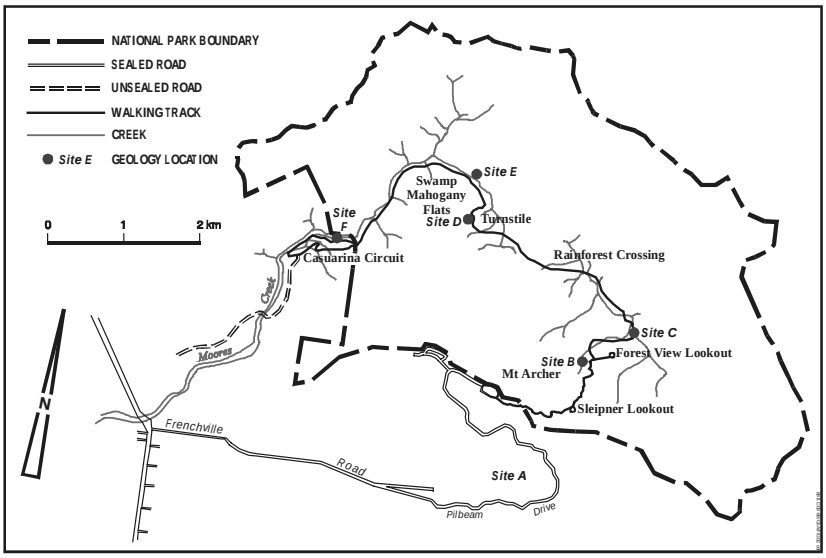
Figure 1: Schematic sections depicting the formation of units identified in the Rockhampton region. (Present day section A-B is defined on Map1)

Formation of today's landscape

Since Permian times, the original terrain has been transformed by the agents of erosion. The Berserker Range and the other nearby mountains of today may represent only a remnant of a much larger area of similar volcanic rocks.
The terrain of this Permian belt of rocks is quite varied. It ranges from flat, unobtrusive country as seen to the west of Artillery Road, and on the flood plains south of Nankin, to deeply incised, steep mountains represented by the Berserker Range, Flat Top Range, Mount Belmont, Mount Kilner, and Broadmount.

The mountains are usually comprised of the resistant rhyolite to dacite intrusive bodies. However, there are

exceptions such as Mount Dick and Mount MacDonald, which are dominated by massive breccia. Flat Top Range is dominated by interbedded sediments and volcanics which occur adjacent to large resistant intrusives. The composition of the rocks forming the mountainous country resulted in shallow soils of only low to moderate fertility. In contrast the lower terrain formed on soft sedimentary rocks, which are easily weathered and eroded, are deeper and more fertile. Subdued topography surrounding the Berserker Range represent easily weathered, older Devonian to Carboniferous rocks.



Map2 - Geological sites in and around the Mount Archer National Park

Mineralisation

Five kilometres north of the Emu Park Road is the abandoned Mount Chalmers mine. Discovered late last century this gold, copper, lead, and zinc deposit is believed to have formed from metal-rich volcanic solutions enriching sediments being deposited nearby. Two kilometres south of Mount Chalmers are the gold deposits of New Zealand Gully. These deposits formed by solutions penetrating along fractures in the rocks to form quartz-gold veins. Both types of deposit are hosted by rocks of the *Chalmers Formation*.

From the Rockhampton-Yeppoon Road south-east to the Fitzroy River, small mineral deposits are known to exist. All are small and uneconomic and are found where small to moderately sized intrusive bodies intrude the surrounding rocks.

Looking at the rocks

Mount Archer National Park

The Mount Archer National Park is dominated by the large rhyolite to dacite intrusives which are responsible for the high terrain of the area. These bodies intrude the sediments and volcaniclastics of the *Chalmers Formation*. Several sites in the Park illustrate the geology (see Map 2).

Site A - The middle and lower road cuttings along Pilbeam Drive exemplify the bedded (layered) volcaniclastics and sediments of the *Chalmers Formation*. The last kilometre of road up to the summit cuts a massive and resistant dark grey rhyolite body of the *Ellrott Rhyolite*.

Site B – The rock where the walking track crosses a waterfall is a massive volcaniclastic rock of the *Chalmers Formation* composed of feldspar crystals, rock clasts, and pumice. This outcrop is similar to the volcaniclastics seen at Site A.

Site C – Within Moore's Creek is a platform of thickly bedded siltstone of the *Lakes Creek Formation* which dips towards the west at approximately 40 degrees.

Site D – At the turnstile is an extensive outcrop of *Ellrott Rhyolite* at the base of Mount Archer. This is a similar rhyolite body to the one seen at Site A.

Site E – There is a large platform of volcaniclastic rock exposed in the creek at this site. This rock looks crystal rich but if you splash the rock surface you can see small rock fragments in the rock outcrop. This is a similar rock to that found at Site B.

Site F – An abandoned pit which was quarried for rock of the *Ellrott Rhyolite*, and used for road gravel.

Fossil sites

Fossilised marine fauna, such as molluscs, brachiopods and bryozoans

can be found at Lakes Creek Quarry, Artillery Road, and Mount Nicholson siding (Map 1). These fossils are found in fine to medium grained sandstone, and reflects a marine, continental shelf environment, with a depth of probably no more than 200 metres.