Walk safely

Be prepared when bushwalking:

- Wear sturdy shoes, hat and sunscreen.
- Carry sufficient food and drinking water — allow 4 litres of water per person per day. Do not rely on tanks or creeks in the park for drinking water.
- Keep to the defined walking. trail.
- Inform a responsible person of your proposed route and expected time of return.
- Weather conditions can change quickly; ensure you have appropriate wet weather clothing.

HIKE – *Moderate*

- some moderate inclines
- irregular surface with loose, uneven base
- average level of fitness

HIKE – *Hard*

- some steep inclines
- irregular surface with loose, uneven base
- average level of fitness
- some hiking experience

First published 1994
Reprinted with additions 2011

(Cover image courtesy of SA Tourism Commission; photo 043528)

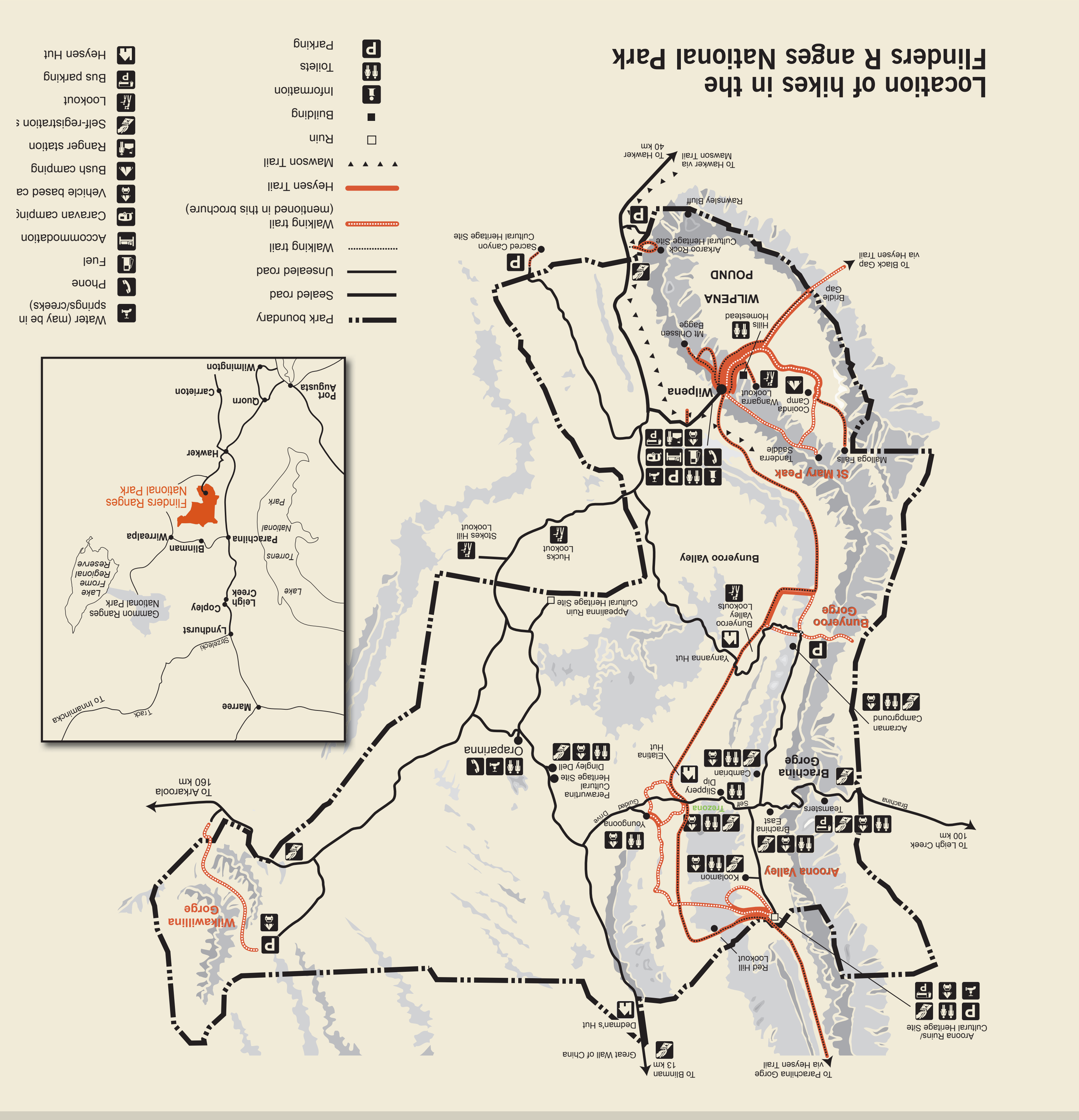
Heysen Trail cont.

The southern section, from Cape Jervis to Spalding in the Mid North, follows the Mount Lofty Ranges and is ideal for beginners and those with children.
The northern section, from Spalding to Parachilna Gorge, is isolated and at times rugged, providing a rewarding challenge for experienced walkers.

The trail has been designed to cater for both the serious backpacker walking the complete length, and for the day walker who might choose to do short walks along different sections.For futher information see <www.environment.sa.gov.au/parks/pdfs/FLRA_PDFS_PARK_GUIDE.PDF> and <www.heysentrail.asn.au/heysen_trail/>.

Trail		Time *	Distance	Trail Notes	Classification
Wilkawillina Gorge Hike		6 hours one-way	11.4 km one-way	Habitat of yellow-footed rock wallaby; unique geological features.	Hard
Bridle Gap Hike		6 hours return	18.8 return	The Wilpena Pound is filled mainly with recent alluvium; observe wildlife through the Pound.	Hard
Bunyeroo and Wilcolo Creeks Hike		5 hours return	9.2 km return	Native pine groves along hilltops; cool, gum-lined creeks.	Moderate
Haywards Huts Hike Network	Yuluna Hike	4 hours loop	8 km loop	This hike leads through the landscape that inspired artist Hans Heysen on his numerous visits to the Flinders Ranges.	Moderate
	Trezona Hike	4 hours loop	8.2 km loop	Discover fossils of some of the earliest lifeforms on Earth in the Trezona Formation.	Hard
	Aroona to Youngoona Hike	7 hours one-way	15 km one-way	A linear walk across the purple shale of the native pine-clad ABC Range to the limestone of the Trezona Range.	Hard
St Mary Peak Hike	direct route (outside trail)	6 hours return	14.6 km return	Breathtaking views of the central Flinders Ranges.	Hard
	loop route (inside trail)	9 hours return	21.5 km return		
Heysen Trail			1500 km	The Heysen Trail is generally open from April to October each year. It is closed during the Fire Danger Season. Dates vary from section to section, and from season to season.	

**Time is generously estimated from an average walking speed of 2 km per hour – allow extra time for resting and sightseeing.*



Location of hikes in the Flinders R anges National Park

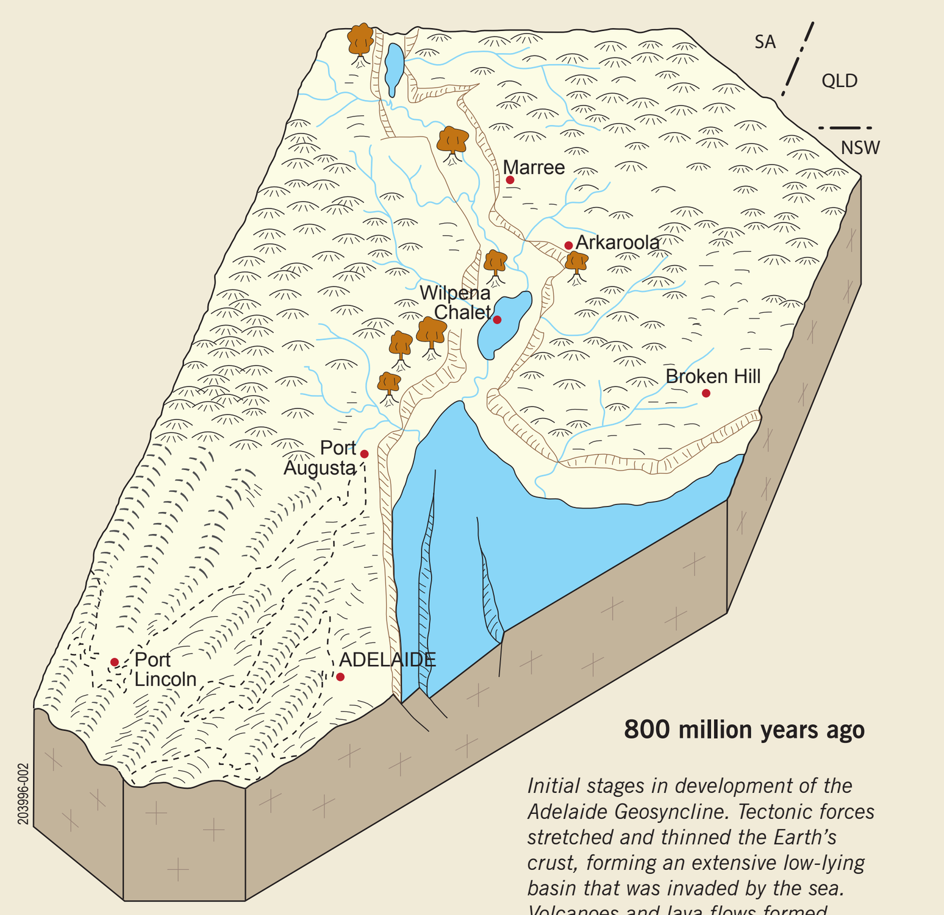
MER 203996

Geological history of the Flinders Ranges

The story of the Flinders Ranges began more than 800 million years ago during the Neoproterozoic Era, when the Earth was undergoing major changes in its crust and surface environments. The land was devoid of plants and animals, and the oceans were populated only by microscopic organisms. It was also a time of break-up of very large continental landmasses, similar to the much later (about 100 million years ago) break-up that formed the present continents.

The Flinders Ranges present a magnificent record of Earth history. With careful observations, the rocks displayed in the rugged ranges and colourful, gum-lined gorges can be read like a book, taking us on a long journey through time. This history is represented in a succession of rock layers, now tilted and eroded, and hence accessible at the Earth's surface. The layers consist of different types of mainly sedimentary rocks, each deposited under different conditions of environment and sediment supply. These rock layers, termed formations, are each up to hundreds of metres thick. They record repeated advances and retreats of the sea and changes in climate, including two major ice ages.

The oldest rocks seen in the Flinders Ranges National Park, the Callanna Group, provide clues to the earliest origins of the ranges. Found only in two large structures known as the Oraparinna and Enorama Diapirs, these rocks are broken and disrupted sedimentary beds originally deposited in shallow, restricted seas, coastal lagoons and saline lakes. Casts of salt crystals are commonly found on the under-surfaces of beds. Lava flows and ash falls recorded in these sediments were derived from volcanic activity as molten rock rose along deep fractures in the crust.



Initial stages in development of the Adelaide Geosyncline. Tectonic forces stretched and thinned the Earth's crust, forming an extensive low-lying basin that was invaded by the sea. Volcanoes and lava flows formed along zones of crustal weakness.

At this time, about 800 million years ago, the Earth's crust was pulled apart and thinned, forming an extensive sedimentary basin as the sea started to fill the resulting depression. This basin, known as the Adelaide Geosyncline, stretched from near Oodnadatta to Kangaroo Island.

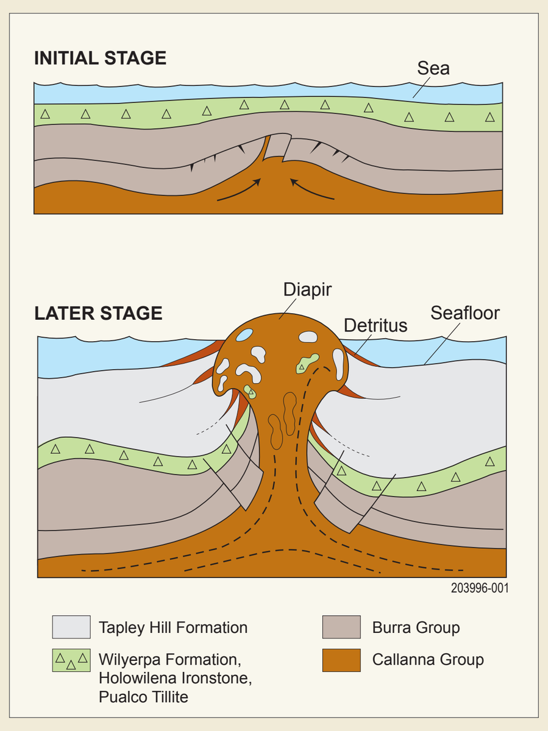
About 700 million years ago, severe climatic cooling led to a major ice age, when glaciers and ice sheets covered much of Australia and other continents. The glaciers scoured deep valleys in the landscape, picking up rock debris that became incorporated in the ice and was later released as the glaciers melted. Such glacially derived sediment is typically a mixture of mud, sand, pebbles and boulders; when compacted and hardened this forms a rock called tillite. In the park, the Pualco Tillite and the dark red, ridge-forming Holowilena Ironstone were deposited during this glaciation. Siltstone of the overlying Wilyerpa Formation records gradual warming, with occasional cobbles and pebbles dropped from melting icebergs. Prominent ridge-forming sandstone at the top of the Wilyerpa Formation, for example near the Loves Mine Range, was deposited off-shore by storm currents from sand freed by melting ice along an ancient shoreline.

A rapid deepening of the sea followed, during which black, organic-rich muds of the Tapley Hill Formation were deposited throughout the Adelaide Geosyncline.

The Oraparinna and Enorama Diapirs first became active at this time. The origin of these structures is thought to be due to the original presence of salt beds in the Callanna Group. Salt is lighter and more ductile than other rock types. As the overlying pile of denser sediments thickened with continuing deposition, the salt-bearing material became unstable. Faulting along zones of weakness in the underlying crust may have been the trigger that initiated upward movement of the less dense sediments of the Callanna Group under the weight of thick overburden. This movement dragged up and disrupted the beds, forming a breccia of fragments of sedimentary rocks, as well as blocks of volcanic rock, from the Callanna Group.

At first, the overlying beds were domed upwards as the salt-bearing material rose. Later, the diapir periodically broke through to the surface, and diapiric breccia spilled out on the seafloor or on small uplifted islands. This material was reworked by currents into the marine sediments of the time, forming lenticular conglomerate layers as seen, for example, in the Tapley Hill Formation around the margins of the diapirs. The fine-grained, grey-green sandstone beds of Mount Caernarvon record gradual shallowing of the basin as it began to fill with sediment.

The Sunderland Formation of the central Flinders Ranges also consists of fine-grained sandstone and siltstone, but its base is an erosional boundary, resulting from a drop in sea level and marked by a thin, coarse-grained sandstone. Channels were cut into the underlying Tapley Hill Formation and filled with oolitic and pebbly limestone. Sea level then rose again, depositing finer grained sediments but, as the basin filled up, shallow marine, sandy to gritty limestone of the Etina Formation accumulated. Large, trough-shaped scours indicate high-energy wave and current-influenced environments. The Oraparinna Diapir was again active at this time, shedding fragments of Callanna Group rocks to form conglomerate lenses in the Etina Formation adjacent to the diapir. Interbedded green, silty shales record quieter, deeper marine episodes, as does the overlying Enorama Shale.



Development of the Oraparinna Diapir. Initially, less dense Callanna Group rocks intruded zones of weakness in overlying sediments. As the diapir continued to rise, it breached the seafloor and detritus was shed into flanking sediments.

The Trezona Formation marks a return to near-shore, tidally influenced and lagoonal environments, ideal for the growth of cyanobacteria which built up stromatolites (see Stromatolites).

At this time, sea level fell with the onset of another glacial period. Limestone of the underlying Trezona Formation was subject to dissolution by rain water, producing a karst topography. Glaciation is recorded by the pebbly sandstone and local tillite of the Elatina Formation, containing glacially derived pebbles, many striated or grooved by rocks grinding against each other while carried by ice.

A prominent yellow-weathering pink dolomite, the Nuccaleena Formation, was then deposited as the sea again flooded the basin with a return to warmer climates. The thick siltstone and fine-grained sandstone of the overlying Brachina Formation in turn records overall shallowing of the basin, culminating in the deposition of beach sand making up the ABC Range Quartzite. Cross-bedding and ripple marks were formed by tidal currents, and mudcracks indicate that thin clay layers were occasionally exposed and dried out.

After a brief erosional interval, there was another major marine flooding of the basin. The monotonous red shale of the Bunyeroo Formation was deposited in deep, quiet water. Within this formation, a unique layer of rock debris, only a few centimetres thick, is thought to represent the fall-out from the impact of a large meteorite that struck the present position of Lake Acraman on northern Eyre Peninsula at this time.

Contact between the white Rawnsley Quartzite (weathering orange) and underlying red Bonney Sandstone, Brachina Gorge. (Courtesy of Bernd Stoecker, photo 042285)

Before sedimentation was able to fill the basin again, it was punctuated in the southern and northern Flinders Ranges by the scouring of canyons up to a kilometre deep, caused by renewed stretching of the crust. The park area, however, was more stable and this remarkable event is recorded by a period of very slow deposition of a one-metre thick, banded yellow dolomite marking the base of the Wonoka Formation. The basin, including the canyons, was quickly flooded by the sea. Deep-water green shale of the Wonoka Formation passes upwards into limestone and sandstone deposited as the basin again began to shallow. Grazing trails of small worms, the first good evidence of marine animal life, are found in this formation.

The Wonoka Formation passes up into the red Bonney Sandstone. Ripple marks, mudcracks, mud pebbles and cross-bedding record shallow deltaic and tidal environments.

The white Rawnsley Quartzite forms the highest bluffs and ranges of the park area. It too was deposited in shallow marine and possibly fluvial environments. Close to the base is a unit of siltstone and thinly bedded sandstone which contains the first abundant evidence of complex marine animal life (see Ediacara Fauna).

At the end of the Neoproterozoic Era about 540 million years ago, the sea withdrew completely. After a period of terrestrial erosion, the basin was again flooded at the beginning of the Cambrian Period, when the first animals with hard shells evolved. In the park area the first Cambrian rock unit is the Parachilna Formation, consisting of white, clayey sandstone and siltstone with long, vertical and U-shaped worm burrows.

Ripple marks in the Rawnsley Quartzite, Wilpena Pound, looking towards Chace Range. (Courtesy of Bernd Stoecker, photo 044287)

The first reefs similar, for example, to the Great Barrier Reef grew in shallow warm waters during the Cambrian, but these were built not by corals, but by sponge-related animals, now extinct, called archaeocyaths. These are beautifully preserved in parts of the Wilkawillina Limestone. In Wilkawillina Gorge, the Parachilna Formation is missing, and the limestone lies directly over the Bonney Sandstone.

Wilkawillina Gorge. Reddish Bonney Sandstone overlain by lighter Rawnsley Quartzite and darker Wilkawillina Limestone on the ridge. (photo 042160)

Later, a drop in sea level caused exposure t the reefs, forming a karst terrain with many sinkholes filled with iron-rich silt.

The dark grey, organic-rich limestone of the Mernmerna Formation was deposited as the basin again flooded, forming an extensive sea for the last time. The overlying green Oraparinna Shale includes the first trilobites, preserved in concretions. As the basin again began to fill with sediment, coarse silt and sand were deposited. The basin had become very restricted, allowing the deposition of shallow-water red sand and silt of the Billy Creek Formation and Lake Frome Group. However, this deposition was interrupted by a brief marine interval represented by the Wirrealpa Limestone.

Sedimentation finally ceased when major movements and heating within the Earth's crust began about 500 million years ago. By now the accumulated sediments had been compacted and cemented. Convergent movement of the ancient stable land masses on either side of the basin caused buckling and upthrusting of the sedimentary rocks. The park occupies a broad, deeply eroded anticline, with the oldest rocks in the centre and strata tilted in opposite directions east and west of this central core (cross-section A A'). Wilpena Pound forms a gentle syncline and the Mount Burns area in the southwestern corner of the map forms a tighter anticline (cross-section BB'). During buckling, large faults and fractures formed along zones of weakness and re-activated faults that had been active during sedimentation.

During folding, the diapirs became the cores of large dome-shaped folds. The salt-bearing diapiric material was further compressed and mobilised, and injected higher into the overlying rocks. Later erosion has cut through the domes, providing a view of the deeper levels of the diapirs.

As a result of this mountain-building activity, the ancestral Flinders Ranges were born. Weathering and erosion immediately began to reduce the mountains as they rose. Large rivers carried away vast amounts of eroded rock totalling several kilometres in thickness, to feed the developing sedimentary basins in eastern Australia. By about 100 million years ago, the ancestral ranges had probably been reduced to a low, gently undulating landscape. Earth movements related to the break-up of Australia from Antarctica then caused renewed uplift. During the last 50 million years, the Flinders Ranges have been rising steadily, and persistent small earth tremors indicate that this is a continuing process today.

Fluvial and lacustrine sedimentation occurred in valleys such as at the entrance to Brachina Gorge. Soft mudstone units were eroded readily to form valleys, while hard rocks such as quartzite remained as peaks and ridges. The spectacular Brachina and Bunyeroo Gorges were cut through by rivers which exploited joints and small faults in the sandstone ridges. These dynamic processes continue to shape the ranges but, with a drier climate today, sedimentary processes are limited to occasional flood events when large quantities of sand, gravel and boulders, as well as up-rooted trees, may be carried down-stream.

As you can see there is more to the ranges than first meets the eye. The evidence of this long period of Earth history is available to the keen observer of the clues preserved in the rocks. This understanding can only enhance the unique beauty of the ranges, one of our most treasured holiday destinations.

Era		Period			Millions of years ago
CAINOZOIC		Quaternary			1.6
	Tertiary	Neogene			23
		Palaeogene			65
MESOZOIC		Cretaceous			141
		Jurassic			205
		Triassic			251
PALAEOZOIC		Permian			298
	Carboniferous	Pennsylvanian	Silesian		
		Mississippian	Dinantian		354
		Devonian			410
		Silurian			434
		Ordovician			490
		Cambrian			545
NEOPROTEROZOIC		Neoproterozoic III			
		Cryogenian			
		Tonian			1000
MESOPROTEROZOIC		Stenian			
		Ectasian			
		Calymmian			1600
PALAEOPROTEROZOIC		Statherian			
		Orosirian			
		Rhyacian			
		Siderian			2500
ARCHAEAN					

Geological time scale represented in the Flinders Ranges

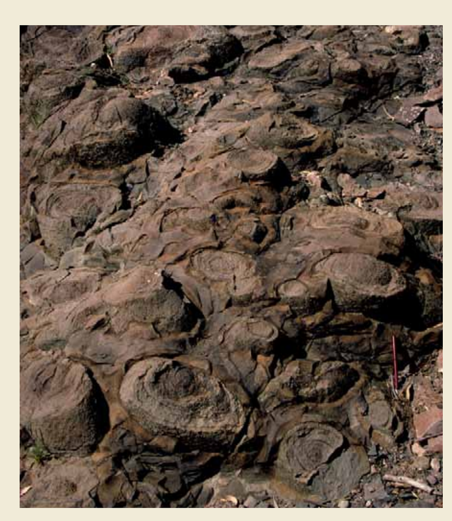
Fossils

Four groups of fossils are present in the park: stromatolites, the Ediacara Fauna, trace fossils and shelly fossils. Each represents a distinct stage in the evolution of life.

Stromatolites

The older sedimentary rocks contain no evidence of animal life. Only primitive, largely single-celled, microscopic organisms lived in the sea. Some of these, being photosynthetic, were responsible for gradually building up the oxygen content of the atmosphere to a point where animal life was able to evolve at some time late in the Neoproterozoic Era.

No fossils of the ancient micro-organisms are preserved intact in the park, however, there is abundant evidence of their activity in some limestone units, e.g. Trezona Formation. Cyanobacteria (formerly known as blue-green algae) flourished on the shallow seafloor. Mats formed by their intertwined microscopic filaments trapped fine sedimentary particles suspended in the water and caused changes in water chemistry, due to photosynthesis, which allowed calcium carbonate to precipitate. This formed thin limy layers and, as the mats grew, they built up the laminated structures known as stromatolites. Depending on the types of micro-organisms in the mats and on the shaping effects of the local environment, stromatolites may take the form of wavy laminations, domes, cabbage-shaped structures, broad columns, or slender, branching columns and fingers. Examples of the wavy laminated, dome-shaped and broadly columnar types can be seen in the Trezona Formation.



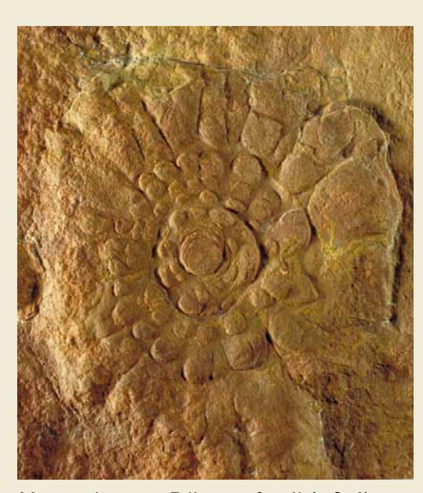
Stromatolites in the Trezona Formation. (Photo 042161)

The Ediacara Fauna

Animal fossils first appear in the Wonoka Formation, but become abundant in the Rawnsley Quartzite.

These animals were soft bodied and are preserved as impressions on quartzite beds. Known collectively as the Ediacara Fauna, they offer our first useful glimpse of early animal evolution. They are dominated by circular impressions until recently thought to be of free-floating jellyfish. However, most of the circular forms are more likely to be buried anchoring devices (or bulbs) of frond-like animals.

Other discs may represent soft, possibly tentacle-bearing polyps which were attached to the seafloor. Also preserved as impressions on the undersides of beds are primitive worms, animals with a coelome (body cavity) of arthropod affinities, ancestors of sea urchins, and some completely enigmatic forms.



Mawsonites, an Ediacara fossil (x 0.4). (photo 038763)

Dickinsonia costata in the Ediacara Member, Rawnsley Quartzite, Brachina Gorge (x 0.7). (Photo 042162)

Cambrian trace fossils

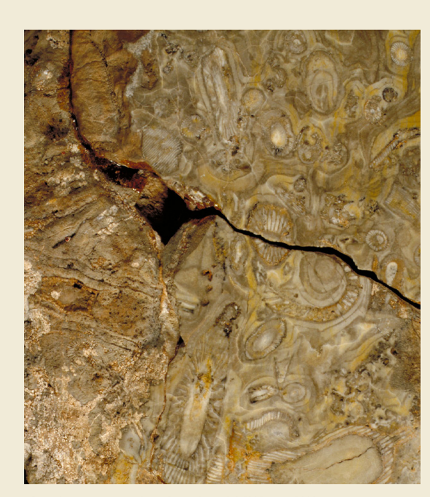
The U-shaped burrows in the Parachilna Formation indicate that the burrowing worms had a rigid, fluid-filled body cavity. The fact that they sought shelter in burrows indicates that predators must have evolved by the Early Cambrian.

Worm burrows in the Parachilna Formation. (photo 042163)

Trilobite from the Oraparinna Shale. (Courtesy of Jim Gehling; photo 408458)

Cambrian shelly fossils

The Cambrian limestones contain the first fossils of animals with hard skeletons. These include the cup-shaped archaeocyaths, which were probably filter feeders related to sponges, and which died out later in the Cambrian Period. Molluscs, including small sea snails and cockle-like shells, brachiopods (lamp-shells), and the extinct trilobites, can also be found in the Cambrian limestones and shales. These animal groups all appeared early in the Cambrian, representing the most dramatic explosion of diversity in the history of evolution.



Archaeocyaths in the Wilkawillina Limestone, Brachina Gorge (x 0.6). (photo 038766)

Drives

Hawker to Blinman Road

Arkaroo Rock

Arkaroo Rock is a large fallen boulder of sandstone shed during the erosion of Wilpena Pound. A cave containing Aboriginal rock art was formed by fretting of sandstone through the action of moisture.

Rawnsley Bluff Lookout

(Just south of the park boundary)

This lookout provides an excellent view of the southern end of Wilpena Pound. White Rawnsley Quartzite forms the high peaks of the rim of the synclinal structure. Below the cliffs, the slopes are formed of red Bonney Sandstone which overlies light coloured Wonoka Formation.

On entering the park, the road follows red shale of the Bunyeroo Formation for 10 km. About 0.5 km after the Wilpena Chalet turn off, the road passes through a gap in the ABC Range (ABC Range Quartzite which dips to the west). For the next 10 km, the road passes through progressively older sedimentary rocks including thin pink dolomite of the Nuccaleena Formation, reddish sandstone of the Elatina Formation and grey limestone of the Trezona Formation.

Hucks Lookout

This lookout, located on grey siltstone of the Tapley Hill Formation, provides excellent views of Wilpena Pound and the complete west-dipping geological succession from Tapley Hill Formation to Rawnsley Quartzite.

Stokes Hill Lookout

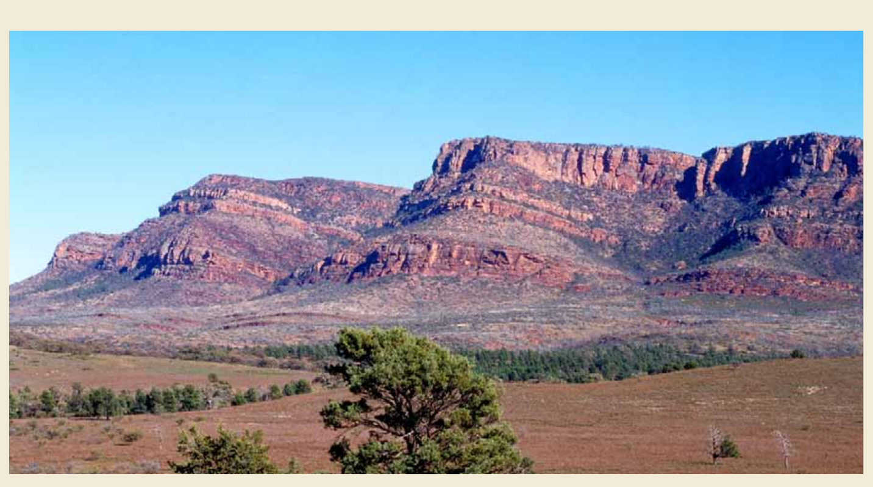
This lookout, also on Tapley Hill Formation, provides views towards Wilpena Pound to the southwest and Oraparinna Diapir to the north.

For the next 12 km, the road passes subdued outcrop of mainly shallow-dipping Tapley Hill Formation. After Oraparinna Station, the road descends through strata which dip gently northwest and become progressively younger for the next 7 km. These include flaggy dolomite of the Wockerawirra Dolomite Member and craggy outcrops of limestone of the Etina Formation. After the Brachina Gorge turn off, green Enorama Shale is traversed for about 10 km until the northern boundary of the park is reached; along the western side of the road is the distinctive Trezona Range comprised of alternating beds of limestone and siltstone of the Trezona Formation.

The road in this area is also at the closest point to the Enorama Diapir which is poorly exposed on a low ridge 500 m to the east, about 1 km north of the park boundary. Here dolomite of the Etina Formation overlies much older basalt rafted up by the diapir.

Great Wall of China

Located some 7 km north of the park, this feature is the eroded cliff-edge of a resistant horizontal bed of limestone within the Etina Formation.



Rawnsley Bluff at the southern end of Wilpena Pound. Cliff-forming Rawnsley Quartzite overlies Bonney Sandstone. (Photo 042164)

Brachina Gorge

(18 km one-way)

This drive, which starts at the turn off on the Hawker-Blinman Road, contains famous landmarks in Earth history. The route cuts through rocks of the Adelaide Geosyncline which range in age from 650 million to 520 million years, and exhibits one of the most complete sedimentary records in the world for this age. These rocks provide a unique record of the geological events and climatic conditions prevalent at the time they were deposited. They are the western remnant of a large domal fold and become progressively younger to the west, including the sequence from Enorama Shale to Wirrealpa Limestone.

Shelters at either end of the drive provide general information on the geology of Brachina Gorge. Stops along the way interpret features of interest including:

- stromatolites in the Trezona Formation, representing some of the earliest life on Earth
- evidence of an ice age in the Elatina Formation
- evidence in the Bunyeroo Formation of a meteorite impact 600 million years ago
- fossils of the Ediacara Fauna, amongst the oldest known soft-bodied animals, in the Rawnsley Quartzite
- the first animals with skeletons and shells in the Wilkawillina and Wirrealpa Limestones.

A more detailed brochure on the Brachina Gorge Geological Trail is available from PIRSA.

Wilkawillina Gorge Road

After leaving the turn off on the Hawker-Blinman Road, the road crosses subdued rolling hills composed of Tapley Hill Formation siltstone. About 5 km after the turn off is a faulted contact between the Tapley Hill Formation and broken and distorted rocks of the Oraparinna Diapir. Outcrop of diapiric breccia containing rafts of sedimentary rocks and bouldery basalt occurs along the roadside for the next few kilometres. Mount Caernarvon in the Loves Mine Range can be seen on the eastern horizon. About 2 km past the turn off to Wilkawillina Gorge, the road turns eastward along a broad valley of Bunyeroo Formation shale. To the north are the spectacular treeless hills of the Wonoka Formation, while the ABC Range Quartzite forms the southern walls of the valley.

Bunyeroo Valley

(27 km one-way)

On leaving the Bunyeroo Valley turn off, the road passes through open country on shale and limestone of the Trezona Formation for a distance of 13 km. After Yanyanna Hut, the road traverses younger rocks until reaching Bunyeroo Valley Lookout.

Bunyeroo Valley Lookout

This lookout is located on siltstone of the Brachina Formation and provides sweeping southerly views along the valley of Bunyeroo Creek towards Wilpena Pound. As elsewhere, the rim of the pound is composed of white Rawnsley Quartzite underlain by red Bonney Sandstone. The road then follows Bunyeroo Creek through the ABC Range and turns north, traversing purplish shale of the Bunyeroo Formation.

Northern rim of Wilpena Pound from Bunyeroo Valley lookout, showing light coloured Rawnsley Quartzite overlying red Bonney Sandstone. (Photo 042165)

Hikes

Wilkawillina Gorge

(11.4 km one-way)

The rocks along this walk are similar to those exposed along Brachina Gorge but the sequence dips in the opposite direction (east) as it is on the other side of a broad domal fold (anticline). At Wilkawillina Gorge, a graben (fault-bounded depression) developed within the Adelaide Geosyncline as it was filling with sediment. Folding of the sediments in the geosyncline about 500 million years ago caused the graben to be tipped on to its end so that, from above, its sediments can be seen in section.

The walk begins in Brachina Formation siltstone and ABC Range Quartzite before crossing the sedimentary rocks bounded by faults of the graben. The sequence within the graben includes limestone and siltstone of the Wonoka Formation, Bonney Sandstone and Wilkawillina Limestone. A highlight of the gorge section is the outcrops of Wilkawillina Limestone containing excellent examples of fossils of the coral-like archaeocyatha.

Unlike the western part of the ranges, the eastern ranges contain little Rawnsley Quartzite. After the Rawnsley sands were deposited, most of the top layers in the east were removed by erosion before the Cambrian limestones were laid down. The Wilkawillina Limestone in this area therefore overlies the Bonney Sandstone and not the Rawnsley Quartzite as in the western ranges.

Bunyeroo and Wilcolo Creeks

(9.2 km return)

This loop walk through rolling hills of the Bunyeroo Valley commences on Brachina Formation siltstone and sandstone which display ripple-marked surfaces indicative of the shallow-water origin of this formation. The walk traverses the ABC Range (ABC Range Quartzite) and reddish Bunyeroo Formation shale.

Haywards Huts

Yuluna (8 km loop), Trezona (8.2 km loop) and Aroona to Youngoona (15 km one-way)

There are three walks to choose from: two loops of about 8 km at either end of a one-way walk of 15.4 km. At the Aroona Valley end, the walk passes through the ABC Range (ABC Range Quartzite) which shows layers of sediment, ripple marks, joints and folds. At the other end, the walk passes through the Trezona Range (Trezona Formation limestone and shale) where dome-shaped stromatolites exposed in Enorama Creek provide evidence of early life on Earth. Tillite of the Elatina Formation, deposited during a period of glaciation, is exposed in Etina Creek. The broad band of country between the ABC and Trezona Ranges is occupied by soft Brachina Formation siltstone which gives rise to a landscape of low, rolling hills.

St Mary Peak

Direct route (14.6 km return)
Loop route (21.5 km return)

This peak, composed of Rawnsley Quartzite, provides views of the basin of Wilpena Pound to the south and, to the north, rows of ranges stretching to the horizon.

Bridle Gap

(18.8 km return)

This walk across Wilpena Pound which can be started either at Wilpena Chalet or Black Gap in Moralana Valley (outside of the National Park). The trail from the Chalet via Pound Gap traverses the red Bonney Sandstone and overlying white Rawnsley Quartzite. After the ruin of the old homestead, the central part of the Pound is filled mainly with recent alluvium.

Heysen Trail

(1500 km)

The Heysen Trail passes through some of South Australia's most diverse and breathtaking landscapes, traversing coastal areas, native bushland, rugged gorges, pine forests and vineyards, as well as rich farmland and historic towns. It includes national parks, state forests and internationally acclaimed tourist destinations – the Barossa Valley and the stunning Wilpena Pound.

cont.

GEOLOGY OF THE FLINDERS RANGES NATIONAL PARK

REFERENCE

QUATERNARY

Alluvium; red-brown clay, silt, sand and gravel.

Low-angle talus deposits; angular pebbles and cobbles, sand and clay.

Pleistocene lake deposits; laminated silt to fine sand and mud.

Pleistocene high-level piedmont gravel; undergoing dissection by modern erosion.

TERTIARY

Clean white sandstone and silty sandstone, often pebbly.

CAMBRIAN

GRINDSTONE RANGE SANDSTONE: Cross-bedded sandstone with quartzite pebble conglomerate in the upper part.
PANTAPINNA SANDSTONE: Reddish, medium-grained sandstone with minor mica-rich siltstone and shale; heavy-mineral laminae; planar lamination and cross-bedding.
BALCORACANA FORMATION: Repetitively bedded red-brown mica-rich siltstone and shale with thin limestone bands; ripple marks, mudcracks and salt casts are common.
MOODLATANA FORMATION: Mica-rich siltstone, shale and white, fine to medium-grained sandstone, planar to ripple-bedded or cross-bedded, with mudcracks, salt casts and trilobite tracks.
WIRREALPA LIMESTONE: Wavy bedded to nodular limestone in a silty matrix. Algal mats and stromatolites are common; fossil trilobites and brachiopods occur close to base.
BILLY CREEK FORMATION: Red-brown siltstone and sandstone with mudcracks, salt casts and ripple marks; includes a thin volcanic ash layer close to top.
ORAPARINNA SHALE: Khaki-green silty shale with limestone concretions which often contain fossil fragments.
BUNKERS SANDSTONE: Silty fine-grained sandstone with cross-bedding and ripple marks.
MERNMERNA FORMATION: Bedded, dark grey, fine-grained, nodular to mottled limestone and shaly limestone.
WILKAWILLINA LIMESTONE: Light to dark grey, massive, bedded archaeocyathan limestone. A major erosional surface defined by karsting and a red weathering crust occurs within the unit.
WOODENDINNA DOLOMITE: Well-bedded stromatolitic and oolitic silty dolomite and limestone with thin silty sandstone interbeds in lower half.
PARACHILNA FORMATION: White, fine to coarse-grained, clayey sandstone; U-shaped burrows, cross-bedding, ripple marks.

NEOPROTEROZOIC

RAWNSLEY QUARTZITE: White, medium to coarse-grained cross-bedded quartzite with lenticular beds, channelling, mud-clast impressions and ripple marks. Lower half includes the Ediacara Member (with erosional base), comprising thick-bedded quartzite, fine olive-green, white and red siltstone, fossil-bearing thin to medium-bedded sandstone grading up into white cross-bedded quartzite.
BONNEY SANDSTONE: Red, mica-rich silty sandstone; ripple marks, mud-clast impressions and mudcracks. Repeated 20-30 m cycles of siltstone to thick cross-bedded sandstone are common.
WONOKA FORMATION: Green-grey laminated siltstone and thin limestone. Sandstone and grey-blue stromatolitic limestone at top.
BUNYEROO FORMATION: Red-brown shale with thin, gritty sandstone, sometimes conglomeratic at base. Thin light green bands and small spherical reduction spots are common. Upper half commonly grey-green in colour. Acraman ejecta debris layer occurs approximately 80 m above base.
ABC RANGE QUARTZITE: White, heavy-mineral laminated cross-bedded quartzite with ripple marks and mud-clasts.
BRACHINA FORMATION: Upper: Olive-green siltstone, coarsening upwards to ripple-marked and cross-bedded sandstone.
Middle: Reddish, coarse-grained banded siltstone.
Lower: Drab olive-green to brown mica-rich siltstone.
NUCCALEENA FORMATION: Cream to buff-yellow fine-grained dolomite. Purple shale beds appear and increase rapidly upwards.
ELATINA FORMATION: Red-brown medium-grained sandstone and red pebbly sandy siltstone of glacial origin.
TREZONA FORMATION: Red and pale grey, fine-grained limestone with stromatolites and algal mud-flakes, alternating with greenish grey laminated shale and siltstone.
ENORAMA SHALE: Laminated grey-green and minor red shale, silty shale and rare fine-grained sandstone.
ETINA FORMATION: Cycles of thick, grey, oolitic and stromatolitic limestone with intervening grey-green shale. Limestone is often sandy, cross-bedded and contains pebble conglomerate lenses near Enorama Diapir.
SUNDERLAND FORMATION: Grey-green calcareous siltstone and fine to medium-grained sandstone.
Basal few metres comprise coarse to pebbly sandstone and/or oolitic limestone, often conglomeratic with large clasts of limestone and siltstone. Slumping of beds is common in upper part.
TAPLEY HILL FORMATION: Dolomitic siltstone and limestone at top.
Dark grey, finely laminated siltstone to fine sandstone cycles.
Ridge-forming, fine-grained grey-green sandstone.
Conglomeratic bands at base around Oraparinna Diapir.
WILYERPA FORMATION: Green siltstone, weathering buff-yellow in lower half, with intervals containing glacial dropstones. Middle section includes thick beds of storm-deposited sandstone and glacial conglomerate.
HOLOWILENA IRONSTONE: Dark red, thinly laminated iron-rich siltstone; includes medium to coarse-grained gritty sandstone and glacial pebbly siltstone.
PUALCO TILLITE: Grey-blue gritty siltstone and minor thin sandstone with pebble to boulder-size glacial clasts.

BURRA GROUP: Undifferentiated siltstone, sandstone and dolomite. (Subsurface only; Section A A').

CALLANNA GROUP: Oraparinna and Enorama Diapirs.

Diapiric breccia: Rock fragments of all sizes cemented with carbonate.

Sedimentary rafts: Larger fragments of sandstone and siltstone with volcanic ash intervals, rare dolomite, partly stromatolitic. Salt casts abundant throughout. Rafts range in size from a few metres to several hundred metres in length.

Volcanic and intrusive rafts: Large fragments of dark green fine-grained basalt and medium to coarse-grained dolerite.

Geological compilation by R.A.Callen, M.Sc. and P.W.Reid, B.Sc (Hons).

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The Honourable D.S.Baker, M.P., Minister for Mines and Energy.

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Grid lines represent 5000 metre intersects of the Australian Map Grid.

TRANSVERSE MERCATOR PROJECTION. Australian Geodetic Datum, 1984.

Magnetic Declination 7°32' (1994).
Annual change is 02' Easterly.

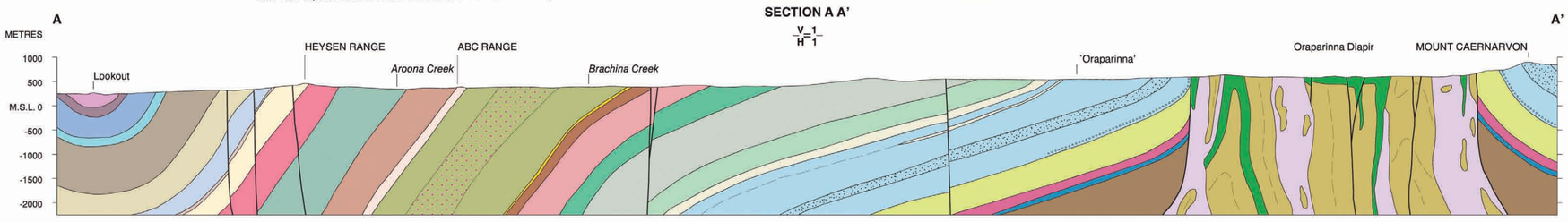
G.N.
T.N.
M.N.

ASSOCIATED TOPOGRAPHIC MAPS 1:50000

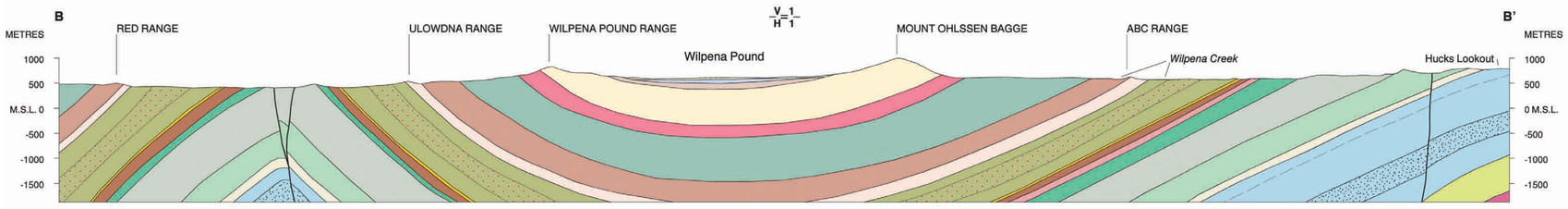
PARACHILNA 6535-1	BLINMAN 6635-4	WIRREALPA 6635-1
EDEOWIE 6535-2	ORAPARINNA 6635-3	THE BUNKERS 6635-2
MORALANA 6534-1	WILPENA 6634-4	CHACE 6634-1

N.T. QLD. W.A. SOUTH AUSTRALIA N.S.W. VIC.

SECTION A A'



SECTION B B'



GEOLOGICAL BOUNDARY
FAULT
BEDDING
TREND
INCLINED
GEOLOGICAL SECTION
HYDROGRAPHIC FEATURES
EPHEMERAL STREAM
FLOODPLAIN
WATERFALL
BORE; WELL; SPRING; WATERHOLE
DAM; TANK
MINE; OPENCUT
MINERAL OCCURRENCE
ASBESTOS Asb
BARITE Ba
COPPER Cu
LEAD Pb
MANGANESE Mn

RELIEF FEATURES
CONTOUR (50 metre interval) 500
IDENTIFIED POINT
SPOT HEIGHT (metres) 714
CULTURAL FEATURES
MAIN ROAD
MINOR ROAD; TRACK
WALKING TRAIL
NATIONAL PARK BOUNDARY
HOMESTEAD; BUILDING
FENCE
YARD
LOOKOUT
LANDING GROUND

SCALE 1 : 75 000

METRES 1000 0 1 2 3 4 5 6 KILOMETRES

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