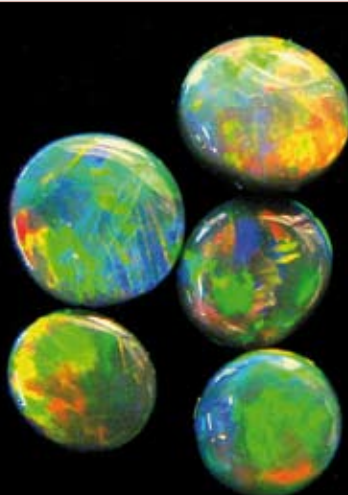


Geology Sites of Lightning Ridge



Lunatic Hill open cut exposes old underground workings



Opal gemstones



Agate



Gypsum Rose



Opal in claystone



Fossil lungfish toothplate



Carved crystal opal



Rip-up clasts in sandstone

Introduction

For first-time visitors to Lightning Ridge from the east coast or southern Australia, there are some important sites you should not miss.

The significance of these sites is such that they make the areas suitable for geotourism and geoconservation. One day the area may achieve accreditation as a Geopark.

Three special features are:

1. The Great Artesian Basin (featured at the Artesian Bore Baths)
2. Opal mining (historic sites and the open cut mine at Lunatic Hill Lookout)
3. Coocoran Lake (a large palaeo-lake with lunettes and a palaeoshoreline).

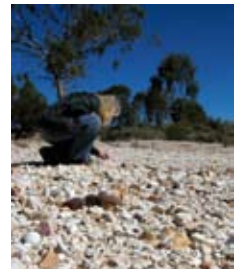
The exposed ridge country consists of the Cretaceous (110mya) Griman Creek formation of the Rolling Downs Group within the Surat Basin. These sedimentary rocks are unconformably overlain by reworked Tertiary (45mya) sands and gravels of the 'Cumborah Formation'. The surrounding plains and palaeo-lake beds are composed of Quaternary alluvium of the Nullawa, Bugwah and Marra Creek formations (less than 100,000 years old).

Grid references: use Zone 55, system GDA94.

Please note:

Take extreme care when entering and leaving highways and main roads. Sites shown on the map are on lands accessible to the public. Permission should be sought from the owners before entering private lands.

Opal mines are located on private mineral titles and should not be interfered with.



'Specking'

Site 6 - Bore Baths, Sherman Way (Grid ref. 596788mE, 6744738mN)

The water here derives from a bore sunk more than a thousand metres into the Great Artesian Basin in 1962. The water arrives at the surface under its own pressure. Geothermal heat makes the water in the baths about 40°C. This Artesian Basin is the largest of its kind in the world, covering over one million square kilometres and containing over 64,900 million million litres of water, oil and gas. The sedimentary layers of sandstone, siltstone and mudstone were laid down in a shallow sea between 100 and 250 million years ago.

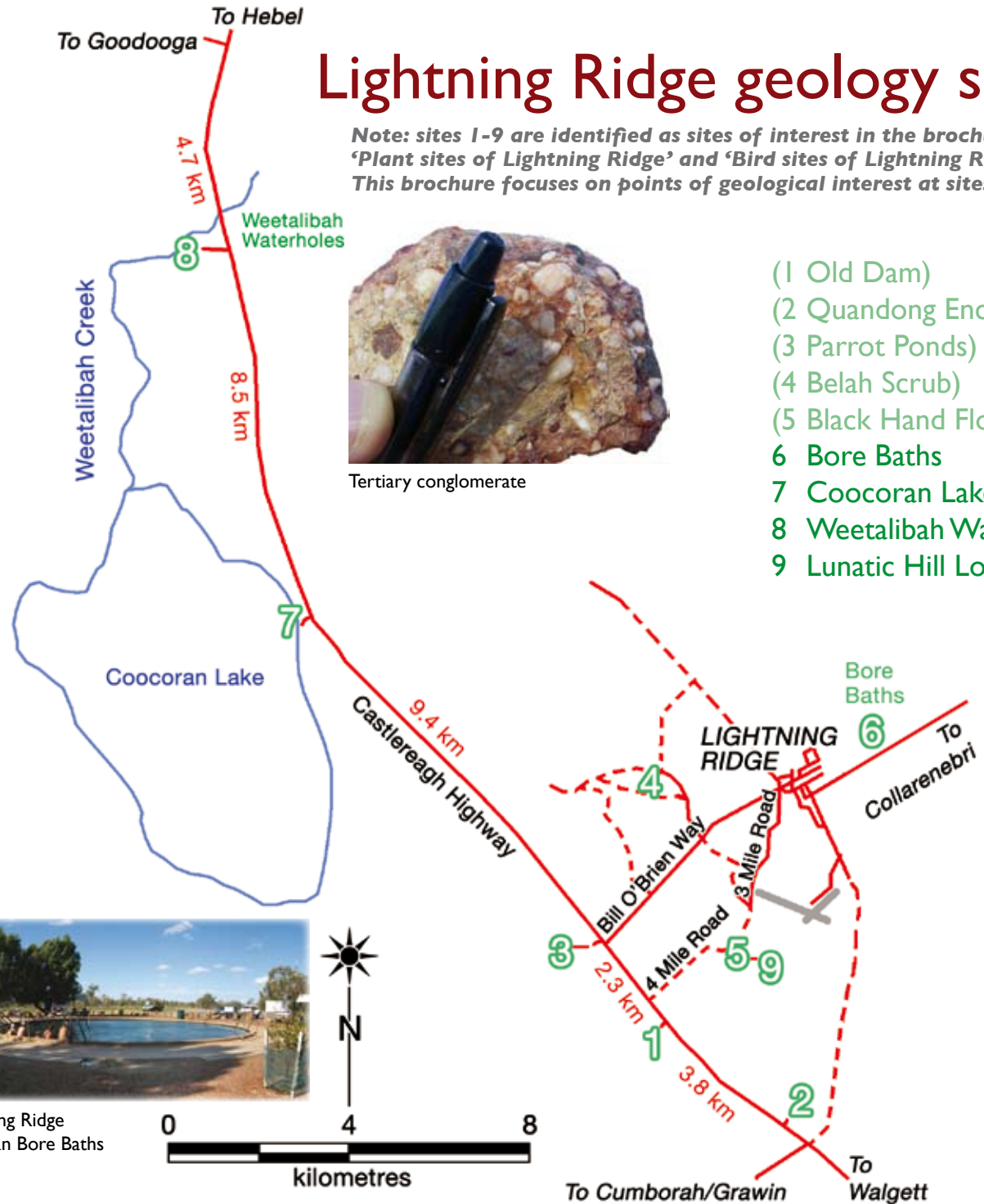
Lightning Ridge geology sites

Note: sites 1-9 are identified as sites of interest in the brochures 'Plant sites of Lightning Ridge' and 'Bird sites of Lightning Ridge.' This brochure focuses on points of geological interest at sites 6-9.

- (1 Old Dam)
- (2 Quandong Enclosure)
- (3 Parrot Ponds)
- (4 Belah Scrub)
- (5 Black Hand Flora Site)
- 6 Bore Baths
- 7 Coocoran Lake
- 8 Weetalibah Waterholes
- 9 Lunatic Hill Lookout



Tertiary conglomerate



Lightning Ridge Artesian Bore Baths



Legend

- Town
- Road
- Great Artesian Basin
- State Borders

0 100 200 300 400 500 Kilometers

Data Sources: Drainage Division, Locality, Roads, State (c) Commonwealth of Australia (Geoscience Australia)

Map produced by Environment Resources Information Network (ERIN) Australian Government, Department of the Environment and Water Resources 07 May 2007

Australian Government Department of the Environment and Water Resources

Site 7 - Coocoran Lake shoreline, Castlereagh Highway (584167mE, 6747675mN)

The Coocoran Lake bed represents a flood basin facies. The lake is 5km x 10km and in flood times is fed by the Weetalibah Creek from the north. The palaeoshoreline at this site shows some lunette sands formed from colluvial and aeolian processes. It is densely vegetated with Coolibah trees.



Coolibah trees along the palaeoshoreline at Coocoran Lake

Site 8 - Weetalibah Waterholes, Castlereagh Highway (Grid ref. 582164mE, 6756028mN)

This site is a Coolibah Billabong. Here can be seen abandoned channels (oxbow), meander plain channels and waterholes leading to the Coocoran Lake. Tertiary conglomerate boulders lie in the channel bed upstream.



Weetalibah Waterhole

Site 9 - Lunatic Hill Lookout (593940mE, 6740354mN)

From the Yellow Car Door 6E, look back through time as you view the exposed section. The surface gravels are waterworn, reworked Tertiary ironstone gravels. They consist of pebbles of quartz, chert, jasper, petrified wood, topaz, agate and bands of silcrete. These sediments unconformably overlie the Coocoran Claystone ('shincracker').

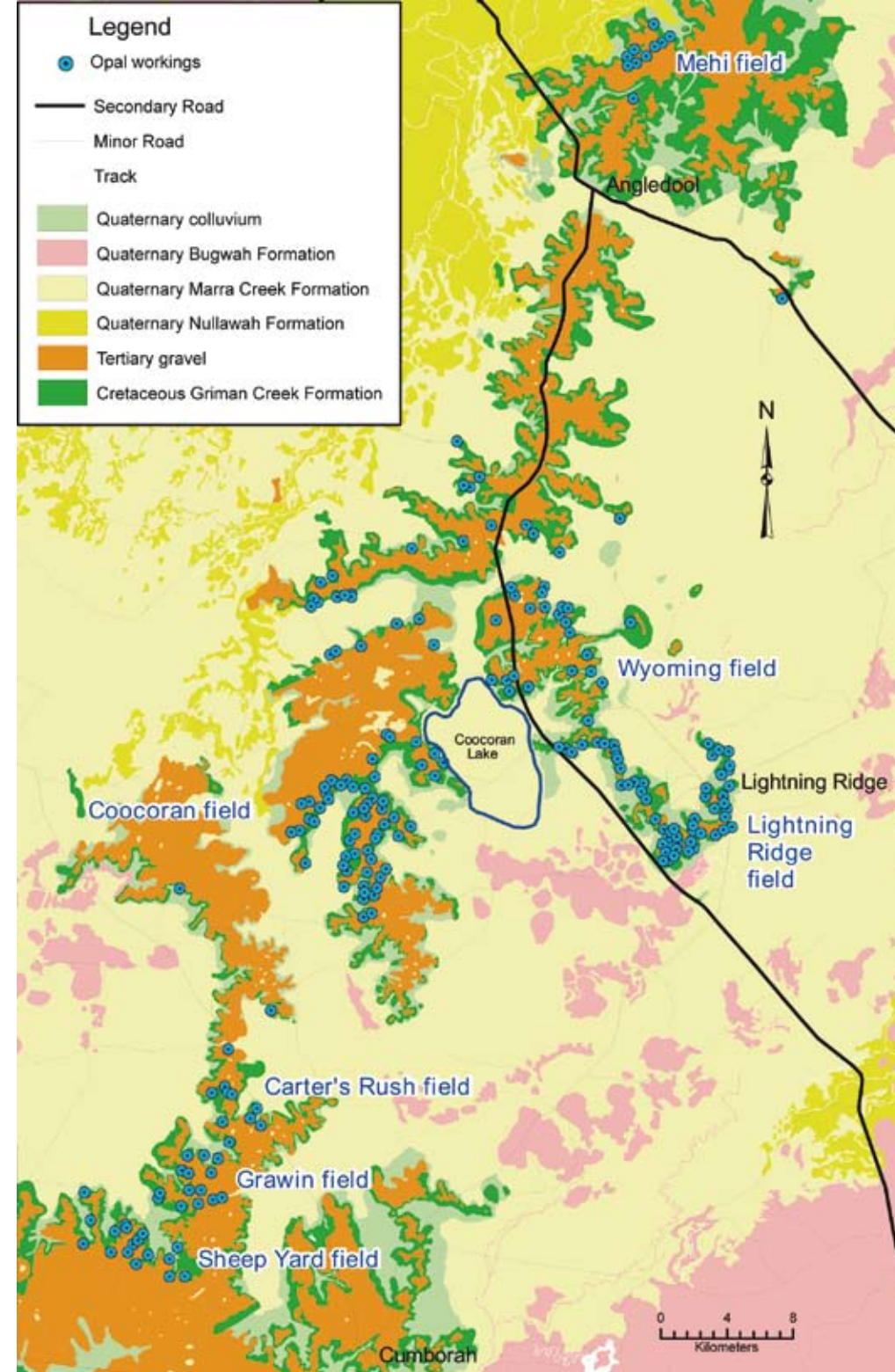
Below this is the orange-coloured Wallangulla Sandstone. At the base of the sandstone, lenses of the Finch Clay facies (kaolinite, smectite and illite) can be seen and these are associated with opal formation.



Tertiary gravels



Exposed geological section at Lunatic Hill Lookout



Lightning Ridge rocks and minerals



Brain stone
Quartz pebble with fracture lines infilled with iron-rich minerals.



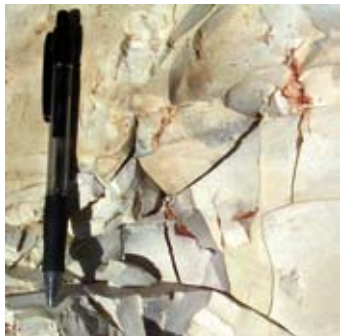
Whitehorse
A calcareous mineral found within the opal-bearing clay.



Honey patch
Also called 'amber' patch; this piece has been polished.



Hollandite
A barium/iron/manganese oxide mineral found in the opal clay.



Coocoran Claystone



Wallangulla Sandstone

Cretaceous sedimentary rocks that overlie the opal clay level. The claystone has a much finer grain size than the sandstone.



Tertiary conglomerate with interbedded silcrete

These waterworn pebbles indicate high-energy travel over a long distance. Finer-grained layers indicate a change of season or climate and silica cementation has formed silcrete.



Topaz in Tertiary gravels



'Blow'
Slump breccia within the Cretaceous rocks.



Rip-up clasts
Sediments disturbed during deposition.



Septarian formation
Formed when shrinkage lines in claystone infilled with silica.



Nobbies in 'angelstone'
Nobbies of precious opal in angelstone (strongly silicified clay).

Opal

Precious opal is amorphous hydrated silica ($\text{SiO}_2 \cdot n\text{H}_2\text{O}$). In its purest form, layers of transparent microspheres cause diffraction and interference of light, giving rise to 'play of colour'. Precious opal may be transparent ('crystal'), black, white or grey. It is found in the Finch Clay as discrete nodules ('nobbies') or seams. Opal with an irregular microsphere size and structure is usually grey and is locally known as **patch**.



Precious opal nodule in claystone (top) and grey patch nodules in claystone.

Fossils

Opalised plant and animal remains occur throughout the Finch Clay and specimens are sometimes recovered during opal mining. The fossils indicate a shallow freshwater environment. Plants, molluscs, lungfish, plesiosaurs, yabbies, turtles, fish, dinosaurs and mammals are all represented.



Opalised fossils (top) and Tertiary leaves.

Fossil leaves of flowering plants occur in some of the Tertiary gravels.

Contacts

Lightning Ridge Visitors' Information Centre
Phone: 02 6829 1670



Opal found at the Visitors' Centre fossicking heap

Handy references:

- Rediscover Opals in Australia - Aracic
- Black Opal Fossils of Lightning Ridge: Treasures from the Rainbow Billabong - E&R Smith
- Future prospects for opal mining in the Lightning Ridge region (Report no.GS1985/119) - Watkins*
- Notes to Angledool 1:250 000 Geological Sheet (Report no.GS2003/183) and A geological investigation of the Coocoran south area, Lightning Ridge (Report no.GS2002/753) - Burton*
- www.dpi.nsw.gov.au/minerals/lightning-ridge
- Bob and Nancy's Geotourism web site at: http://ozgeotours.110mb.com/LRidge_tour.PDF
- * <http://digsopen.minerals.nsw.gov.au>

For opal books and geology books, enquire at the 'Opal Books etc' shop at Bluey Motel, 32 Morilla St, Lightning Ridge, Phone: 02 6829 0380

Produced by:

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Black opal country