

NARACOORTE CAVES NATIONAL PARK: VISITOR FACILITY UPGRADES

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This article is dedicated to Ken Grimes, Scientist (geology and geomorphology), ACKMA Member, karst expert, caver and friend. Ken had a long association with Naracoorte Caves National Park and World Heritage Area and we are all deeply saddened by his tragic loss this month.

From the time I took up the position as Manager Naracoorte and Tantanoola Caves in 2009 Ken unstintingly provided me his expert advice and opinion. He freely and generously helped me with the Field Guide for the 2015 ACKMA Conference that we hosted in Naracoorte. From 2014 until early August 2016 he provided comment on the Master Plan visitor asset upgrade proposals. We also formally contracted him to provide karst geology training to Site Interpreters and in the past nine months, in conjunction with geotechnical engineer Tony Meyers and with long-time friends and karst associates Kevin Mott and Ian Lewis, he was very involved in a process whereby karst values were considered in the design phases for visitor asset upgrades and therefore ensuring that those values, along with other natural, historical and cultural values are protected and conserved during construction.

BACKGROUND

In 2012 the Department of Environment, Water and Natural Resources (DEWNR) commissioned Shannon Architects to produce a Master Plan to direct the upgrading of 15-20 year old infrastructure in the Naracoorte Caves National Park and World Heritage Area, including interpretation. In conjunction with this, DEWNR established a Master Plan Community Group comprising local, regional, State and Federal representatives, inviting their input into the upgrade planning.

In 2013 the Federal Government granted funding to establish a World Heritage governance group and for an Executive Officer position to provide secretariat services to the group and assist the Australian Fossil Mammal Site (AFMS) Property Manager with World Heritage administrative matters. DEWNR invited the organisations with representatives on the Master Plan Community Group to transfer that representation to the World Heritage governance group, the Inter-agency Community Reference Group (IRG).

On 17 December 2014 the IRG and DEWNR Executive endorsed the costed Naracoorte Caves National Park and World Heritage Master Plan.

Early in 2015 special tourism funding was granted by the South Australian Tourism Commission and DEWNR to begin the first upgrade, the 'Roof-top' Loop Walk. Funds were also made available to commission a Style Guide to ensure cohesion to directional and informative wayfinding and interpretation around the Park, in the Wonambi Fossil Centre upgrade and in caves.

The 'Roof-top' Loop Walk

Upgrading this walk will open up part of the National Park to a wider range of visitors so they can enjoy perspectives of the Park many are not otherwise able to experience. In doing this DEWNR continues to meet an important obligation - that World Heritage sites should *"have a place in the life of the community"*.

A key audience of this upgrade comprises visitors who cannot go into a cave for various reasons (less-abled or vision impaired visitors, people who are claustrophobic, those who cannot afford a cave tour); families with young children in pushers and older children who need to expend a bit of energy. Visitors who just enjoy walking in a National Park will benefit. Currently wheel-chair users can only access the Wonambi Fossil Centre, the Bat Observation Centre and the Caves Café.

The 850 metre walk will link the Wonambi Fossil Centre, the Bat Observation Centre and Blanche Cave as the original walk did. The difference is that it will be a loop without short-cuts.

One access road and two pathways wide enough to be utilised by vehicles will be removed because they run across the top of Bat Cave maternity chambers where in some places the caprock thickness for vehicle traffic is less than approved karst geotechnical specifications.



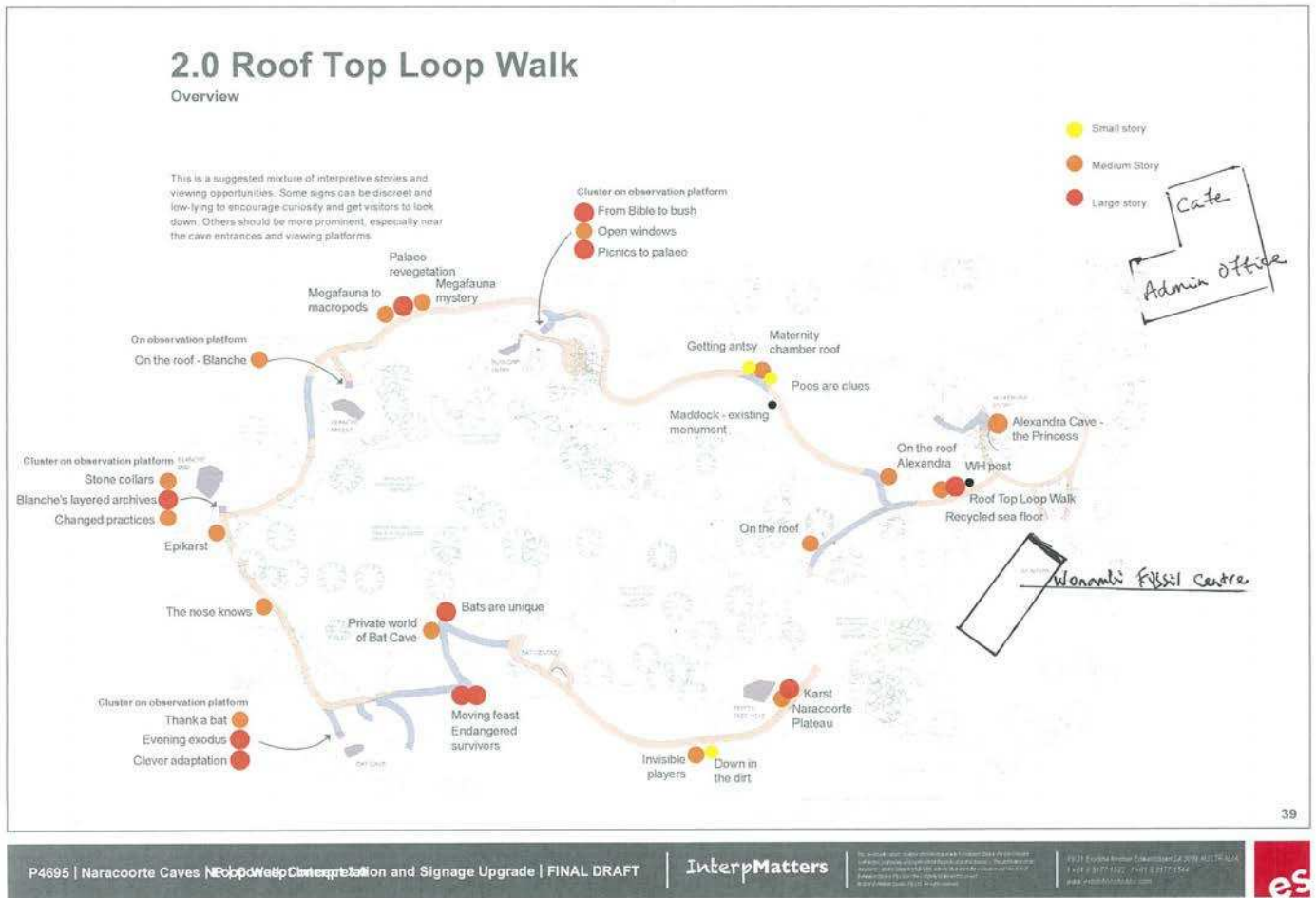
Two-tone path surfaces. The re-routed pathway between the second and third chambers of Blanche Cave. The path here is utilising in-cave pillars for strength.

Disability Access

The walk plan was assessed by a disability auditor regarding access requirements for less-abled users. The gradient for wheel-chair users is 1:20 or less and pathways require rest nodes at set distances. Observation platforms at cave openings will be accessible to all visitors and allow everyone an opportunity to look down 'from the roof' into at cave entrances and openings (hence the name, the 'Roof-top' Loop Walk).

Telling the Stories

Sections of the walk follow the original pathway and are still crossing over some sections of Bat, Blanche and Alexandra Caves. Where the walk crosses a cave the colour of surface material comprises grey-coloured scalps (gravel) which is to let visitors know they are walking over the roof of a cave. Where it is not over a cave the surface material is light-coloured limestone scalps.



Map: 'Roof-top' Loop Walk

The map shows the route of the walk and the placement of interpretation panels at wheel-chair rest nodes. Visitors to the Loop Walk will gain a good perspective of the site's natural and cultural heritage from the stories on the panels so that if all they do on their visit they will leave with awareness and appreciation of South Australia's only World Heritage Area.

On the interpretation panels hand-drawn illustrations and early (black and white) photographs will be used rather than coloured photographs, the intention being that the illustrative style reflects scientific drawings and diagrams, internationally recognisable and timeless. This style emphasises and promotes the Naracoorte Caves Australian Fossil Mammal Site's brand driver (sic) of science and research being a fundamental factor in sustaining a 'living and engaging' National Park and World Heritage Site.

Due Diligence

Prior to the letting of a construction contract to Bull Bros Pty Ltd (a local Naracoorte firm), a nine month consultative process was undertaken around karst conservation and endangered species and fossil protection. This included researching Cave Exploration Group South Australia (CEGSA) and SA Mines Dept cave maps, contracting ground-penetrating radar analysis, contracting surface and in-cave surveying and geotechnical engineering analysis and involving reputable karst scientists and geologists.

Geotechnical engineer Tony Meyers, Rocktest Ltd, Adelaide had been contracted in October 2015 to undertake a structural assessment of the show-caves and adventure caving caves where DEWNR conducts its tourism business. Tony provided a structural report, a ground-control management plan and an emergency response plan. He has provided training for the cave

guides and site managers, teaching us what to look for regarding change in cave structure. He recommended specific work to be done on entry structures, which has been completed, and for glass slides to be installed in caves as part of the caves' monitoring (ground-control) program.

The geotechnical learning is very interesting and the cave guides are developing and implementing the ground control (monitoring) plan. As the site's Work, Health and Safety representative cave guide Frank Bromley is tasked as being the lead.

Throughout the due diligence process Ken Grimes, Kevin Mott and Ian Lewis added their knowledge of the site and karst expertise which is taken into account in infrastructure design and location of walks, observation platforms and possible relocation of some cave fences. Ken was formally contracted to assist the geotech analysis. Kevin retired from DEWNR in 2015 but continues to provide an experienced, respected cave and karst management voice to the Department. He was invited onto the IRG in 2015 after he retired and his long-term involvement with Naracoorte Caves has been very well utilised during the year. He has an amazing archive of maps and plans into which he has delved. Ian is still employed by DEWNR and is a key adviser on karst matters.

Discussions regarding the walk upgrade were held on site with bat specialists Terry Reardon and Lindy Lumsden. They support the decision to remove the access road from across the top of

the maternity chambers and to re-route the two pathways that are occasionally used as vehicle access - mitigating of vehicle vibration over pupping mums/new babies.

The proposed design of the observation platforms was assessed. Research around echo-location was considered and the advice was that the proposed safety glass should be replaced with balusters in the platform design. The research considers bats can 'locate' glass but in certain circumstances reflections may cause a bat to think it's looking at potential food or just cause disorientation and collision.

Path lighting and lighting around Bat Cave was discussed and styles and locations agreed. DEWNR has to comply with rules around providing visitors' access to the Observation Centre and Bat Cave at night - pathways must be lit. The results of the discussions with Terry and Lindy are that in the vicinity of the Bat and Blanche Caves the existing tall lampposts will be removed. Red lighting will be used from the back of the Bat Observation Centre towards the Bat Cave and inside the Bat Cave when the bats are in residence. The pathways facing away from the Bat Cave between the Bat Observation Centre to the Wonambi Fossil Centre (WFC, the Park's Visitor Centre) will have white coloured lighting, complying with the visitor access code.

Current pathway construction is timetabled around the Southern Bentwinged Bats' breeding seasons (as to whether they are off or on site and if on site, where - because they over-winter on site most years). The installation of observation platforms, interpretative panels and lighting will also take account of bats' seasonal whereabouts.

The Director of the Federal Government's World Heritage Division, Veronica Blazeley, accepted an invitation to visit Naracoorte Caves in February 2016. Veronica was impressed with the consultative and thorough approach the site takes regarding its World Heritage administration and other heritage asset protection. We discussed whether or not an EPBC referral would be required with regard the 'Roof-top' Loop Walk upgrade but Veronica was satisfied that the mitigation measures were sufficient not to require referral.

Weights, Heights and Actions

In designing the construction contract and thinking about future maintenance we took into account a range of aspects - the location of caves and their individual configurations; span, shape, height and width, slope and gradient and features such as the position of pillars. The thickness of limestone over a void is important. A paper by Dr Susan White OAM on the Naracoorte Caves limestone was considered. The shape, width, location and surfacing of pathways is a prime long-term maintenance consideration. An alternate vehicle access route to Bat Cave was agreed.

The relevant characteristics of a void (treating each cave on its merits) and consideration of the frequency and type of traffic over a void need to be taken into account and matched with the geotechnical recommendations regarding thicknesses of limestone which are:

- Pedestrians - one metre minimum thickness
- Light vehicles such as a park utility - three metres minimum thickness
- Heavy trucks such as a fire truck - five metres minimum thickness

When establishing the construction contract, particular regard was given to the weight and action of machinery and vehicles. Three sections of the Loop Walk involve working over caves. In these areas the work is done 'by hand'. 'By hand' includes hand-work with shovels supported by specified light-weight machines. Bull Bros. bought a motorised wheelbarrow that has tracks instead of wheels especially for this job and is very



Hand-work on the epikarst adjacent Blanche Cave.

pleased with how useful this item is proving. These machines have great stability and maneuverability minimising vibration effects.

Bull Bros. is fully engaged in good practices regarding working in the karst. The firm is not permitted to cut into the limestone even when it's not going over a cave. The firm has been diligent in this and have shifted the path alignment at times to meet this condition.

Employees got very excited when they uncovered some epikarst near Blanche Cave and happily exposed a section beside the track so we can interpret it. Photos were sent to Ken, Kevin and Ian to gain expert description - the latter two came back with some very silly ideas, Ian concluding with asking Kevin if he was "karsting aspersions". Fortunately Ken was able to provide sense to the discussion.



Exposed section of epikarst and pathway upgrade adjacent to Blanche Cave's third roof window.



Ian Lewis at the now treeless Peppertree Hole doline. The non-native trees were affected by a prescribed burn in 2014 and removed in preparation for the new pathway.

By the time discussion was needed about the 'Peppertree Hole' doline Kevin and Ian had regained their senses and the three of them agreed it has the characteristics of a solution doline. Ken had further thoughts about collapse doline but decided it was too hard to tell.

RESURVEYS

Resurvey of Mulberry Tree Chamber, Victoria Fossil Cave (VFC)

If all goes to plan the VFC Precinct will be upgraded in 2017-18. In the process of designing a concept we had considerable discussion about caprock thickness. When Kevin Mott, the original Mulberry Chamber surveyor, said he thought it wasn't located quite where it was shown on the map we had it resurveyed. And he was rightthe chamber had 'moved' by about two metres.

This is to the advantage of cave conservation regarding the revamp of the car parking area. With the location confirmed Kevin recalculated the slope and depth of the chamber under the car-parking area, updating cross-section views. The limestone thickness ranges between 5 and 20 metres.

Resurvey of Bat and Blanche Caves

Since VFC had 'moved a bit' Kevin and I thought it pertinent to resurvey Bat and Blanche Caves. These proved to be pretty accurate, with only minor adjustments to current maps.

We pin-pointed the locations of the series of adjoining pillars in the second chamber of Blanche Cave so that the new walk goes over the pillars which means we more than meet the geotechnical recommendations re limestone thickness - the walk now has floor-to-ceiling structure underneath it. Kevin was keen for the surveyor to record the '*Mines datum point*' located between the second and third roof holes. Copies of the updated Bat and Blanche Caves maps now reside in Kevin's archives.

On the 'Roof-top'

Stage One of the Loop Walk is complete and open. Stage Two will commence in December 2016. State and Federal funding totally \$1.4M will be used to extend the Walk to include the surface above Wet and Cathedral Caves, observation platforms at cave entrances and interpretation on the paths and Wonambi Fossil Centre. New path lighting will be added between the Wonambi Fossil Centre and Bat Observation Centre.