

17 February 2021

Mr Josh Carlon
Coordinator Environment
South32 - Illawarra Metallurgical Coal
Cordeaux Colliery
Picton Road, Mount Keira West NSW 2500

Via email: josh.carlon@south32.net

Dear Mr Carlon,

Re: Dendrobium Colliery Longwall 16 End of Panel Report - Aboriginal Cultural Heritage Assessment (Niche ref #6413)

Niche Environment and Heritage (Niche) has undertaken a site assessment and review of the predicted and observed impacts on Aboriginal cultural heritage sites and their associated values resulting from the extraction of Longwall 16 at Dendrobium Colliery. This assessment was developed for inclusion in the South32 - Illawarra Metallurgical Coal (IMC) End of Panel Report (EoP) for Longwall 16.

DM 21 (AHIMS ID #52-2-3645), a Shelter with Art and Deposit, has previously experienced diagonal and vertical cracking at the northern exterior end of the shelter as a result of the extraction of Longwall 15. No additional cracking was noted as part of the End of Panel monitoring for Longwall 16.

There were no impacts recorded at Browns Road Site 8 (AHIMS ID#52-2-1623) and Upper Avon 35 (AHIMS ID#52-2-1771).

Dendrobium 6 (AHIMS ID#52-2-2246) was not inspected as it is an Isolated Artefact and would not have been able to be relocated. Dendrobium 7 (AHIMS ID#52-2-2248) and Dendrobium 8 (AHIMS ID#52-2-3068) were not inspected during this round of monitoring due to safety concerns as both sites are situated in the Longwall 17 active mining area.

As a result of this assessment the following is recommended:

Recommendations	
	General
1.	Send this draft report to the Registered Aboriginal Parties for review and comment.
2.	Continue monitoring program for remaining longwalls with condition assessment and photographic records as per the Trigger Action Response Plan.

Please do not hesitate to contact me should you require any further information.

Yours sincerely,



Renée Regal
Team Leader – NSW Aboriginal Heritage
Niche Environment and Heritage

1. Aboriginal heritage assessment

1.1 Background and introduction

South32-Illawarra Metallurgical Coal (IMC) commissioned Niche Environment and Heritage (Niche) to conduct an End of Panel (EoP) assessment of the Aboriginal cultural heritage sites within the limit of predicted subsidence effects of Longwall 16 at their Dendrobium Colliery. This area has been defined as the 'Subject Area' and is shown in Figure 1.

This EoP Aboriginal heritage assessment report includes a summary of:

- previous monitoring;
- the results of the Subsidence Report prepared by MSEC;
- the results of a site inspection;
- a discussion; and
- conclusions and recommendations.

Monitoring of Aboriginal archaeological sites at Dendrobium Colliery to-date has been carried out as recommended by Biosis Research (2007 and 2012).

1.2 Subsidence monitoring results summary (MSEC)

The EoP Subsidence Report for Area 3B, Longwalls 9 - 18 has been prepared by Mine Subsidence Engineering Consultants (MSEC). This assessment includes a comprehensive report which addresses all aspects of the recorded subsidence parameters resulting from longwall extraction. For this assessment, the initial MSEC predictions have been referred to in order to address any potential impacts at the sites.

Specifically, in relation to matters that may affect Aboriginal cultural heritage values, MSEC (Section 5.23.1 Archaeological sites) provides maximum predicted total conventional subsidence, tilt and curvature for the archaeological sites resulting from the extraction of the proposed longwalls (MSEC459) The predictions are outlined in Table 1.

Table 1: Maximum predicted subsidence movements for Aboriginal cultural heritage sites relevant to Longwall 16.

Aboriginal site (AHIMS)	Maximum predicted total conventional subsidence (mm)	Maximum predicted total conventional tilt (mm/m)	Maximum predicted total conventional hogging curvature (km ⁻¹)	Maximum predicted total conventional sagging curvature (km ⁻¹)
Browns Road Site 8 (AHIMS ID# 52-2-1623)	675	7	0.6	0.15
Upper Avon 35 (AHIMS ID# 52-2-1771)	<20	<0.5	<0.01	<0.01
Dendrobium 6 (AHIMS ID# 52-2-2246)	275	7	0.20	0.01
Dendrobium 7 (AHIMS ID# 52-2-2248)	200	6	0.15	0.01

Aboriginal site (AHIMS)	Maximum predicted total conventional subsidence (mm)	Maximum predicted total conventional tilt (mm/m)	Maximum predicted total conventional hogging curvature (km ⁻¹)	Maximum predicted total conventional sagging curvature (km ⁻¹)
Dendrobium 8 (AHIMS ID# 52-2-3068)	750	20	0.80	0.06
DM 21 (AHIMS ID# 52-2-3645)	1375	25	0.55	0.08

1.3 Site inspection and results

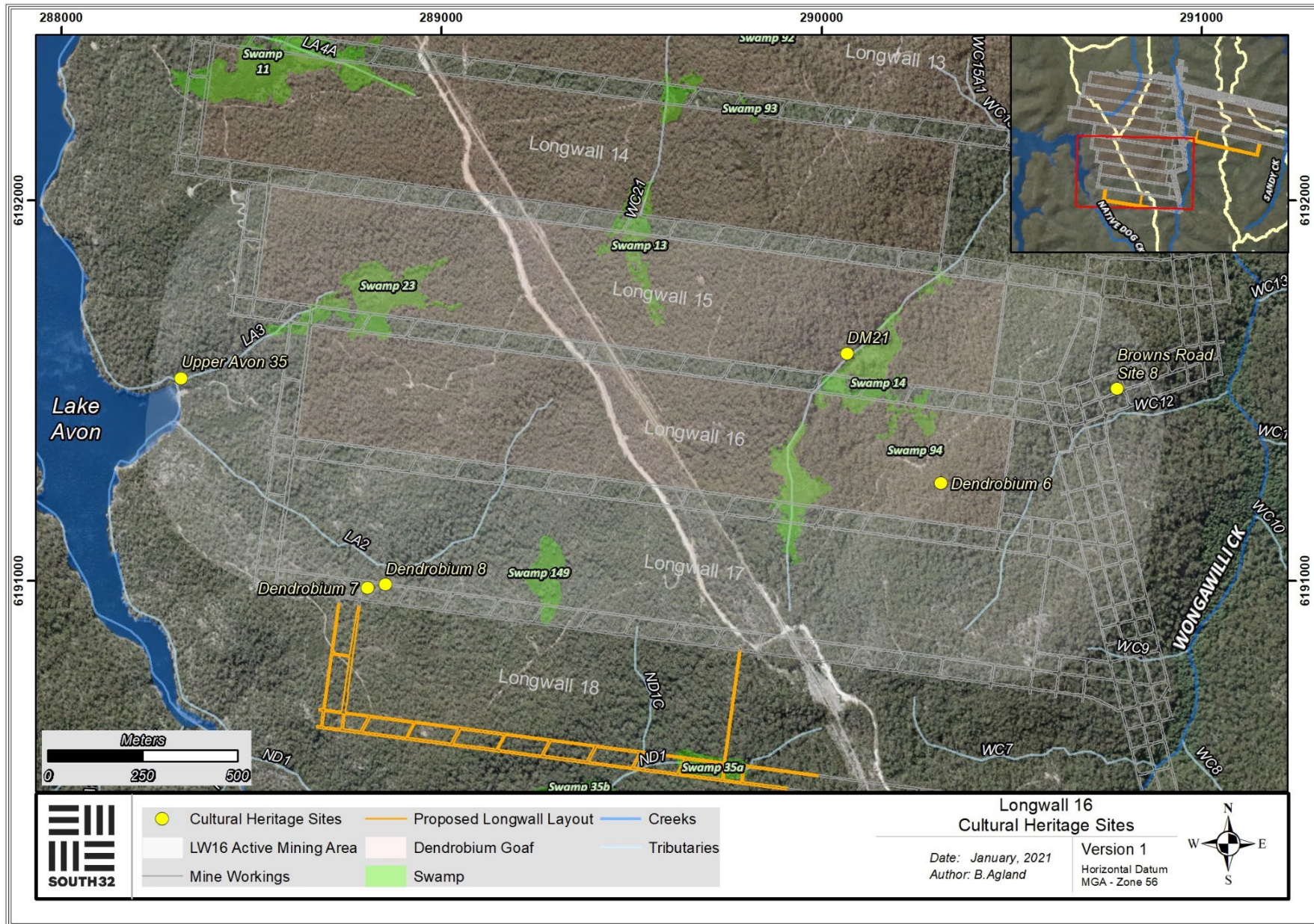
The six Aboriginal sites addressed in this assessment are listed in Table 2 and shown in Figure 1:

Table 2: Sites inspected as part of this assessment

Site Name	AHIMS ID	Site Type	Date Surveyed
Browns Road Site 8	52-2-1623	Shelter with Deposit	20 January 2021
Upper Avon 35	52-2-1771	Shelter with Deposit	20 January 2021
Dendrobium 6	52-2-2246	Isolated Artefact	Not inspected as it is an Isolated Artefact that would not be able to be relocated.
Dendrobium 7	52-2-2248	Shelter with Art	Not inspected due to safety reasons- active mining within close proximity
Dendrobium 8	52-2-3068	Shelter with Art and Grinding Grooves	Not inspected due to safety reasons- active mining within close proximity
DM21	52-2-3645	Shelter with Art and Deposit	20 January 2021

The site inspection was carried out on 20 January 2021 by Renée Regal (Team Leader – NSW Heritage Team Leader). A summary of the findings of the site visit are outlined in Sections 1.3.1 to 1.3.6. Three (3) out of these six (6) sites were inspected as they were all located within the possible zone of subsidence movements associated with the extraction of Longwall 16.

Figure 1: Map of AHIMS sites located within the Longwall 16 Subject Area (Source: South32-IMC and AHIMS).



1.3.1 Browns Road Site 8 (AHIMS ID# 52-2-1623)

This Shelter with Deposit site is located 150 m south of Fire Trail 6Q, approximately 1 km from the junction of Fire Trails 6A and 6Q; the site is 70 m from tributary WC12 (Figure 1). The sandstone overhang measures 8 x 4.5 x 1.8 m. The site was formed by block fall and cavernous weathering. The floor deposit is light brown loamy sand 10 cm deep. One chert flake was located in the dripline of the shelter when the site was first recorded by Sefton in 1981. This shelter does not contain art.

Table 3: Summary of the site visit to Browns Road Site 8 (AHIMS ID# 52-2-1623)

AHIMS number	Site name	Results of inspections
52-2-1623	Browns Road Site 8	This Shelter with Deposit site was previously recorded during monitoring by Niche (2020) for the Longwall 15 EoP report. During the recent monitoring, no impacts related to the extraction of Longwall 16 were observed. The shelter had a dry interior, and naturally occurring granular loss, exfoliation, mineral efflorescence and microvegetation were observed within the interior. The chert flake noted in the AHIMS site card completed by Sefton during 1981 could not be relocated at the time of the site inspection due to deep leaf litter (Plate 1).

Longwall 16 EoP Monitoring Images



Plate 1: General photo of Browns Road Site 8 facing east, showing the leaf litter covering the interior deposit. Photo taken: 20 January 2021.

Previous Images from Longwall 15 Monitoring Program



Plate 2: Comparison photo of Browns Road Site 8, facing west (Niche 2020). Photo taken: 16 April 2020.

Longwall 16 EoP Monitoring Images



Plate 3: Close up of shelter roof and backwall facing south-east. Photo taken: 20 January 2021.

Previous Images from Longwall 15 Monitoring Program



Plate 4: Comparison photo of shelter roof and back wall, facing north-west. Taken during monitoring by Niche (2020) for the Longwall 15 EoP report. Photo taken: 16 April 2020.

1.3.2 Upper Avon 35 (AHIMS ID#52-2-1771)

This Shelter with Deposit is located on the eastern side of Lake Avon, adjacent to Tributary LA3. The site is approximately 10 m above the stored water of Avon Dam (Figure 1). The sandstone overhang is 15 x 4.5 x 3.5 m and the living area is 4 x 1 m. The shelter was formed by block fall, and the floor deposit consists of yellow grey loamy sand, approximately 30 cm deep. During monitoring for the Longwall 15 End of Panel Report, nine artefacts were located: one quartzite scraper, one quartz core, two mudstone flakes, one quartzite flake, one mudstone core, one petrified wood flake, one quartz flake and red ochre. The recording noted that this site was in good condition despite continued cavernous weathering with additional disturbance from a wombat burrow.

Table 4: Summary of the site visit to Upper Avon 35 (AHIMS ID # 52-2-1771)

AHIMS number	Site name	Results of inspections
52-2-1771	Upper Avon 35	This Shelter with Deposit site was previously recorded during the Longwall 9 -18 baseline recording report completed by Biosis (2012) and the Longwall 15 End of Panel report completed by Niche (2020). During the recent monitoring, no impacts related to the extraction of Longwall 15 were observed. The shelter had a dry interior, with granular loss, exfoliation and microvegetation observed in its interior. All of the eight (8) artefacts noted in the AHIMS site card recording completed by Biosis (2007) were relocated.

Longwall 16 EoP Monitoring Images



Plate 5: General photo of shelter facing south. Photo taken: 20 January 2021.

Previous Monitoring Images



Plate 6: Comparison general photo of shelter from Biosis (2012) Longwall 9-18 baseline recording. Photo taken: February 2012.

Longwall 16 EoP Monitoring Images



Plate 7: General photo of shelter floor deposit, facing south. Photo taken: 20 January 2021.

Previous Monitoring Images



Plate 8: General photo of shelter floor, from Niche (2020) monitoring survey for the Longwall 15 End of Panel report. Facing south. Photo taken: 15 April 2020.

1.3.3 Dendrobium 6 (AHIMS #52-2-2246)

Dendrobium 6 is an Isolated Artefact site located on the surface of a vehicle track (Figure 1). The site has experienced some disturbance from the vehicle track and contains a single artefact. This site has little representational rarity value as the isolated artefacts can and do occur virtually anywhere in any landform (Biosis 2012).

Table 5: Summary of the site visit to Dendrobium 6 (AHIMS ID# 52-2-2246)

AHIMS number	Site name	Results of inspection
52-2-2246	Dendrobium 6	This Isolated Artefact is a surface find that has a negligible chance of impact from subsidence related effects (Biosis 2012). This site was not relocated during this survey and is not expected to be impacted by the extraction of Longwall 16.

1.3.4 Dendrobium 7 (AHIMS ID#52-2-2248)

This Shelter with Art is situated approximately 370 m south of Longwall 16, at its closest point (Figure 1). Formed by blockfall and cavernous weathering on the mid to lower cliff line outcrop, the shelter comprises a long, narrow sandstone overhang measuring 18 x 1.9 x 1.98 m (Biosis 2012). As Longwall 17 is currently being extracted, this site was unable to be safely visited for the Longwall 16 End of Panel monitoring.

Table 6: Summary of the site visit to DM 7 (AHIMS ID# 52-2-2248)

AHIMS number	Site name	Results of inspections
52-2-2248	Dendrobium 7	This Shelter with Art was unable to be safely visited for the Longwall 16 EoP monitoring, due to the current extraction of Longwall 17.

1.3.5 Dendrobium 8 (AHIMS ID#52-2-3068)

This Shelter with Art is located approximately 355 m south of Longwall 16, at its closest point (Figure 1). Formed by blockfall and cavernous weathering on the mid to lower cliff line outcrop, the art within the shelter comprises one indeterminate charcoal with infill motif (Biosis 2012). As Longwall 17 is currently being extracted, this site was unable to be safely visited for the Longwall 16 End of Panel monitoring.

Table 7: Summary of the site visit to Dendrobium 8 (AHIMS ID# 52-2-3088)

AHIMS number	Site name	Results of inspections
52-2-3088	Dendrobium 8	This Shelter with Art was unable to be visited safely for the Longwall 16 EoP monitoring, due to the current extraction of Longwall 17.

1.3.6 DM 21 (AHIMS ID# 52-2-3645)

This Shelter with Art and Deposit is situated at the end of a small sandstone spur and adjacent to Swamp 14 (Figure 1). The shelter is cavernously weathered, with a wide but low entrance that opens out to a large cavern. During baseline recording (Biosis 2012), some seepage was present on the shelter walls and roof, and the shelter was slightly damp. Green lichen and mould growth cover the majority of the shelter’s inside surface and dense vegetation surrounded the exterior of the shelter. The shelter interior measures 9 x 3.5 x 2 m. The Art consists of ten red ochre stencils, a single white clay handprint, scratching superimposition associated with one set of stencils, and a series of indeterminate charcoal motifs that were obscured by lichen and mould at the time of recording. Seven flaked stone artefacts were recorded on the floor of the shelter, on a good deposit that is at least 20 cm deep.

Table 8: Summary of the site visit to DM 21 (AHIMS ID# 52-2-3645)

AHIMS number	Site name	Results of inspections
52-2-3645	DM 21	This Shelter with Art and Deposit site was previously recorded as part of the Longwall 15 End of Panel monitoring program (Niche 2020). During the previous recording, the interior cavern of the shelter had not experienced any direct impacts from subsidence; however, the northern exterior of the shelter was noted to have experienced fracturing as result of subsidence from the extraction of Longwall 15. Four main instances of vertical and diagonal cracking were observed, with the largest crack at the base of the ridgeline measuring 3.7 cm in width (Niche 2020). During the recent monitoring program no observable changes were recorded, and the monitoring point of natural fissuring did not have any further separation in comparison to previous monitoring. The Art Panels had not noticeably faded since the previous monitoring.

Longwall 16 EoP Monitoring Images

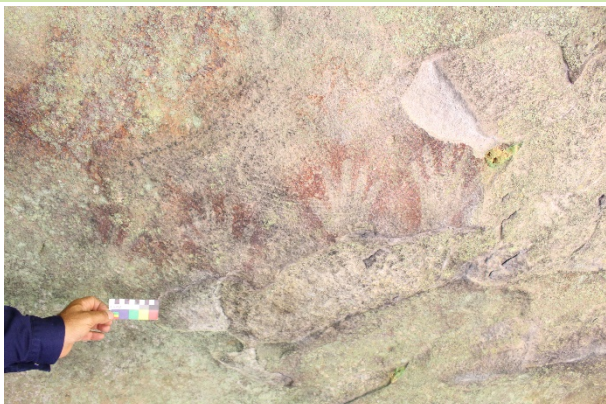


Plate 9: Image of fading ochre hand stencils located on the roof shelter. Photo taken: 20 January 2021.

Previous Images from Longwall 15 Monitoring Program



Plate 10: Comparison image of fading ochre hand stencils located on the roof shelter, from the Longwall 15 EoP monitoring completed by Niche (2020). Photo taken: 15 April 2020.

Longwall 16 EoP Monitoring Images



Plate 11: Close up of vertical cracking located at the base of the northern exterior of the shelter cavern area. Photo taken: 20 January 2021.

Previous Images from Longwall 15 Monitoring Program



Plate 12: Close up of vertical cracking located at the base of the northern exterior of the shelter cavern area. Recorded by Niche (2020) for the Longwall 15 EoP. Photo taken: 15 April 2020.

1.4 Discussion and conclusion

Three (3) out of the six (6) Aboriginal cultural heritage sites located within the Subject Area were visited, with Dendrobium 7 (AHIMS ID#52-2-2248) and Dendrobium 8 (AHIMS ID#52-2-3068) not able to be visited safely due to ongoing Longwall 17 extraction. One (1) Dendrobium 6 (AHIMS ID#) consists of an Isolated Artefact and would not be able to be relocated for this assessment. One (1) out of the three (3) Aboriginal cultural heritage sites visited (DM 21 AHIMS ID #52-2-3645) experienced observable impacts from previous subsidence movements related to extraction of Longwall 15, with diagonal and vertical cracking having occurred at the northern exterior end of the shelter without impacting the Art Panels (Niche 2020). No further impacts to DM 21 (AHIMS ID#52-2-3645) were observed as a result of the extraction of Longwall 16. No impacts were observed at Browns Road Site 8 (AHIMS ID#52-2-1623) or Upper Avon 35 (AHIMS ID#52-2-1771).

In the Aboriginal Heritage Impact Permit (AHIP # 1132005) granted to harm Aboriginal objects located within Dendrobium Underground Mine Area 3B, DM 21 (AHIMS ID #52-2-3645) is identified in Schedule C as a site that can be harmed by extraction related activities, under Section 90 of *The National Parks and Wildlife Act 1974*.

The Trigger Action Response Plan (TARP) (Table 10) contains the Performance Measures along with the proposed Corrective Management Actions (CMA) for Aboriginal cultural heritage sites, as outlined in the Dendrobium Area 3B Subsidence Management Plan (SMP). As per the TARP's performance measures, Browns Road Site 8 (AHIMS ID#52-2-1623), Upper Avon 35 (AHIMS ID#52-2-1771), Dendrobium 6 (AHIMS ID#52-2-2246), Dendrobium7 (AHIMS ID#52-2-2248), Dendrobium 8 (AHIMS ID#52-2-3068) and DM 21 (AHIMS ID #52-2-3645) do not trigger CMAs.

As a result of this assessment, the following is recommended:

Table 9: Recommendations for Aboriginal sites within the Subject Area.

Recommendations	
	General
1.	Send this draft report to the Registered Aboriginal Parties for review and comment.
2.	Continue monitoring program for remaining longwalls with condition assessment and photographic records as per the Trigger Action Response Plan.

Table 10: Dendrobium Approval Performance Measures Table - Trigger Action Response Plan (TARP)

Feature	Performance Measures	Observations	Actions as a result of performance measure rating
<p>Browns Road Site 8 (AHIMS ID#52-2-1623) Upper Avon 35 (AHIMS ID#52-2-1771) Dendrobium 6 (AHIMS ID#52-2-2246) Dendrobium7* (AHIMS ID#52-2-2248) Dendrobium 8* (AHIMS ID#52-2-3068) DM 21 (AHIMS ID #52-2-3645)</p> <p><i>* Sites not visited due to safety reasons</i></p>	<p>Observational and photographic monitoring in consultation with stakeholders (completed by this assessment).</p>	<p>Any changes attributable to natural weathering such as macro vegetation growth and exfoliation. Art, where previously recorded, remains intact.</p>	<p>None.</p>
<p>None identified</p>	<p><u>Level 1</u> Change in shelter conditions not attributable to natural weathering or preservation- mineral growth of micro-organism growth (as observed by comparing pre-mining photographs with post-subsidence/ mining photographs). Changes external to the shelter that affect the site context (e.g. ground cracking, boulder slumping, rock and/or tree falls).</p>	<p>N/A.</p>	<p>N/A.</p>
<p>None identified</p>	<p><u>Level 2</u> Change in shelter conditions not attributable to natural weathering or preservation- change in drip line or seepage, cracking or exfoliation of overhang or shelter, movement or opening of existing planes and joints in panel, block fall within shelter or overhang, shelter or overhang collapse.</p>	<p>N/A.</p>	<p>N/A.</p>
<p>None identified</p>	<p><u>Level 3</u> Level 2 impacts at greater frequency than predicted. Level 2 impacts attributable to mining remote from the mining area.</p>	<p>N/A.</p>	<p>N/A.</p>

References

BHP Billiton Illawarra Coal (2007), *Dendrobium Area 3B: Subsidence Management Plan*. An unpublished report for DPI.

Biosis Research (2007), *Dendrobium Area 3 Archaeological and Cultural Heritage Assessment*. An unpublished report for BHP Billiton Illawarra Coal.

Biosis Research (2012), *Dendrobium Area 3B Longwalls 9 to 18: Aboriginal Cultural Heritage Assessment Report*. An unpublished report for BHP Billiton Illawarra Coal.

Niche Environment and Heritage (2020), *Dendrobium Colliery Longwall 15 End of Panel Report - Aboriginal Heritage Assessment*. An unpublished report for South 32 Illawarra Coal.