

21 June 2019

Mr Josh Carlon
Environmental Field Team Coordinator
South 32-Illawarra Coal
Cordeaux Colliery
Picton Road, Mount Keira West NSW 2500

Via email: josh.carlon@south32.net

Dear Josh,

Re: Dendrobium Colliery Longwall 14 End of Panel Report - Aboriginal Heritage Assessment (#4872)

Niche Environment and Heritage (Niche) has undertaken a site assessment and review of the predicted and observed impacts on Aboriginal heritage sites and their associated values resulting from the extraction of coal at Longwall 14 at Dendrobium Colliery. This assessment is attached for inclusion in the South 32-Illawarra Coal (Illawarra Coal) End of Panel Report for Longwall 14.

Browns Road Site 11 (AHIMS ID# 52-2-1626) and Site 1 DB 1 (AHIMS ID #52-2-2229) have been impacted by subsidence related movements caused by mining. Upper Avon 37 (AHIMS ID#52-2-1773), DM22 (AHIMS ID#52-2-3646) and DM21 (AHIMS ID#52-2-3645) did not have any observable impacts noted during the site inspections.

The following is recommended:

- Browns Road Site 11 (AHIMS ID# 52-2-1626) and Site 1 DB 1 (AHIMS ID #52-2-2229)
 - Notify relevant specialists and key stakeholders any significant changes to the condition of the Aboriginal Sites (outlined in section 21.3 of the Dendrobium Area 3B Subsidence Management Plan).
 - Illawarra Coal should continue to monitor the Aboriginal sites as outlined in Condition 7 (b) of Aboriginal Heritage Impact Permit 1132005.

Please do not hesitate to contact me on 0488 774 501 should you require any further information.

Yours sincerely,



Layne Holloway
Heritage Consultant
Niche Environment and Heritage

1. Aboriginal Heritage Assessment

1.1 Background and Introduction

South 32- Illawarra Coal (Illawarra Coal) commissioned Niche Environment and Heritage (Niche) to conduct an End of Panel (EoP) assessment of the Aboriginal cultural heritage sites within the limit of subsidence effects of Longwall 14 at Dendrobium Colliery. This area has been defined as the 'Subject Area' and is shown in Figure 1, which is reproduced from MSEC1039FINAL 2019: 141 Figure MSEC792-13 and MSEC459REVB 2019:84.

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 End of Panel Subsidence Report for Longwall 14 is being prepared by Mine Subsidence Engineering Consultants (MSEC). This assessment includes a comprehensive report which addresses all aspects of the recorded subsidence parameters resulting from the extraction of Longwall 14. 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 Archaeological sites) provides maximum predicted total conventional subsidence, tilt and curvature for the archaeological sites resulting from the extraction of the proposed longwalls (MSEC459REVB 2012:84). The predictions are reproduced below:

Table 1: Maximum predicted subsidence movements for Aboriginal cultural heritage sites relevant to Longwall 14.

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 11 (52-2-1626)	1875	25	0.40	0.55
Site 1 DB 1 (52-2-2229)	2425	18	0.20	0.70
DM 21 (52-2-3645)	1375	25	0.55	0.08
DM 22 (52-2-3646)	<20	<0.5	<0.01	<0.01
Upper Avon 37 (52-2-1773)	0	0	0	0

Browns Road Site 11 (AHIMS ID#52-2-1626) and 1 DB-1 (AHIMS ID #52-2-2229) are located over Longwall 14 and have both been impacted by mining related effects, as summarised in Table 2 and Table 3 of this assessment.

1.3 Site inspection and results

The five Aboriginal sites inspected as part of this assessment include:

- AHIMS #52-2-1626 (Browns Road Site 11) shelter with art ;
- AHIMS # 52-2-2229 (Site 1-DB1) shelter with art ;
- AHIMS # 52-2-3645 (DM21) shelter with art and deposit;
- AHIMS #52-2-3646 (DM22) shelter with art;
- Upper Avon 37 (AHIMS ID#52-2-1773), shelter with art;

These five sites were inspected as they were all located within the possible zone of subsidence movements associated with Longwall 14 (Figure 1)

The site inspection was carried out on 10 May 2019 by Renée Regal (Senior Heritage Consultant-Niche) and Layne Holloway (Heritage Consultant-Niche). A summary of the findings of the site visit are outlined in Table 2.

Table 2: Summary of the site visits to the Aboriginal heritage sites in proximity to Longwall 14.

AHIMS site numbers	Site name	Results of inspections
52-2-1626	Browns Road Site 11	This shelter had visible impacts from subsidence movements. The impact is comprised of one main area of rock fracturing. Diagonal and vertical cracking are contained to the southern end of the floor of the shelter, including minor block fall. No lateral movement or opening of joints were visible within the shelter site. The sandstone shelter is actively exfoliating, possibly expedited by subsidence movements. Further localised cracking was observed to the north of the shelter, within a shared ridgeline. Cracking within the southern floor area measured to an approximate length of 0.7m and maximum width of 0.03m. The site was undermined by Longwall 14 on 28 January 2019. The two art panels remain in the same condition as described in Biosis Research 2011, and 2007. Macro vegetation was observed growing within the natural joint lines of the shelter.



Plate 1: General Photo of Browns Road Site 11.



Plate 2: General Photo of Browns Road Site 11 facing south.



Plate 3: General Photo of Browns Road Site 11 facing north.



Plate 4: Subsidence cracking north of the shelter.



Plate 5: Subsidence cracking at the western end of the shelter.



Plate 6: Bedding planes located in the centre of the shelter.



Plate 7: Panel 1 Indeterminate charcoal motifs and charcoal eel motif.



Plate 8: Panel 1 Indeterminate charcoal.



Plate 9: Panel 1 Indeterminate charcoal.



Plate 10: Panel 2 Indeterminate charcoal.

Table 3: Summary of the site visits to the Aboriginal heritage sites in proximity to Longwall 14

AHIMS site numbers	Site name	Results of inspections
52-2-2229	Site 1-DB1	This shelter had visible impacts from subsidence. The impact is comprised of two rock fractures with the largest having a maximum measurable length of 1m, and a maximum width of 0.03m. The fracturing is located within the back wall of the Aboriginal Site 1-DB1, this site comprises of a sandstone shelter containing art on the roof area. The shelter is 4.5m in length, 2m wide, 1.2m high with a sanded floor. The art is not directly impacted by the fracture, which is contained to the underlying, disconnected rock. The site was undermined by Longwall 14 on 28 January 2019. Access to the site was restricted during mining due to safety concerns. The art panel remains in the same condition as described in Biosis Research 2008, and 2009.



Plate 11: General Photo of Site 1-DB1.



Plate 12: Subsidence related cracking to the northern side of the shelter.

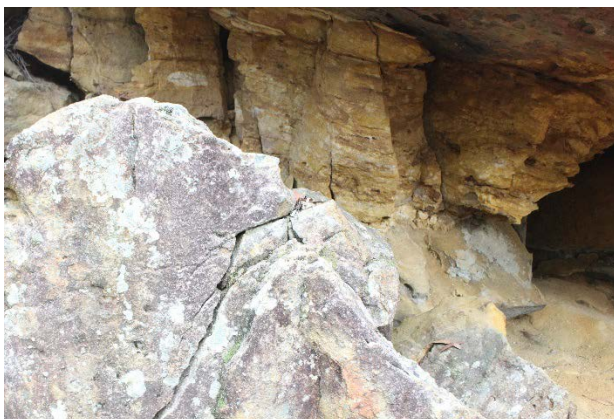


Plate 13: Subsidence related cracking on the back wall of the north side of the shelter.



Plate 14: Subsidence related cracking to the northern side of the shelter.

Table 4: Summary of the site visits to the Aboriginal heritage sites in proximity to Longwall 14.

AHIMS site numbers	Site name	Results of inspections
52-2-3645	DM21	<p>This shelter was in the same condition as described by Biosis in 2011. There has been no movement of the horizontal bedding plane joints of the shelter and no cracking or exfoliation observed in relation to the extraction of Longwall 14.</p> <p>There has been no altered seepage or water movements in the shelter, and there is no evidence of water flow or recent micro-vegetation growth associated with any movement.</p> <p>The art panel remains in the same condition as described in Biosis Research 2008, and 2011.</p>

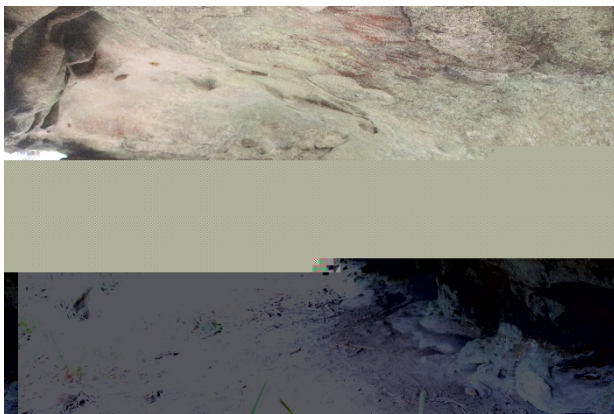


Plate 15: General Photo of DM21 facing east. Panels 1, 2 and 3.



Plate 16: Location of Panel 3, red ochre stencils with circular etching.

Table 5: Summary of the site visits to the Aboriginal heritage sites in proximity to Longwall 14.

AHIMS site numbers	Site name	Results of inspections
52-2-3646	DM22	<p>This shelter was in the same condition as described by Biosis in 2011. There has been no movement of the horizontal bedding plane joints of the shelter and no cracking or exfoliation observed in relation to the extraction of Longwall 14.</p> <p>There has been no altered seepage or water movements in the shelter, and there is no evidence of water flow or recent micro-vegetation growth associated with any movement.</p> <p>The art panel remains in the same condition as described in Biosis Research 2007, and 2013.</p>



Plate 17: General Photo of DM22 facing east.



Plate 18: Panel 1, charcoal outline of anthropomorphic figure and Panel 2, charcoal indeterminate.

Table 6: Summary of the site visits to the Aboriginal heritage sites in proximity to Longwall 14.

AHIMS site numbers	Site name	Results of inspections
52-2-1773	Upper Avon 37	<p>This shelter was in the same condition as described by Biosis in 2011. There has been no movement of the horizontal bedding plane joints of the shelter and no cracking or exfoliation observed in relation to the extraction of Longwall 14.</p> <p>There has been no altered seepage or water movements in the shelter, and there is no evidence of water flow or recent micro-vegetation growth associated with any movement.</p> <p>The artefact could not be relocated.</p>



Plate 19: General Photo of Upper Avon 37 facing east.



Plate 20: General Photo of Upper Avon 37 facing south towards Lake Avon.

1.4 Discussion and conclusion

Two out of the five Aboriginal sites had observable impacts from subsidence movements related to extraction of Longwall 14. Browns Road Site 11 (AHIMS ID# 52-2-1626) and Site 1 DB 1 (AHIMS ID #52-2-2229) are both shelter with art sites. The sandstone shelters have experienced diagonal and vertical cracking with possible block fall and exfoliation expedited with subsidence. Art panels have not been impacted by subsidence effects.

The Aboriginal Heritage Impact Permit (AHIP), granted to harm Aboriginal objects located within Dendrobium Underground Mine Area 3B, states that Browns Road Site 11 (AHIMS ID# 52-2-1626) and Site 1 DB 1 (AHIMS ID #52-2-2229) are identified in schedule C as sites that can be harmed by mining related activity under section 90 of *The National Parks and Wildlife Act*.

The Trigger Action Response Plan (TARP) (Table 3) contains the Performance Measures along with the proposed Corrective Management Actions (CMA) for Aboriginal heritage sites, as outlined in the Dendrobium Area 3B Subsidence Management Plan (SMP). As per the TARP's performance measures, Browns Road Site 11 (AHIMS ID# 52-2-1626) and Site 1 DB 1 (AHIMS ID #52-2-2229) are considered to act on level 1 performance measures. Upper Avon 37 (52-2-1773), DM22 (52-2-3646) and DM21 (52-2-3645) do not trigger CMA's.

It is recommended that Illawarra Coal continue to monitor the Aboriginal sites as outlined below, based on in Condition 7 (b) of Aboriginal Heritage Impact Permit 1132005.

Table 7: Recommendations for Aboriginal sites within the Subject Area.

Recommendations	
	Browns Road Site 11 (AHIMS ID# 52-2-1626) and Site 1 DB 1 (AHIMS ID #52-22229)
1.	Notify relevant specialists and key stakeholders (e.g Aboriginal community groups).
2.	Continue monitoring program with condition assessment and photographic records As Per TARPS.

Table 3: Dendrobium Approval Performance Measures Table

Feature	Performance Measures	Observations	Actions as a result of performance measure rating
<p>Upper Avon 37 (52-2-1773), DM22 (52-2-3646) DM21 (52-2-3645)</p>	<ul style="list-style-type: none"> Observational and photographic monitoring in consultation with stakeholders (completed by this assessment). 	<ul style="list-style-type: none"> Changes attributable to natural weathering such as macro vegetation growth and exfoliation. Art remains intact. 	<ul style="list-style-type: none"> None.
<p>Browns Road Site 11 (52-2-1626) Site 1 DB 1 (AHIMS ID #52-2-2229)</p>	<p>Level 1</p> <ul style="list-style-type: none"> 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). 	<ul style="list-style-type: none"> Diagonal And horizontal cracking of sandstone shelter caused by subsidence. Exfoliation expedited by subsidence. Minor block fall within sandstone shelter caused by subsidence. Art panels remains intact. 	<ul style="list-style-type: none"> Continue monitoring program. Condition assessment and photographic record Notify relevant specialists and key stakeholders (e.g Aboriginal community groups), outlined in section 21.3 of the Dendrobium Area 3B Subsidence Management Plan). Summarise impacts and report in the End of Panel report and AEMR.
<p>None identified</p>	<p>Level 2</p> <ul style="list-style-type: none"> Change in shelter conditions not attributable to 	<ul style="list-style-type: none"> N/A. 	<ul style="list-style-type: none"> Actions as stated for Level 1. Modify monitoring program if necessary.

	<p>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>		<ul style="list-style-type: none"> • Consider development of site management plan to mitigate effects in consultation with Registered Aboriginal Groups and Landowner (WaterNSW). • Notify RAP's of damages caused from mining. • Notify OEH and complete Aboriginal Site Impact Recording Forms (ASIRF) for damaged sites. • NONE REQUIRED.
<p>None identified</p>	<p><u>Level 3</u></p> <ul style="list-style-type: none"> • Level 2 impacts at greater frequency than predicted. • Level 2 impacts attributable to mining remote from the mining area. 	<ul style="list-style-type: none"> • N/A. 	<ul style="list-style-type: none"> • Actions stated for Level 2 . • Immediately notify OEH, DoPI, DPI, SCA (WaterNSW), other resource managers and relevant technical specialists and seek advice in any CMA required. • Site visits with stakeholders if required. • Review monitoring program and notify if necessary within 1 month. • Implement increased monitoring if required within 2 weeks. • Develop site CMA in consultation with key stakeholders within 1 month, (pending stakeholder availability) and seek approvals. • Completion of works following approvals. • Issue CMA report within 1 month of works completion. • Conduct initial follow up monitoring and reporting within two months of CMA completion. • Review the relevant TARP and Management Plan in consultation with key stakeholders. • NONE REQUIRED.

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.

Biosis Pty Ltd (2013) *Baseline recording of Aboriginal sites in Dendrobium Area 3B Longwall 9-18*. Report for BHP Billiton Illawarra Coal.

MSEC1039 FINAL (2019) *BHP Billiton Illawarra Coal: Dendrobium Area 3B-Longwall 14*. An unpublished report for South 32 Illawarra Coal.

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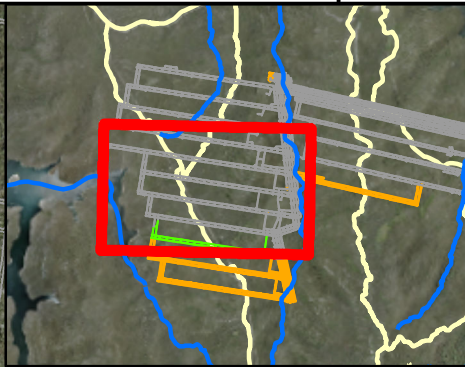
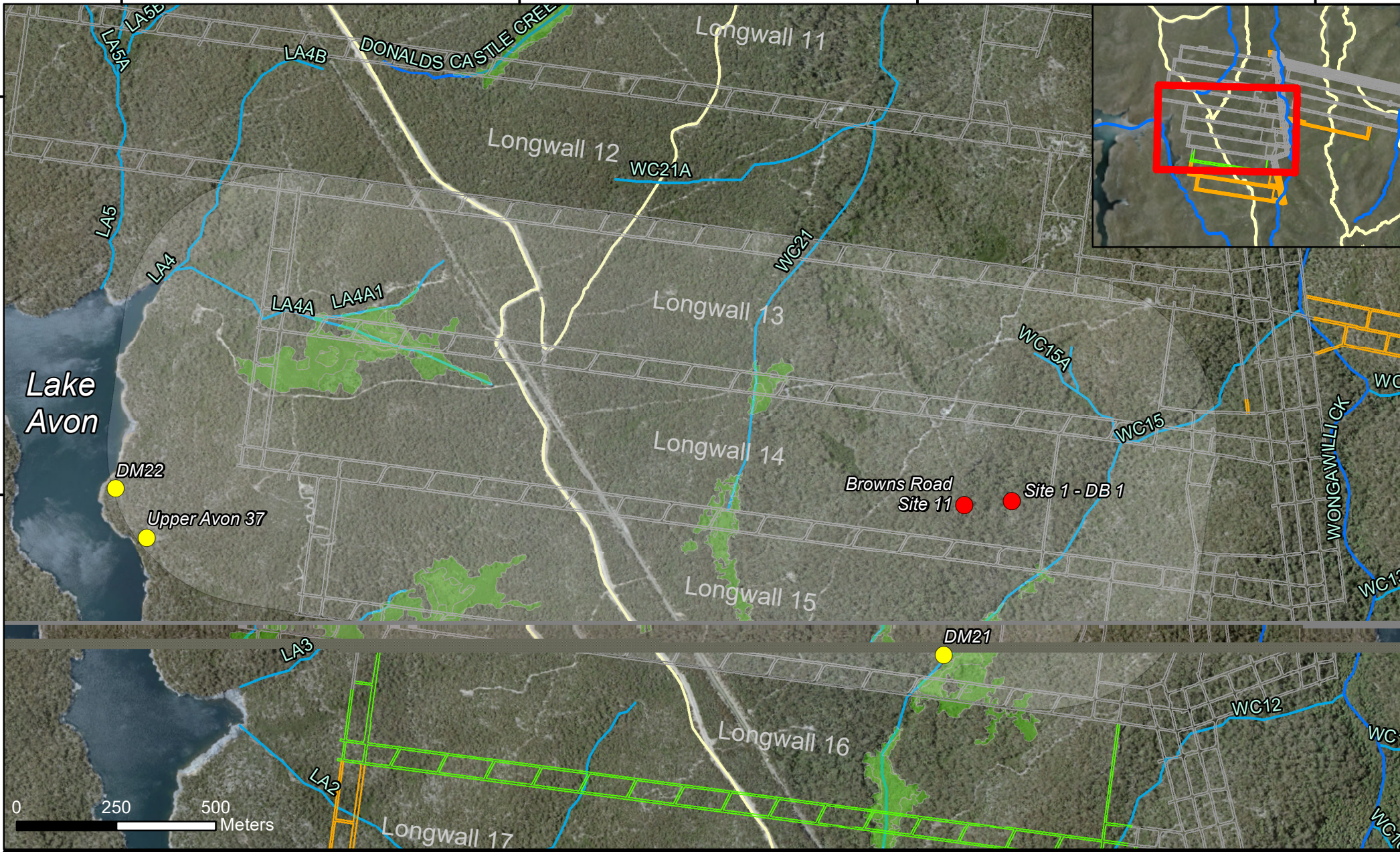
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Lake Avon

DONALDS CASTLE CREEK

Longwall 11

Longwall 12

Longwall 13

Longwall 14

Longwall 15

Longwall 16

Longwall 17

LA4B

LA4

LA4A

LA4A1

LA3

LA2

WC21A

WC21

WC15A

WC15

DM21

WC12

WONGAWILLI CK

WC

WC15

WC

WC

Legend

- Impacted Aboriginal Archaeological Sites
- Unimpacted Aboriginal Archaeological Sites
- Active Mining Area
- Mine Workings
- Approved Longwall Layout
- Proposed Longwall Layout
- Swamps
- Fire Roads
- Creeks
- Tributaries



Longwall 14
Cultural Heritage Sites

Date: June, 2019
Author: B. Agland

Version 1
Horizontal Datum
MGA - Zone 56

