



APPENDIX F

Aboriginal Cultural Heritage
Assessment

Aboriginal Cultural Heritage Assessment Report

Dendrobium Mine Extension Project

Wollongong, Wingecarribee and Wollondilly Local Government Areas

Prepared for Illawarra Metallurgical Coal

Prepared by Niche Environment and Heritage | 15 February 2022



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Executive Summary

Niche Environment and Heritage (Niche) was commissioned by Illawarra Metallurgical Coal (IMC), to prepare an Aboriginal Cultural Heritage Assessment (ACHA) report in support of an application for the Dendrobium Mine Extension Project ('the Project'). Niche has prepared an ACHA to assess the potential impacts of the Project to any Aboriginal cultural heritage sites or values within the Subject Area.

The Subject Area is located within the Local Government Areas (LGAs) of Wollongong, Wingecarribee and Wollondilly. The Subject Area is situated within the traditional country of the Tharawal people and falls within the Tharawal Local Aboriginal Land Council (LALC) and the Illawarra LALC.

This ACHA has been prepared in accordance with the *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in New South Wales* (OEH 2011). The objectives of the assessment are to identify Aboriginal cultural heritage sites that may be harmed by the Project, to undertake consultation with registered Aboriginal parties, to identify the cultural values connected with the Subject Area and to provide recommendations to reduce the extent and severity of harm that will be caused by the Project where it cannot be avoided. The ACHA also provides guidance on the process for investigating and assessing Aboriginal cultural heritage in NSW. Aboriginal community consultation was undertaken from Stage 2 of the *Aboriginal cultural heritage consultation requirements for proponents* with 30 Aboriginal stakeholder groups (Registered Aboriginal Parties).

As part of the EIS for the Project, an Aboriginal cultural heritage survey program was completed for the Subject Area in compliance with the requirements of the *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW 2010a). The results of the archaeological assessment are presented in an Archaeological Report (AR) provided in Appendix A and have been considered in this ACHA when assessing the likely harm of the proposed activity on the Aboriginal objects present within the Subject Area.

Avoidance of key surface features associated with Aboriginal heritage values has been incorporated into the design of the Project. The surface infrastructure proposed by IMC would avoid all previously identified Aboriginal cultural heritage sites, including rock shelters and grinding grooves. IMC has proposed a Project design that would:

- not longwall mine beneath 3rd, 4th and 5th order (or above) streams;
- not longwall mine beneath previously identified high archaeological (scientific) significance Aboriginal cultural heritage sites;
- set longwall mining at a distance of at least 400 m from named watercourses (i.e. the Avon River, Cordeaux River, Donalds Castle Creek and Wongawilli Creek);
- avoid longwall mining beneath identified key stream features;
- avoid longwall mining beneath "Area 4" swamp cluster; and
- use existing infrastructure (namely the Dendrobium Pit Top, Kemira Valley Coal Loading Facility, Kemira Valley Rail Line, Dendrobium CPP, Shaft Sites Nos 1, 2 and 3 and the West Cliff Stage 3 Coal Wash Emplacement) which would reduce the requirement for additional surface disturbance.

Within the Subject Area, 28 previously recorded Aboriginal heritage sites were identified, comprising a combination of 12 Axe Grinding Groove sites, 1 Isolated Find and 15 Sandstone Shelters with Art, Deposit, Potential Archaeological Deposit or a combination of all types. A field survey was undertaken to revisit these sites and the results of the survey are included in Appendix A. An additional 3 sites were identified during the field survey and fall within the Subject Area. They include two rock shelters with art and a Potential Archaeological Deposit (PAD) and one Axe Grinding Groove site.

A total of six Aboriginal heritage sites have been identified directly above the proposed longwalls. An additional 12 sites have been identified that are located outside of the area directly above the proposed longwalls but within the 35° angle of draw (MSEC 2022). There are also an additional 13 sites which are identified within the Subject Area based on the 600 m buffer from the proposed longwalls which could experience valley- related effects.

The potential for mining-induced fracturing on these sites has been assessed by MSEC (2022) as:

- Six sites located over longwalls - unlikely (<10%).
- 12 sites within 35 degree angle of draw - rare (<5%).
- outside 35 degree angle of draw - very rare (<1%).

The sites are primarily listed as having low (scientific) significance, one site has been identified as having moderate and three sites having high (scientific) significance. Three shelters (AHIMS ID# 52-2-1780, AHIMS ID# 52-2-1754 and AHIMS ID# 52-2-1752) all feature art and have been assessed as being of high (scientific) significance due to the representativeness, rarity and level of intactness of the sites.

All sites are highlighted by the Aboriginal community to have high cultural significance.

IMC has initiated additional consultation with RAPs and other Aboriginal stakeholders via a cultural values consultation (CVC) process to identify and better understand the cultural values, including both tangible and intangible values and Aboriginal places, associated with the Project area and surrounding landscape. The Project is located within the broader cultural landscape that is important to the local Aboriginal community historically, socially and spiritually. Initial consultation for the CVC process did not identify any specific unique cultural values within the Project area relative to the broader surrounding landscape, however, it is acknowledged that Aboriginal stakeholders have a connection to 'Country' including within Area 5. If the Project is approved, it is recommended IMC continue to undertake further engagement with any Aboriginal stakeholders that may hold knowledge regarding cultural values in the Project area, including undertaking further interviews, conversations and 'on Country' engagement to further explore cultural values.

Glossary and List of Abbreviations

Term or abbreviation	Definition
Aboriginal cultural heritage	The tangible (objects) and intangible (dreaming stories, legends and places) cultural practices and traditions associated with past and present-day Aboriginal communities.
ACHA	Aboriginal Cultural Heritage Assessment.
Aboriginal object(s)	The legal definition for material Aboriginal cultural heritage under the NSW <i>National Parks and Wildlife Act 1974</i> .
Aboriginal stakeholders	Members of a local Aboriginal land council, registered holders of Native Title, Aboriginal groups or other Aboriginal people who may have an interest in the Project.
AHIMS	Aboriginal Heritage Information Management System.
AHIP	Aboriginal Heritage Impact Permit.
AR	Archaeological Report.
Archaeology	The scientific Subject of material traces of human history, particularly the relics and cultural remains of past human activities.
Archaeological deposit	A layer of soil material containing archaeological objects and/or human remains.
Archaeological investigation	The process of assessing the archaeological potential of an impact area by a qualified archaeologist.
Archaeological site	An area that contains surface or sub-surface material evidence of past human activity in which material evidence (artefacts) of past activity is preserved.
Artefact	An object made by human agency (e.g. stone artefacts).
Assemblage	A group of artefacts found in close association with one another Any group of items designated for analysis that exist in spatial and/or vertical context – without any assumptions of chronological or spatial relatedness.
Avoidance	A management strategy which protects Aboriginal sites within an impact area by avoiding them totally in development.
BCD	The Biodiversity and Conservation Division (formerly the Office of Environment and Heritage and now Heritage NSW of the Department of Premier and Cabinet).
Catchment	The area from which a surface watercourse or a groundwater system derives its water.
Code of Practice	Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales.
Cumulative impacts	Combination of individual effects of the same kind due to multiple actions from various sources over time.
CVC	Cultural Values Consultation
DECCW	The Department of Conservation, Climate Change and Water, replaced by the Biodiversity and Conservation Division (BCD) of the Department of Planning, Industry and Environment (DPIE) and now Heritage NSW of the Department of Premier and Cabinet (DPC).

Term or abbreviation	Definition
Development	The processes involved in preparing the Subject Area for subdivision and associated road infrastructure, including levelling and compacting for future housing constructing, and cutting and compacting areas for road infrastructure.
DG	Director General
DPC	Department of Premier and Cabinet
DPIE	The Department of Planning, Industry and Environment.
Drainage	Natural or artificial means for the interception and removal of surface or subsurface water.
EP&A Act	NSW Environmental Planning and Assessment Act 1979.
FGS	Fine Grained Siliceous material. A type of raw material from which stone artefacts were manufactured.
Flake	A piece of stone detached from a core, displaying a bulb of percussion and striking platform.
Harm	With regard to Aboriginal objects this has the same meaning as the NSW <i>National Parks and Wildlife Act 1974</i> .
HMP	Heritage Management Plan.
Heritage NSW	Aboriginal cultural heritage regulator in the Department of Premier and Cabinet. Responsible for the management of Aboriginal Cultural Heritage (ACH) regulation functions under the National Parks and Wildlife Act 1974. Formerly BCD of DPIE.
Impact	Influence or effect exerted by a project or other activity on the natural, built and community environment.
Impact area	An area that requires archaeological investigation and management assessment.
In situ	Latin words meaning 'on the spot, undisturbed'.
Isolated artefact / find	A single artefact found in an isolated context.
Landscape character	The aggregate of built, natural and cultural aspects that make up an area and provide a sense of place. Includes all aspects of a tract of land – built, planted and natural topographical and ecological features.
Land unit	An area of common landform, and frequently with common geology, soils and vegetation types, occurring repeatedly at similar points in the landscape over a defined region. It is a constituent part of a land system.
Landform	Any one of the various features that make up the surface of the earth.
LALC	Local Aboriginal Land Council.
LEP	Local Environmental Plan.
LGA	Local Government Area.
Management plans	Conservation plans which identify short- and long-term management strategies for all known sites recorded within a (usually approved) Subject Area.
Methodology	The procedures used to undertake an archaeological investigation.
Mitigation	To address the problem of conflict between land use and site conservation.
NPW Act	National Parks and Wildlife Act 1974.
NPW Regulation	National Parks and Wildlife Regulation 2019.

Term or abbreviation	Definition
OEH	Office of Environment and Heritage, replaced by the Biodiversity and Conservation Division (BCD) of the Department of Planning, Industry and Environment (DPIE) and now Heritage NSW of the Department of Premier and Cabinet.
Open camp site	An archaeological site situated within an open space (e.g. archaeological material located on a creek bank, in a forest, on a hill, etc.).
PAD	Potential Archaeological Deposit. A location considered to have a potential for subsurface archaeological material.
RAP	Registered Aboriginal Party.
Site recording	The systematic process of collecting archaeological data for an archaeological investigation.
Site	A place where past human activity is identifiable.
Spit	A unit of archaeological excavation with an arbitrary assigned measurement of depth and extent.
Survey coverage	A graphic and statistical representation of how much of an impact area was actually surveyed and therefore assessed.

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1. Introduction

1.1 Background

The Dendrobium Mine is an underground coal mine situated in the Southern Coalfield of New South Wales (NSW) approximately 8 kilometres (km) west of Wollongong (Figure 1).

Illawarra Coal Holdings Pty Ltd (Illawarra Metallurgical Coal [IMC]), a wholly owned subsidiary of South32 Limited (South32), is the owner and operator of the Dendrobium Mine. The Dendrobium Mine, Appin Mine and supporting operations are managed by IMC.

Development Consent DA 60-03-2001 for the Dendrobium Mine was granted by the NSW Minister for Urban Affairs and Planning under the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) in November 2001.

The Dendrobium Mine extracts coal from the Wongawilli Seam (also known as the No 3 Seam) within Consolidated Coal Lease (CCL) 768 using underground longwall mining methods. The Dendrobium Mine includes five approved underground mining domains, named Areas 1, 2, 3A, 3B and 3C. Longwall mining is currently being undertaken in Area 3B, with extraction largely complete in Areas 1, 2 and 3A (Figure 1).

The Dendrobium Mine has an approved operational capacity of up to 5.2 million tonnes per annum (Mtpa) of run of mine (ROM) coal until 31 December 2030.

IMC is seeking an Infrastructure Approval for the Dendrobium Mine Extension Project (the Project), which would support the extraction of approximately 31 million tonnes (Mt) of ROM coal from Area 5, within CCL 768. The life of the Project includes longwall mining in Area 5 up to approximately 31 December 2034, and ongoing use of existing surface facilities for handling of Area 3C ROM coal until 2041¹.

Extension of the underground mining operations would be supported by existing Dendrobium Mine infrastructure and the development of additional surface infrastructure proposed as part of the Project.

Niche Environment and Heritage Pty Ltd (Niche) was commissioned by IMC to produce an Aboriginal Cultural Heritage Assessment (ACHA) for the Project. The longwall mining in Area 5 (including a 600 m buffer from the proposed longwalls) and the additional surface infrastructure defines the Subject Area (Figure 2a and Figure 2b) and have been assessed as part of the ACHA.

IMC previously sought to extend mining operations at the Dendrobium Mine through a previous development application (known as the Dendrobium Mine – Plan for the Future: Coal for Steelmaking [the previous application]), however the previous application was not approved. As a consequence, the Project has been refined to reduce the extent of underground mining to address previously raised concerns. A description of the Project is provided in greater detail in Section 1.2 and in the Main Text of the EIS.

¹ The Project does not include approved underground mining operations in the Wongawilli Seam in Areas 1, 2, 3A, 3B and 3C at the Dendrobium Mine and associated surface activities (such as monitoring and remediation). These activities will continue to operate in accordance with Development Consent DA 60-03-2001 (as modified).

1.2 Project Overview

The Project would include the following activities:

- longwall mining of the Bulli Seam in a new underground mining area (Area 5);
- development of underground roadways from existing Dendrobium Mine underground areas (namely Area 3) to Area 5;
- use of existing Dendrobium Mine underground roadways and drifts for personnel and materials access, ventilation, dewatering and other ancillary activities related to Area 5;
- development of new surface infrastructure associated with mine ventilation and gas management and abatement, water management and other ancillary infrastructure;
- handling and processing of up to 5.2 Mtpa of ROM coal (no change from the approved Dendrobium Mine);
- extension of underground mining operations within Area 5 until approximately 2035;
- use of the existing Dendrobium Pit Top, Kemira Valley Coal Loading Facility, Dendrobium CPP and Dendrobium Shafts with minor upgrades and extensions until approximately 2041;
- transport of ROM coal from the Kemira Valley Coal Loading Facility to the Dendrobium CPP via the Kemira Valley Rail Line;
- handling and processing of coal from the Dendrobium Mine (including the Project) and IMC's Appin Mine (if required) to the Dendrobium CPP to 2041;
- delivery of coal from the Dendrobium CPP to Port Kembla for domestic use at the Port Kembla Steelworks and Liberty Primary Steel Whyalla Steelworks or export through the Port Kembla Coal Terminal (PKCT);
- transport of coal wash by road to customers for engineering purposes (e.g. civil construction fill) for other beneficial uses and/or for emplacement at the West Cliff Stage 3 and/or Stage 4 Coal Wash Emplacement;
- development and rehabilitation of the West Cliff Stage 3 Coal Wash Emplacement (noting that opportunities for beneficial use of coal wash would be maximised);
- continued use of the Cordeaux Pit Top for mining support activities such as exploration, environmental monitoring, survey, rehabilitation, administration and other ancillary activities;
- extension of the Pit Top carpark, including an access track from Cordeaux Road and a core shed;
- progressive development of sumps, pumps, pipelines, water storages and other water management infrastructure, including development of temporary water supply infrastructure for construction activities;
- development of an Electricity Transmission Line (ETL) laydown area that has been nominated near Cordeaux Dam in an area preferred for such a purpose by WaterNSW. This would involve no ground clearing and would utilise a previously cleared track and Picnic Area;
- controlled release of excess water in accordance with the conditions of Environmental Protection Licence (EPL) 3241 and/or beneficial use;
- monitoring, rehabilitation and remediation of subsidence and other mining effects; and
- other associated infrastructure, plant, equipment and activities.

In order to supply water for the construction of the vent shaft, three design options have been proposed, namely:

- The development of an underground pumping system and pipeline to supply recycled mine water from the Dendrobium Mine underground workings via existing boreholes. The pipeline and infrastructure required at the existing borehole site would be located within existing disturbance areas, where possible; or

- The development of a temporary pumping station at the Cordeaux River crossing and water supply pipeline along Fire Trail 6 (subject to agreement to purchase water from WaterNSW). The pipeline would be located along existing disturbed corridors, where possible; or
- The delivery of potable water via water truck to Ventilation Shaft Site No. 5A along Fire Trail 6.

For the first option mentioned above, the proposed pipeline route would be situated on a previous borehole track extending approximately one kilometre in length. The track is currently being rehabilitated and would require the use of machine to remove branches and logs from the track and to pull the poly pipe into position. The works would include the trampling of regrowth and the selective secondary clearing of vegetation at some locations to a width of 3m. The existing borehole site extends approximately 60m x 60m and has been utilised as the site of S2002.

1.3 Statutory and Regulatory Framework

The *Environmental Planning and Assessment Act 1979* (EP&A Act) and *Environmental Planning and Assessment Regulation 2021* (EP&A Regulation) generally set the framework for planning and environmental assessment in NSW. Approval for the Project will be sought under the State Significant Infrastructure (SSI) provisions (i.e. Division 5.2) under Part 5 of the EP&A Act.

As the Project has been declared to be SSI and may be carried out without obtaining Development Consent under Part 4 of the EP&A Act, the Project requires assessment and approval under Part 5, Division 5.2 of the EP&A Act.

The NSW Minister for Planning is the approval authority for SSI (including the Project) under Part 5 of the EP&A Act.

Section 5.23(1) of the EP&A Act describes the authorisations that are not required for an SSI approved under Part 5, that includes Aboriginal Heritage Impact Permits (AHIPs) under section 90 of the *National Parks and Wildlife Act 1974*.

1.4 Scope and Objectives

This ACHA report is designed to inform the design and development process and to manage and mitigate harm to Aboriginal objects and cultural heritage values during any future development within the Subject Area. Niche have prepared the ACHA in accordance with the following guidelines:

- *Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation* (NSW Department of Environment and Conservation [DEC] 2005a);
- *Aboriginal cultural heritage consultation requirements for proponents 2010* (ACHCRs) (NSW Department of Environment, Climate Change and Water [DECCW] 2010a);
- *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (Code of Practice) (DECCW 2010b);
- *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales* (DECCW2010c);
- *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW* (OEH 2011)
- *The Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance* (the Burra Charter) (Australia International Council on Monuments and Sites [ICOMOS] 2013);
- *NSW Minerals Industry Due Diligence Code of Practice for the Protection of Aboriginal Objects* (NSW Minerals Council 2010);
- *Engage Early* (Commonwealth Government 2016); and
- *NSW National Parks and Wildlife Regulation 2019* (NPW Regulation).

The assessment requirements and objectives for the ACHA are provided in the Table 1 below.

Table 1: Assessment requirements, scope, and objectives as per the above guidelines

Objectives:	Addressed in:
– Identify whether Aboriginal objects could be present within the Subject Area.	Section 6, Section 7 and Appendix A
– Provide a description of the Aboriginal objects and declared Aboriginal places located within the area of the proposed activity.	Section 6, Section 7, and Appendix A
– Provide a description of the cultural heritage values, including the significance of the Aboriginal objects and declared Aboriginal places, that exist across the whole area that will be affected by the proposed activity and the significance of these values for the Aboriginal people who have a cultural association with the land.	Section 4, Section 5, Section 6 and Appendix A
– Demonstrate how the requirements for consultation with Aboriginal people have been met (as specified in subclause 60(1) of the NPW Regulation).	Section 3, Appendix B, Appendix C and Appendix D
– Present the views of those Aboriginal people regarding the likely impact of the proposed activity on their cultural heritage (if any submissions have been received as a part of the consultation requirements, the report must include a copy of each submission and response).	Section 3, Appendix A, Appendix B and Appendix C
– Provide an assessment of actual or likely harm posed to the Aboriginal objects or declared Aboriginal places from the proposed activity, with reference to the cultural heritage values identified.	Section 7
– Provide any practical measures that may be taken to protect and conserve those Aboriginal objects or declared Aboriginal places and any practical measures that may be taken to avoid or mitigate any actual or likely harm, alternatives to harm or, if this is not possible, to manage (minimise) harm.	Section 7, Section 8, Section 9 and Appendix A

A reconciliation of the Secretary’s Environmental Assessment Requirements (SEARs) for the Project relevant to Aboriginal heritage provided in Appendix E.

Figure 1: Location of Subject Area within regional context (Source: IMC and Niche)

Not included in this version.

Figure 2a: Subject Area – Project Underground Mining Layout and Indicative Surface Disturbance Area (Source: IMC and Niche)

Not included in this version.

Figure 2b: Subject Area – Proposed Dendrobium Pit Top Carpark Extension (Source: IMC and Niche)

Not included in this version.

2. Description of the Area

2.1 Location

The Project is located in the Southern Coalfield of NSW, approximately 8 km west of Wollongong (Figure 1, Figure 2a and Figure 2b). The Subject Area is within the Local Government Areas of Wollongong, Wingecarribee and Wollondilly. The Subject Area is located within the catchments of the Avon and Cordeaux Rivers, which are within the WaterNSW Metropolitan Special Area. Area 5 is located directly east of the Avon River, with an area of approximately 792 hectares (ha) directly above the longwalls and an area of approximately 1,980 ha for the Subject Area (e.g. 600 m buffer area potentially subject to subsidence effects associated with mining of the Bulli Seam). Figure 3a to Figure 3b and Figure 4a to Figure 4b provide the topographical representation and the soil landscapes, respectively, within the Subject Area.

2.2 Description of land where Aboriginal objects are proposed to be harmed

For the purposes of this ACHA, the Subject Area is comprised of two elements (Figure 2a and Figure 2b):

- Area 5 that includes a 600 m buffer around the longwalls (Figure 2a), (e.g. the area that could experience subsidence effects associated with mining of the Bulli Seam).
- Areas of indicative surface disturbance (Figure 2a and Figure 2b), including an ETL, proposed mine ventilation infrastructure, extensions to the Dendrobium Pit Top car park and other ancillary infrastructure).

The extent of the Subject Area for this ACHA includes the proposed Project activities, and encompasses the relevant underground and surface infrastructure investigation areas. Full and detailed descriptions of the proposed activities within the Subject Area are presented in Section 1.2 and in the Main Text of the EIS.

Aboriginal objects are proposed to be harmed within the Subject Area. Figure 3 of the accompanying Archaeological Report provides an overview of known Aboriginal cultural heritage sites in the Subject Area and surrounds. It should be noted that the Subject Area is greater than the expected extent of potential harm which allows for conservative consideration and assessment of all Aboriginal objects in the vicinity of the Project.

Table 2 provides a summary of Aboriginal cultural heritage sites proposed for harm within the Subject Area. Aboriginal cultural heritage sites in Table 2 which are addressed in the MSEC (2022) report are highlighted in dark grey. Further details of these sites are provided in the Archaeological Report (AR) in Appendix A. The site-specific details are provided in Annex 1 of the AR (Appendix A).

A field assessment was undertaken as part of the process of producing the ACHA and is outlined in detail in Appendix A. Figure 5a to Figure 5b provide an overview of the extent of the survey coverage undertaken as part of this field assessment, as well as the survey coverage of the 2017 investigations by Niche. The survey coverage is explored in greater detail in Section 10 of the AR.

Table 2: Summary of Aboriginal cultural heritage sites proposed for harm within the Subject Area.

Site Name	AHIMS ID#	Site features	Mechanism for impact	Site likely or unlikely to be harmed
Donalds Castle Creek Site 5	52-2-1566	Axe Grinding Groove	Subsidence impacts as site is directly above proposed longwalls	Unlikely direct subsidence impacts (less than 10%)
Donald Castle Creek Site 6	52-2-1567	Shelter with Art	Potential unconventional and far-field subsidence impacts as site is located within 600 m buffer of proposed longwalls	Potential subsidence impacts but very rare (less than 1%)
Donald Castle Creek Site 7	52-2-1568	Axe Grinding Groove	Potential subsidence impacts as site is located within 35 degree angle of draw of proposed longwalls	Potential subsidence impacts but rare (less than 5%)
Donald Castle Creek Site 9	52-2-1570	Shelter with Art	Potential unconventional and far-field subsidence impacts as site is located within 600 m buffer of proposed longwalls	Potential subsidence impacts but very rare (less than 1%)
Donald Castle Creek Site 30	52-2-1591	Shelter with Art	Potential unconventional and far-field subsidence impacts as site is located within 600 m buffer of proposed longwalls	Potential subsidence impacts but very rare (less than 1%)
Donald Castle Creek Site 31	52-2-1592	Axe Grinding Groove	Subsidence impacts as site is directly above proposed longwalls	Unlikely direct subsidence impacts (less than 10%)
Ricki Lee 1	52-2-1729	Axe Grinding Groove	Potential subsidence impacts as site is located within 35 degree angle of draw of proposed longwalls	Potential subsidence impacts but rare (less than 5%)
Ricki Lee 2	52-2-1730	Axe Grinding Groove	Potential subsidence impacts as site is located within 35 degree angle of draw of proposed longwalls	Potential subsidence impacts but rare (less than 5%)
Upper Avon 53	52-2-1747	Shelter with Art and PAD	Subsidence impacts as site is directly above proposed longwalls	Unlikely direct subsidence impacts (less than 10%)
Upper Avon 47	52-2-1752	Shelter with Art and PAD	Potential unconventional and far-field subsidence impacts as site is located within 600 m buffer of proposed longwalls	Potential subsidence impacts but very rare (less than 1%)
Upper Avon 48	52-2-1753	Shelter with Art	Potential unconventional and far-field subsidence impacts as site is located within 600 m buffer of proposed longwalls	Potential subsidence impacts but very rare (less than 1%)
Upper Avon 49	52-2-1754	Shelter with Deposit	Potential unconventional and far-field subsidence impacts as site is located within 600 m buffer of proposed longwalls	Potential subsidence impacts but very rare (less than 1%)

Site Name	AHIMS ID#	Site features	Mechanism for impact	Site likely or unlikely to be harmed
Upper Avon 50	52-2-1755	Shelter with Art	Potential unconventional and far-field subsidence impacts as site is located within 600 m buffer of proposed longwalls	Potential subsidence impacts but very rare (less than 1%)
Upper Avon 51	52-2-1756	Shelter with Art	Potential subsidence impacts as site is located within 35 degree angle of draw of proposed longwalls	Potential subsidence impacts but rare (less than 5%)
Upper Avon 52	52-2-1757	Shelter with Deposit	Potential subsidence impacts as site is located within 35 degree angle of draw of proposed longwalls	Potential subsidence impacts but rare (less than 5%)
Upper Avon 54	52-2-1758	Axe Grinding Groove	Subsidence impacts as site is directly above proposed longwalls	Unlikely direct subsidence impacts (less than 10%)
Upper Avon 55	52-2-1759	Shelter with Art and PAD	Potential subsidence impacts as site is located within 35 degree angle of draw of proposed longwalls	Potential subsidence impacts but rare (less than 5%)
Upper Avon 46	52-2-1761	Shelter with Art and Deposit	Potential unconventional and far-field subsidence impacts as site is located within 600 m buffer of proposed longwalls	Potential subsidence impacts but very rare (less than 1%)
Upper Avon 42	52-2-1779	Axe Grinding Groove	Potential subsidence impacts as site is located within 35 degree angle of draw of proposed longwalls	Potential subsidence impacts but rare (less than 5%)
Upper Avon 43	52-2-1780	Shelter with Art	Potential subsidence impacts as site is located within 35 degree angle of draw of proposed longwalls	Potential subsidence impacts but rare (less than 5%)
Upper Avon 44	52-2-1781	Axe Grinding Groove	Potential subsidence impacts as site is located within 35 degree angle of draw of proposed longwalls	Potential subsidence impacts but rare (less than 5%)
Upper Avon 45	52-2-1782	Shelter with Art	Subsidence impacts as site is directly above proposed longwalls	Unlikely direct subsidence impacts (less than 10%)
Avon Dam IF1	52-2-3204	Isolated Find	Potential unconventional and far-field subsidence impacts as site is located within 600 m buffer of proposed longwalls	Potential subsidence impacts but very rare (less than 1%)
M2D PAD2	52-2-3955	Shelter with Art and PAD	Subsidence impacts as site is directly above proposed longwalls	Unlikely direct subsidence impacts (less than 10%)
Dendrobium ACHA AGG-4	52-2-4465	Axe Grinding Groove	Potential subsidence impacts as site is located within 35 degree angle of draw of proposed longwalls	Potential subsidence impacts but rare (less than 5%)
Dendrobium ACHA AGG-3	52-2-4466	Axe Grinding Groove	Potential unconventional and far-field subsidence impacts as site is located within 600 m buffer of proposed longwalls	Potential subsidence impacts but very rare (less than 1%)

Site Name	AHIMS ID#	Site features	Mechanism for impact	Site likely or unlikely to be harmed
Dendrobium ACHA AGG-2	52-2-4467	Axe Grinding Groove	Potential unconventional and far-field subsidence impacts as site is located within 600 m buffer of proposed longwalls	Potential subsidence impacts but very rare (less than 1%)
Dendrobium ACHA AGG-1	52-2-4468	Axe Grinding Groove	Potential subsidence impacts as site is located within 35 degree angle of draw of proposed longwalls	Potential subsidence impacts but rare (less than 5%)
Dendrobium ACHA Shelter-3	AHIMS Pending	Shelter with Art and PAD	Potential unconventional and far-field subsidence impacts as site is located within 600 m buffer of proposed longwalls	Potential subsidence impacts but very rare (less than 1%)
Dendrobium ACHA Shelter-4	AHIMS Pending	Shelter with Art and PAD	Potential subsidence impacts as site is located within 35 degree angle of draw of proposed longwalls	Potential subsidence impacts but rare (less than 5%)
Dendrobium ACHA AGG-5	AHIMS Pending	Axe Grinding Groove	Potential unconventional and far-field subsidence impacts as site is located within 600 m buffer of proposed longwalls	Potential subsidence impacts but very rare (less than 1%)

2.3 Environmental Context

Understanding the past and present environmental contexts of an area is requisite in any Aboriginal archaeological and cultural heritage investigation (DECCW 2010a). The nature and distribution of Aboriginal archaeological sites are closely related to the environmental context. This section provides a broad overview of the environmental setting of the Subject Area, before describing each of the soil landscapes that are contained within it. Soil landscapes, when considered with the levels of past land use and modification, are a useful tool in identifying environmental proxies for the likely preservation and burial of Aboriginal objects in a landscape and resources that may have been available to Aboriginal people in the past; such as the presence of rock outcrops to provide surfaces for art or to sharpen and prepare implements, stone for the manufacture of stone tools and plant species.

2.4 Geology

Broadly, the Subject Area is located on the southern Woronora Plateau within the Cordeaux and Avon River catchment areas. The Project is located within the southern portion of the Permo-Triassic Sydney Basin. The terrain of the Subject Area is characterised by Middle Triassic Hawkesbury Sandstone, which is comprised of overlapping beds of quartz-rich sandstone. Under the sandstone formations the substrates comprise of deep Permian Coal Measures that consist of shale sandstone, conglomerates, tuff, chert and coal (Branagan and Packham 2000).

There are four soil landscapes present within the Subject Area which are defined by Hazelton and Tille (1990) as the Hawkesbury, Lucas Heights, Volcanic (in less than 5% of the Subject Area) and Illawarra Escarpment (Dendrobium Pit Top carpark extension area). These formations are divided into colluvial and residual landscapes and are further described in Sections 2.5 to 2.6.

A topographical representation of the terrain and slope of the Subject Area is shown on Figure 3a and Figure 3b.

The soil landscapes within the Subject Area are shown on Figure 4a and Figure 4b.

2.5 Colluvial Soil Landscapes

In colluvial soil landscapes, the dominant form of landscape formation is mass movement (rock fall) hazard with steep sloped, rock outcrops with shallow stony highly permeable soil (Hazelton and Tille 1990:45, 58). There are two colluvial soil landscapes within the Subject Area; the Hawkesbury soil landscape and the Illawarra Escarpment soil landscape.

The Hawkesbury soil landscape (Plate 1) ranges from rolling and rugged hills to very steep sandstone escarpment and ridges. Within this landscape sandstone outcrops are very common and often occur as horizontal benches and broken scarps up to 10 metres (m) high. Rock outcrops and surface boulders and cobbles make up to half of the ground surface (Hazelton and Tille 1990:45-46). This outcropping is evident around the Avon and Cordeaux Rivers within the Subject Area. The soils comprise of shallow sandy lenses; up to 30 centimetres (cm) deep. The topsoil of colluvial landscapes has low erodibility, consisting of permeable, loose, coarse sands and organic matter. The Hawkesbury soil landscape is highly susceptible to concentrated flow erosion. This landscape is the most archaeologically sensitive within the Subject Area, as the blocks and weathered scarps provide suitable overhangs to be used for shelter. Within these overhangs there is often suitable surfaces for art, as well as floor space for the accumulation of archaeological deposit. However, there is limited space for a deep accumulation of stratified subsurface deposits due to the size of the majority of the overhangs, as evidenced by the number of shelter sites previously recorded within the Subject Area.

The vegetation within this landscape is mostly uncleared woodland and open forest with some areas of tall open forest, and rainforest within the sheltered gullies. On the open crests and ridges, woodland and open forest contains red bloodwood, narrow leaved stringy bark, snappy gum, hard-leaved scribbly-gum, blue mountains mallee ash and old man banksia. Sheltered side slopes of the landscape are characterised by open-forest containing silver top ash, Sydney peppermint, smooth-barked apple and black she-oak with an understorey of Epacridaceae, Myrtaceae, Fabaceae and Proteaceae (Hazelton and Tille 1990: 46).

The Illawarra Escarpment soil landscape (Plate 2) comprises of debris mantle covering the upper slopes and benches on steep to very steep slopes. Large landslips are very common as well as large surface and subsurface boulders, and streamlines are unidirectional (Hazelton and Tille 1990:58). The dominant soils are dark sandy clays. The topsoil of colluvial landscapes has low erodibility, consisting of permeable, loose, coarse sands and organic matter. The Illawarra Escarpment soil landscape is also highly susceptible to concentrated flow erosion, in addition to mass movement such as major slumping and landslips. The blocks and weathered scarps of this landscape provide suitable overhangs to be used for shelter. Within these overhangs there is often suitable surfaces for art, as well as floor space for the accumulation of archaeological deposit. Similar to the Hawkesbury soil landscape there is limited space for a deep accumulation of stratified subsurface deposits due to the size of the majority of the overhangs, as evidenced by the number of shelter sites previously recorded within the Subject Area.

The vegetation within this landscape is mostly uncleared tall open forest and rainforest. Tall open forest is dominated by blackbutt and includes lilly pilly, sandpaper fig, moreton bay fig, small-leaved fig, port jackson fig, deciduous fig, coachwood and red cedar. Rainforest of the escarpment includes grey myrtle, brush bloodwood, whitewood and cabbage tree palm (Hazelton and Tille 1990, 58-59).



Plate 1: Example of the Hawkesbury landscape



Plate 2: Example of a rock shelter in the Hawkesbury landscape.

2.6 Residual Soil Landscapes

The dominant geomorphic process in residual soil landscapes is the *in situ* weathering of parent rock and soil material. The landscape comprises of shallow, highly permeable soils, with isolated rock outcrops (Hazelton and Tille 1990: 20). Two residual landscapes occur within the Subject Area, the Lucas Heights and Volcanic soil landscapes.

The Lucas Heights soil landscape (Plate 3) consists of gently undulating crests, ridges and plateaus of the Mittagong Formation, that alternates between bands of shale and fine-grained sandstones. Rock outcrop is absent within this landscape, with slopes of less than 10%. Unlike the aforementioned Hawkesbury Landscape, the soil of this landscape comprises of moderately deep hard setting yellow soils on ridge and plateau surfaces (Hazelton and Tille 1990: 23). There is some archaeological potential associated with this landscape, however the site types found within it often comprise of isolated artefacts rather than large open camp sites with multiple stone artefacts present.

The vegetation within this landscape is eucalypt low open-forest and eucalypt low woodland with a shrub understorey. The most dominant tree species include turpentine, smooth-barked apple, red bloodwood, silvertop ash, scribbly gum and Sydney peppermint (Hazelton and Tille 1990: 23).



Plate 3: Example of the Lucas Heights landscape within the Subject Area.

The Volcanic landscape is an associated soil landscape of the Hawkesbury formation and makes up less than 5% of the Subject Area landform. It consists of gently undulating valley floors surrounded by steep colluvial side slopes formed on volcanic intrusions within the Hawkesbury Sandstone and Wianamatta Group Shales. The soils are moderately reactive subsoils with low wet bearing strength; erosion and mass movement hazards on steep slopes (Hazelton and Tille 1990:143).

Due to its high erodibility and hardsetting tendencies this soil landscape has limited archaeological potential.

This landscape is difficult to distinguish from the Hawkesbury Landscape with its vegetation comprising of tall open-forest on the side slopes with Sydney blue gum, cabbage gum, deans gum, scattered Australian red cedar, turpentine and burrawang being the dominate species. The understorey comprises of ferns and bracken (Hazelton and Tille 1990: 144).

2.7 Disturbance and Modification

The above soil landscapes have been subject to limited impacts over time, due to the area being used as water catchment and therefore excluded from development. Land use impacts include:

- creation of the Avon and Cordeaux Dams;
- installation of services (powerlines, pipes, roads, railway corridor); and
- exploration drilling and seismic activities.

Each of the above land uses and activities impacts the preservation and visibility of the archaeological record within the Subject Area. The majority of the Subject Area has been subject to very limited modification and disturbance.

2.8 Summary of Environmental Context

The Subject Area consists of rugged sandstone ridgelines and escarpments, with moderate to steep slopes and narrow incised valleys around the Avon and Cordeaux Rivers that have had limited disturbance or modification due to the area being used as a water catchment. This landscape is most likely to contain sandstone overhangs that were used for shelter and for art. Those sandstone platforms located within the rivers, tributaries and adjacent to swamps are most likely to contain axe grinding grooves.

2.9 Aboriginal Occupation and Land Use of the Subject Area

The Subject Area is located in the traditional country of the Tharawal people. Tindale (1940, 1974) has identified the Tharawal boundaries as being from the south side of Botany Bay to north of the Shoalhaven River, and running inland to the Campbelltown and Camden area (Attenbrow 2010: 34, SA Museum 2010). Attenbrow (2010:35) points out that such boundary mapping, undertaken as it was in the nineteenth century is indicative at best; however there appears to be reasonably strong agreement between those who have mapped language boundaries that the area is Tharawal country. The Wodi Wodi also spoke the Tharawal dialect, and they inhabited the coastal plains and escarpment around Wollongong where the Dendrobium Pit Top and coal handling infrastructure is located. Tharawal people distinguished themselves as Fresh Water, Bitter Water or Salt Water depending on where in the wider language boundary their traditional lands were – the inland hills and valleys, the plateaus and swamps or the coastal plain respectively (DEC 2005b: 6).

The records and histories of the Tharawal and their country at the time of contact with Europeans are subject to bias and are generally fragmented, providing nothing like a complete picture of the way Aboriginal people were living prior to European contact. Nevertheless, we know the Tharawal regularly communicated, moved, traded and participated in ceremonies between their country and neighbouring areas. It is most likely family groups or clans would ‘intermingle and interact along both physical and social boundaries’ rather than be strictly confined to the ‘tribal’ borders that were to be artificially imposed by European anthropologists (Organ 1990: xlili). A representative of the Illawarra Local Aboriginal Land Council noted during the consultation process that the swamps of the region would have been very important to the Aboriginal people of the region as they would have been used for resource gathering and occupation, prior to colonisation.

It is generally accepted that Aboriginal occupation of Australia dates back at least 40,000 years (Allen and O’Connell 2003). The result of this extensive and continued occupation of the Sydney Basin, of which the Woronora Plateau is a part, has left a vast amount of accumulated depositional evidence. The oldest date generally considered to be reliable for the earliest occupation around the region comes from excavations at Parramatta where archaeological material has been dated to 30,735 ± 407 Before Present (BP) (McDonald 2005). Nearer to the Dendrobium Mine area, the site of Bass Point at Shellharbour was occupied from 20,000 years ago, indicating a great antiquity of Aboriginal occupation in the region (Attenbrow 2010: 153, Flood 1995: 112).

The majority of reliably dated archaeological sites within the region are less than 5,000 years old, with previous excavations of rock shelters on the Woronora Plateau providing the oldest date of just over 2,000 years BP (Sefton 1998 a, 1998b). A combination of reasons has been suggested for this collection of relatively recent dates. There is an argument that an increase in population and ‘intensification’ of much of the continent took place around this time leading to a great deal more evidence being deposited than was deposited as a result of the sparser former occupation period. It is also the case that many archaeological sites along the former coastline may have been submerged as the seas rose to approximately their current level around 6,000 years ago. This would have had the effect of covering evidence of previous coastal occupation. In addition, it is also true that the acidic soils that predominate around the Sydney region are not conducive to the long-term survival of sites (Hiscock 2008: 106).

The arrival of the First Fleet in Sydney Cove in 1788 was followed the next year by a smallpox epidemic, which spread to the neighbouring regions and, although the exact effects are not known, killed over half the Aboriginal population of the areas effected (Organ 1990: 5).

Early in the nineteenth century, European graziers began taking land in the south of the Cumberland Plain and the coastal plains around Wollongong, with cedar getting in the narrower northern coastal plain and rainforest areas of the escarpment (DEC 2005b). Access to traditional and everyday resources (such as water) and clearing the land of trees would have had a major impact on the ways in which Aboriginal people would have been living, and also caused significant social disruption between Aboriginal groups, and pressure between Aboriginal people and the ever-increasing European population. This period was a time of drought, and the competition for resources between the Europeans and the Tharawal, who were adapting to the massive changes that were so quickly upon them, led to several years of conflict. Organ (1990) documents the various skirmishes, killings and reprisals between Europeans and the Tharawal during the 1814 – 1815 period in the Cowpastures, Camden and Appin districts. Eventually this sporadic bloodshed would lead to larger scale conflict, with Governor Macquarie implementing a sustained punitive action against the Aboriginal population in the district. This resulted in the Appin Massacre of 17 April 1816, in which Aboriginal people were shot and driven over the steep cliffs (probably near Broughtons Pass) to their death during a surprise attack by a detachment of the 46th Regiment, in the middle of the night.

Despite the massive changes that were so quickly brought to the Aboriginal people of the region, they maintained a sense of community, traditional customs and practices, cultural knowledge and continued to care for significant sites and the land in general. Today there are many thousands of Aboriginal people living in the Illawarra. They continue to be custodians of the land, whilst traditional owners maintain cultural knowledge.

Figure 3a: Terrain and Slope of the Subject Area in Vicinity of Mine Area 5 (Source: Niche)

Not included in this version.

Figure 3b: Terrain and Slope in Vicinity of Dendrobium Pit Top Carpark Extension (Source: Niche)

Not included in this version.

Figure 4a: Soil Landscapes and Hydrology in Vicinity of Mine Area 5 (Source: Niche)

Not included in this version.

Figure 4b: Soil Landscapes and Hydrology in Vicinity of Dendrobium Pit Top Carpark Extension (Source: Niche)

Not included in this version.

Figure 5a: Survey coverage in Vicinity of Area 5 (Source: Niche)

Not included in this version.

Figure 5b: Survey Coverage in Vicinity of Dendrobium Pit Top Carpark Extension (Source: Niche)

Not included in this version.

3. Consultation Process

In administering its statutory functions under Part 6 of the NPW Act, Heritage NSW requires that proponents consult with Aboriginal people about the Aboriginal cultural heritage values (cultural significance) of Aboriginal objects and/or places within any given development area, in accordance with subclause 60(1) of NSW National Parks and Wildlife Regulation 2019 ('the NPW Regulation').

Heritage NSW maintains that the objective of consultation with Aboriginal communities about the cultural heritage values of Aboriginal objects and places is to ensure that Aboriginal people have the opportunity to improve Aboriginal cultural heritage assessment outcomes (DECCW 2010a) through creating opportunities for Registered Aboriginal Parties to:

- Provide relevant information about the cultural significance and values of Aboriginal objects and /or places;
- Inform the design of the methodology to assess cultural and significance of Aboriginal objects and/or places;
- Actively contribute to the development of cultural heritage management options and recommendations for any Aboriginal objects and/or places within the proposed Subject Area; and
- Comment on draft assessment reports before they are submitted by the Proponent to the Heritage NSW.

Consultation in the form outlined in the ACHCRs (DECCW 2010a) is a formal requirement in cases where a proponent is aware that their development activity has the potential to harm Aboriginal objects or places. Heritage NSW also recommends that these requirements be used when the certainty of harm is not yet established but a proponent has, through some formal development mechanism, been required to undertake a cultural heritage assessment to establish the potential harm their proposal may have on Aboriginal objects and/or places.

The ACHCRs (DECCW 2010a) outline a four-stage consultation process that includes detailed step-by-step guidance as to the aim of the stage, how it should be proceed, and what actions are necessary for it to be considered successfully completed. The four stages area:

- Stage 1 – Notification of project proposal and registration of interest.
- Stage 2 – Presentation of information about the proposed project.
- Stage 3 – Gathering information about the cultural significance of the project area.
- Stage 4 – Review of the draft ACHA report.

The ACHCRs (DECCW 2010a) also outline the roles and responsibilities of Heritage NSW, Registered Aboriginal Parties (RAPs) including Local and State Aboriginal Land Councils, and proponents throughout the consultation process. To meet the requirements of consultation it is expected that the proponent will:

- Bring the RAPs (or their nominated representatives) together and be responsible for ensuring appropriate administration and management of the consultation process.
- Consider the cultural perspectives, views, knowledge and advice of the RAPs involved in the consultation process when they assess cultural significance and work together to develop any heritage management outcomes for Aboriginal object(s) and/or place(s).
- Provide evidence to Heritage NSW of consultation by including information such as cultural perspectives, views, knowledge and advice provided by the RAPs.

- Accurately record and clearly articulate all consultation findings in the final cultural heritage assessment report, and
- Provide copies of their final cultural heritage assessment report to the RAPs who have been consulted.

The consultation process is undertaken to seek active involvement from appropriate Aboriginal representatives for the Project followed the current NSW statutory guidelines, including the ACHCRs (DECCW 2010a) and clause 60 of the NPW Regulation. Section 1.3 of the ACHCRs (DECCW 2010a) describes the guiding principles of the document, which have been derived directly from the Australian Heritage Commission's *Ask First: A guide to respecting Indigenous heritage places and values* (Australian Heritage Commission, 2002). Both documents share the aim of creating a system where advice can be sought from the Aboriginal community.

A detailed account of all contact made with RAPs is included in Appendix B. A record of all correspondence related to the consultation process is included in Appendix C.

An extensive process of consultation has been undertaken by IMC and Niche with Registered Aboriginal Parties (RAPs). This process commenced in 2017 as part of the prior assessment. As part of the present assessment, a new process of consultation was initiated and is detailed in Section 3.2. In addition to the involvement of RAP groups in the field assessments, all registered parties were engaged to provide cultural information and advice relating to the cultural values within the Subject Area. This was completed via additional interviews with both RAPs and members of the broader Aboriginal community for inclusion in the Cultural Values Consultation process, the process for which has been outlined in Section 4 of this assessment. A number of quotes from this interview process have been included within Section 6 of this assessment. For the four stages of community consultation as outlined in ACHARs (DECCW 2010a) the community was provided with background information including the draft ACHA, AR and field methodologies as well as being invited to multiple information sessions in order to discuss the Project. The following sections outline the process and results of the consultation conducted during this assessment to ascertain and reflect the Aboriginal cultural heritage values of the Subject Area.

3.1 Previous Community Consultation for the Previous Application

3.1.1 Stage 1 – Notifications and Registration for the Previous Application

As part of the previous ACHA prepared for the previous application a process of consultation was undertaken. This stage of the consultation process is used to identify, notify and register any Aboriginal people or groups who may have a cultural interest in and/or possess cultural knowledge relevant to determining the cultural significance of Aboriginal objects or places within the Subject Area.

Notifications were sent on 3 January and 31 January 2017 to the following organisations:

- Greater Sydney Local Land Services;
- Illawarra Local Aboriginal Land Council (LALC);
- Native Title Services Corporation Limited (NTS Corp Limited);
- Office of the Registrar, *Aboriginal Land Rights Act 1983*;
- South East Local Land Services;
- Tharawal Local Aboriginal Land Council (LALC);
- Wollongong City Council;
- Wollongong Regional Operations Group, OEH (Now Heritage NSW);
- Wollondilly Shire Council;
- Wingecaribbee Shire Council; and
- National Native Title Tribunal (NNTT).

Responses to the notifications were received from the following organisations:

- NNTT (4 January 2017);
- Tharawal LALC (12 January 2017);
- Office of the Registrar, *Aboriginal Land Rights Act 1983* (13 January 2017);
- Wollondilly Shire Council (16 January 2017);
- Wingecaribbee Shire Council (17 January 2017); and
- Wollongong Regional Operations Group, OEH (18 January 2017).

As a result of the responses received, a total of 75 individuals and organisations were identified as potential knowledge holders for the Subject Area. A full record of all correspondence received from and sent to the Aboriginal community and the abovementioned organisations is contained in the ACHA for the previous application.

The NNTT advised that there is no Native Title Claim covering the Subject Area. No Indigenous Land Use Agreements exist within the Subject Area. Since this initial request a Native Title Claim was made by the South Coast People (NC2017/003). This request was registered with the tribunal on the 31 January 2018. As this occurred outside of the current consultation process the South Coast People Claimants were not included in this assessment.

The Office of the Registrar, *Aboriginal Land Rights Act 1983* advised that there were no Aboriginal owners pursuant to Division 3 of the NSW *Aboriginal Land Rights Act 1983*.

In accordance with Sections 4.1 and 4.2 of the consultation requirements outlined in the ACHCRs (DECCW 2010a), all 75 individuals and organisations identified through the above correspondence were contacted in writing on 18 January and 8 February 2017, and were invited to register an interest in the Project. Advertisements inviting the registration of Aboriginal persons or groups who hold cultural knowledge relevant to, or who have a right or interest in, determining the cultural heritage significance of Aboriginal object(s) and/or place(s) in the Subject Area were published in the following newspapers:

- *Illawarra Mercury* (17 January 2017);
- *Macarthur Advertiser* (18 January 2017);
- *Illawarra Mercury* (8 February 2017); and
- *Macarthur Advertiser* (8 February 2017).

Individuals and organisations were contacted twice, and newspaper advertisements were published in both newspapers a second time, in order to further clarify the surface infrastructure requirements of the Project.

As a result of the above consultation 17 individuals and organisations were registered as RAPs to the Project during the registration period (17 January – 22 February 2017). A copy of the list of the 17 RAPs, along with a copy of the written notifications and advertisements, were provided to the Illawarra Regional Office of Environment and Heritage Environment Protection and Regulation Group Office, Illawarra LALC and Tharawal LALC on 22 February 2017, in accordance with Section 4.1.6 of the ACHCRs. A list of RAPs is provided in Table 3.

Table 3: Summary of Registered Aboriginal Parties for the previous application

Registered Aboriginal Parties (registered during the registration period 17 January - 22 February 2017)		
Name	Name	Name
Bellambi Indigenous Corporation Gandangara Traditional Owners	Gulaga	Peter Falk Consultancy
Biamanga (Murrin Clan/Peoples)	Illawarra LALC	Tharawal LALC
Cubbitch Barta Native Title Claimants	Kamilaroi Yankuntjatjaka Working Group	Warra Bingi Nunda Gurri
Cullendulla (Murrin clan/Peoples)	Kawul Cultural Services	Woronora Plateau Gundungara Elders Council
Didge Ngunawal Clan	Montaga	Wurrumay Consultants
Goobah Development PTY LTD (Murrin Clan/People)	Murramarang (Murrin Clan/Peoples)	

3.1.2 Stages 2 and 3 – Presentation of Project Information and Gathering Information about Cultural Significance for the Previous Application

3.1.2.1 Proposed Methodology and Information Session for the Previous Application

Information regarding the previous application, as well as an invitation to attend an information session, a copy of the Proposed Methodology for review and comment, request for valid insurances and questionnaire to assist with field team selection was provided to the RAPs on 6 February 2017, in accordance with the ACHCRs (DECCW 2010a). A minimum of 28 days was allowed for RAPs to provide input in regards to the following aspects:

- the nature of the Proposed Methodology for the previous application;
- any Aboriginal objects or places of cultural value within the Subject Area for the previous application, or issues of cultural significance;
- any restrictions or protocols considered necessary in relation to any information of sensitivity that may be provided; and
- any other factors considered to be relevant to the ACHA for the previous application to be adopted into the information gathering process and assessment methodology.

An information session was held at the Cordeaux Colliery on 6 March 2017. At the information session, a representative of Illawarra Coal provided a presentation on the nature and scale of the previous application, an overview of the impact assessment process, critical timelines and milestones for the completion of assessment activities and delivery of reports, a discussion of the roles, functions and responsibilities of participants and protocols for the management of any sensitive cultural heritage information. The information session also provided RAPs with an opportunity to raise any cultural issues or comments/perspectives and assessment requirements (if any) regarding the previous application or the Proposed Methodology.

As described above, IMC recorded that the proposed Project information had been presented to the RAPs. This record (i.e. the Proposed Methodology provided to the RAPs and the information session presentation also provided to all RAPs) includes any agreed outcomes and contentious issues that required further discussion to establish mutual resolution (where applicable).

The period for commenting on the Proposed Methodology for the previous application closed on 8 March 2017. The methodology was also discussed at the information session.

3.1.2.2 Responses to Comments Received on Proposed Methodology for the Previous Application

A copy of the Proposed Methodology for the previous application was provided to all RAPs for their review and comment on 6 February 2017, with comments requested by 8 March 2017, allowing for a 28 day review period.

Further to this, IMC offered all RAPs the opportunity to attend a Project information session regarding the Proposed Methodology and the proposed Project at Cordeaux Colliery on 6 March 2017. This information session provided an opportunity for the RAPs to provide comments on the Proposed Methodology. Questions raised during this information session regarding the Proposed Methodology are listed in Table 4.

Table 4: Questions raised by RAPs regarding the Proposed Methodology for the previous application

Question	IMC/ Niche response
Although the methodology is targeting AHIMS registered sites, will other areas be surveyed?	In addition to previously registered sites that fall within the underground investigation area, the survey will investigate other areas of the Subject Area. As stated in the Proposed Methodology, the surveys will also target: <ul style="list-style-type: none"> • Areas designated within the Subject Area that would be disturbed by surface infrastructure. • Creek lines and large sandstone rock platforms that have the potential to be affected by subsidence within the Subject Area.
If members of RAP groups were not present at the meeting, will they be excluded from the survey?	All RAPs will have an opportunity to attend the survey in accordance with the Aboriginal cultural heritage consultation requirements. In addition, during the draft ACHA review period, all RAPs will be invited to attend an information session and site inspection where they will have the opportunity to view a selection of the Aboriginal cultural heritage sites recorded within the Study Area, and to discuss and/or provide comments or feedback on the draft ACHA.

There were no further written responses received in regards to the Proposed Methodology prior to the comment cut-off date.

3.1.2.3 Survey Engagement Application Process for the Previous Application

All RAPs were invited to participate in the field survey. The invitation described the requirements that IMC needed applicants to satisfy for engagement in regards to fitness for work and personal protective equipment.

The invitation included a *Field Survey Engagement Application Form* which sought responses on:

- cultural, social and historical connections to the Subject Area;
- traditional knowledge of the Subject Area;
- previous experience in ACHA survey; and
- copies of current insurances.

A completed questionnaire (to assist with field team selection) and valid insurances were received from the following RAPs:

- Biamanga (Murrin Clan/Peoples).
- Cubbitch Barta Native Title Claimants.
- Cullendulla (Murrin Clan/Peoples).
- Didge Ngunawal Clan.
- Goobah Development PTY LTD (Murrin Clan/People).
- Gulaga.
- Illawarra LALC.
- Kamilaroi Yankuntjatjaka Working Group.
- Kawul Cultural Services.
- Murramarang (Murrin Clan/Peoples).
- Warra Bingi Nunda Gurri.
- Woronora Plateau Gundungara Elders Council.
- Wurrumay Consultants.

3.1.2.4 Engagement for Surveys for the Previous Application

Representatives from the following 13 RAPs were invited to participate in the conduct of the survey:

- Biamanga (Murrin Clan/Peoples).
- Cubbitch Barta Native Title Claimants.
- Cullendulla (Murrin Clan/Peoples).
- Didge Ngunawal Clan.
- Goobah Development PTY LTD (Murrin Clan/People).
- Gulaga.
- Illawarra LALC.
- Kamilaroi Yankuntjatjaka Working Group.
- Kawul Cultural Services².
- Murramarang (Murrin Clan/Peoples).
- Warra Bingi Nunda Gurri.
- Woronora Plateau Gundungara Elders Council.
- Wurrumay Consultants.

3.1.2.5 Aboriginal Heritage Surveys for the Previous Application

Aboriginal cultural heritage surveys were conducted over several periods, including the following dates:

- 13 February 2017;
- 1 May to 5 May 2017;
- 11 May to 12 May 2017;
- 16 May to 18 May 2017;
- 22 May to 26 May 2017; and
- 22 June 2017.

The majority of the survey work was completed in May 2017. Additional survey was undertaken on 22 June 2017 to ventilation shaft site options.

Further to this the RAPs were informed in writing on 7 May 2018 that a revision had been made to the proposed longwall layout; and as a result additional survey would be required. The survey of this additional area was desirable to achieve the level of survey sampling indicated in the Proposed Methodology. This additional survey was conducted on the following dates:

- 28 to 29 May 2018;
- 5 June 2018;
- 26 to 28 June 2018; and
- 3 July 2018.

Survey dates relied on weather conditions; due to both safety and restrictions on access to the Subject Area due to rainfall restriction.

² Whilst a representative of Kawul Cultural Services was invited to attend the field assessment, they did not attend or provide explanation as to why they had not sent a representative on the days rostered.

Further details regarding the survey and the survey coverage are provided in Sections 8 and 9 of the accompanying Archaeological Report (Appendix A). Table 5 summarises the survey dates and representatives of the RAPs who attended the surveys.

Table 5: Aboriginal Cultural Heritage Survey Attendance

Representative	Registered Aboriginal Party
13 February 2017 and 1 May 2017	
Ebony Chalker	Cubbitch Barta Native Title Claimants
Nathanial Kennedy	Warra Bingi Nunda Gurri
Kayla Williams	Woronora Plateau Gundungara Elders Council
2 May 2017	
John Carriage	Biamanga
Keenden Bell	Cullendulla
Paul Boyd	Didge Ngunawal Clan
3 May 2017	
John Carriage	Goobah
Richard Dutton	Gulaga
Jake Bell	Murramurrang
4 May 2017	
Kiran Wapau	Kamilaroi Yankuntjatjaka Working Group
Representative was invited however did not attend	Kawul Cultural Services
Representative was invited however did not attend	Wurrumay Consultants
5 May 2017	
Kristy-Lee Chalker	Cubbitch Barta Native Title Claimants
Leanne Tungai	Illawarra LALC
Shakiah Tungai	Warra Bingi Nunda Gurri
11 May 2017	
John Carriage	Biamanga
Paul Boyd	Didge Ngunawal Clan
Richard Dutton	Cullendulla
12 May 2017	
Keeden Bell	Goobah
Richard Dutton	Gulaga
John Carriage	Murramurrang
16 May 2017	
John Carriage	Cullendulla
Representative was invited however did not attend	Illawarra LALC
Paul Cummins	Woronora Plateau Gundangara Elders Council
17 May 2017	
Ebony Chalker	Cubbitch Barta Native Title Claimants
Linda Kennedy	Warra Bingi Nunda Gurri
Paul Cummins	Woronora Plateau Gundangara Elders Council
18 May 2017	
John Carriage	Biamanga
Richard Dutton	Cullendulla
Paul Cummins	Woronora Plateau Gundangara Elders Council
22 May 2017	

Representative	Registered Aboriginal Party
Paul Boyd	Didge Ngunawal Clan
Kiran Wapau	Kamilaroi Yankuntjatjaka Working Group
Representative was invited however did not attend	Kawul Cultural Services
23 May 2017	
John Carrage	Biamanga
Paul Boyd	Didge Ngunawal Clan
Representative was invited however did not attend	Illawarra LALC
24 May 2017	
Richard Dutton	Goobah
Representative was invited however did not attend	Kawul Cultural Services
Keeden Bell	Murramurrang
25 May 2017	
Keeden Bell	Biamanga
Richard Dutton	Cullendulla
Paul Boyd	Didge Ngunawal Clan
26 May 2017	
Paul Boyd	Didge Ngunawal Clan
Keeden Bell	Goobah
Richard Dutton	Gulaga
Representative was invited however did not attend	Kamilaroi Yankuntjatjaka Working Group
Representative was invited however did not attend	Kawul Cultural Services
John Carriage	Murramurrang
Representative was invited however did not attend	Wurrumay Consultants
22 June 2017	
Keenan Bell	Murramurrang
Richard Dutton	Gulaga
28 May 2018	
Frank Thomas	Gulaga
John Carriage	Biamanga
Paul Cummins	Woronora Plateau Gundungara Elders Council
29 May 2018	
Kayla Williamson	Woronora Plateau Gundungara Elders Council
Frank Thomas	Gulga
Mark Dutton	Biamanga
5 June 2018	
Frank Thomas	Gulaga
Shanece Ardler	Goobah
Kayla Williamson	Woronora Plateau Gundungara Elders Council
26 June 2018	
Colin Walker	Cullendulla
Frank Thomas	Biamanga
Representative was invited however did not attend	Cubbitch Barta Native Title Claimant
27 June 2018	
Frank Thomas	Murramurrang
Dwana Chalker	Cubbitch Barta Native Title Claimants

Representative	Registered Aboriginal Party
Paul Cummins	Woronora Plateau Gundungara Elders Council
28 June 2018	
Frank Thomas	Murramarrang
Rebecca Chalker	Cubbitch Barta Native Title Claimants
Kayla Williamson	Woronora Plateau Gundungara Elders Council
3 July 2018	
Frank Thomas	Goobah
Representative was invited however did not attend	Kamilaroi Yankuntjatjaka Working Group
Representative was invited however did not attend	Gulaga

3.1.3 Stage 4 – Review of First Draft Report for the Previous Application

A copy of the draft report was provided to all RAPs for their review and comment on 5 January 2018 in accordance with Sections 4.3 and 4.4 of the ACHCRs (DECCW 2010a). RAPs were given 28 days to provide comment on the draft ACHA. The closing date for these comments was 5 February 2018. Prior to this closing date an information session was undertaken on the 22 January 2018 at Cordeaux Colliery. The purpose of the information sessions was to discuss the key findings of the draft ACHA and to provide an opportunity for RAPs and other community stakeholders and Elders to discuss, ask questions and/or provide comment on the draft ACHA. The following RAP groups attended this information session:

- Biamanga (Murrin Clan/Peoples).
- Cullendulla (Murrin Clan/Peoples).
- Didge Ngunawal Clan.
- Goobah Development PTY LTD (Murrin Clan/people).
- Gulaga.
- Kamilaroi Yankuntjatjaka Working Group.
- Walnuja (Murrin Clan/peoples).
- Warra Bingi Nunda Gurri.
- Woronora Plateau Gundungarra Elders Council.

Details of this verbal comment is outlined in Table 6.

Table 6: Verbal comment made by RAPs regarding the first draft ACHA for the Previous Application

Representative Group	Comment	IMC/ Niche Response
Didge Ngunawal Clan	Asked for confirmation that no sites were at risk of direct damage from the Project.	Confirmed that the main surface impacts were at the ventilation shaft sites, and that there were no sites located within these footprints. It was noted that there was one site (Dendrobium ACHA AGG-1 (52-2-4468)), which is close to Ventillation Shaft Site No. 5B, but this would be barricaded during construction to mitigate any risk of harm. Any sites that are mined under and subject to subsidence movements could be impacted, but impacts are generally minor and only occur in fewer than 10% of cases.
Goobah Development PTY LTD	Noted that there was a huge amount of Aboriginal heritage in the area and that the community would like to access it for teaching and education.	Access to the Metropolitan Special Area is administered by WaterNSW.
Woronora Plateau Gundungara Elders Council	The community are after reasonable access to the area.	Where the sites overlap with South32 operations, South32 can facilitate access but beyond that South32 have no authority or ability to organise access. Suggested that the RAPs put their desire/ requests for access to these areas in their response to the Draft ACHA as WaterNSW will be provided with these documents.
Walnuja		
Goobah Developments PTY LTD	Asked about WaterNSW's involvement in the Project.	They are the landowner/ manager and a key stakeholder for mining.
Walnuja	Interested in organising Aboriginal community access for an annual event, irrespective of the place. Further noted the importance of the presence and continuity of culture at the sites, and that it comes down to the RAPs attending sites and making regular observations. A reiteration was made of the importance of maintaining continuity at the sites and places.	This feedback was welcomed/ understood and appreciated as it is valuable broader feedback.
	Asked if South32 and Niche Environment and Heritage were aware of the Native Title Claim that had been made by the South Coast Peoples. Described that the claim went all the way up the coast from the far South Coast to the Hawkesbury.	This feedback was welcomed. As a result a revised Native Title Search was completed for inclusion in this current assessment.
Woronora Plateau Gundungara Elders Council	How frequently will the sites be accessed under an Aboriginal Cultural Heritage Management Plan (ACHMP), would it be similar to what is done at other collieries within the Southern Coalfield?	It depends on the mining schedule and condiditons, but typically there is an inspection every 12 months. The point of the observation is to make records prior to and then at each subsidence event. Therefore, things like length of the longwall, position of the sites relative to the longwalls all affect the frequency of observations under an ACHMP.

Representative Group	Comment	IMC/ Niche Response
Warra Bingi Nunda Gurri	Asked what the response would be if there was movement detected at the site- is it a stop work or other action.	The response will depend on the management procedures and Trigger Action Response Plan (TARP) approved by the government. Generally, there have been no major or significant impacts to sites in the Southern Coalfield. There are management responses that anticipate larger impacts, although these are infrequently needed, and usually there is no specific management action needed.
	Asked what the point of monitoring was then [if the response was nothing]?	In some cases, there are options in which physical interventions can be used to manage impacts - things like artificial driplines for example. Management actions including stop work orders would be considered as part of the Project management plans, so it is important that we don't get too far ahead of ourselves.
Walnuja	Has there been any radiocarbon dating and age of sites in the area?	Dates are generally "young" with dates less than 4,000 years BP and most often less than 2,000 and sometimes a few hundred years old. There are some challenges with dating sandy deposits, such as date inversion with old dates being above young dates in the soil sequence.
Warra Bingi Nunda Gurri	Would the report be available to the public?	There is a broader consultation process within the public exhibition process under the EP&A Act. RAPs were encouraged to look out for this and to provide comments directly to the Department of Planning and Environment through this process. Illawarra Coal/ Niche would provide the RAP group with details of the public exhibition when it happens, so further comments can be made, should they be required.
Warra Bingi Nunda Gurri	Asked whether the shaft site will impact the nearby axe grinding grooves.	Not likely, and the axe grinding groove would be avoided and barricaded (during construction).
Walnuja	Asked how many jobs would be created for Aboriginal people and if there was any chance of there being identified positions for Aboriginal people during the operations- even if its 0.5% of the jobs - does 0.5% seem reasonable? Further noted that it would be good that the Traditional Owners (Illawarra and South Coast people) are given priority or further defined/targeted within that.	Job opportunities for Aboriginal people is a very reasonable suggestion. There is also a social impact assessment being prepared for the Project. This social impact assessment includes consideration of the Aboriginal community and there will be recommendations for targeted employment. This is something that comes through strongly in the report recommendations.

All RAPs were provided with a printed copy of the main text of the first draft ACHA, and an electronic copy of the full first draft ACHA (including all supporting appendices). All RAPs were also advised if they wish to discuss anything within the report they could get in contact with Renée Regal (Niche) directly.

3.1.3.1 Comments Received on First Draft Report and Consideration for the Previous Application

Comments on the first draft ACHA received during the 28-day review period included those from the following RAPs:

- Cubbitch Barta Native Title Claimants.
- Kamilaroi Yankuntjatjaka Working Group.
- Warra Bingi Nunda Gurri.
- Woronora Elder Plateau Gundungara Elders Council.

Copies of the submissions are included in Appendix C. Responses to each submission received by the RAPs on the draft ACHA are provided in Table 7.

Table 7: Written comment made by RAPs regarding the draft ACHA for the Previous Application

Representative Group	Comment	IMC/Niche Response
Cubbitch Barta Native Title Claimants	The locations of the sites should not be in any public document, so therefore that includes the site cards. I realise that there is a need to include them for approvals, and RAPs etc, but not for the public.	Appendices 3, 5, 7 and 8 as well as Figures 12 and 13 will be removed from the public documentation as requested.
	The areas that will be impacted for ventilation shafts and other infrastructure should be looked at more closely. These areas are from that I can make out on the maps, are on level ridgelines that may have been used for open camp sites. We should not just be considering the impacts of mining on shelters and grinding grooves, but also the impacts on possible subsurface materials, located in these infrastructure areas. I realise that these areas were inspected during the survey, but there was probably little visibility at the time, I cannot find anything specific about these areas in the report.	Your comments have been noted and can be further explored during the Aboriginal Cultural Heritage Management Plan, should the Project be approved.
	The monitoring process should continue as part of this project, as it allows us the opportunity to keep informed of any impacts that may be taking place. I have seen many of the damaged listed in Table 22, over the years in the southern coalfields, and have also seen a complete shelter collapse, that the mining company put down to environmental factors, not the mine subsidence that had caused the cracking in the same creek line. Not all impacts are predictable, some damage can occur when not predicted, and yet other predictions of major damage does not occur.	Continued monitoring is a recommendation of this assessment. This will be further explored during the development of the Aboriginal Cultural Heritage Management Plan, should the Project be approved. Many thanks for yours, Ebony, Kirsty-Lee's and Daniel's assistance with the Aboriginal Cultural Heritage Assessment and survey efforts. Your feedback has been incorporated within the assessment report.

Representative Group	Comment	IMC/Niche Response
Kamilaroi Yankuntjatjaka Working Group	I am happy with the Draft Assessment Report and have no problems with it Thanks again	Many thanks for your assistance with the Aboriginal Cultural Heritage Assessment and survey efforts. Your feedback has been incorporated within the assessment report.
Warra Bingi Nunda Gurri	p. 73 Sites that cannot be avoided Recommendation for the archival recording to include artefact casting in case of damage to the grinding groove on the southern boundary of the proposed location of Ventilation Shaft Site No. 5B	Your comments have been noted and can be further explored during the Aboriginal Cultural heritage Management Plan, should the Project be approved. Many thanks for yours and Linda's assistance with the Aboriginal Cultural Heritage Assessment and survey efforts. Your feedback has been incorporated within the assessment report.
	p. 74 Recommendations No. 6- Recommendation for the subsidence monitoring program to be adaptive to respond to any unpredicted subsidence impacts.	Your comments have been noted and can be further explored during the Aboriginal Cultural Heritage Management Plan, should the Project be approved.
Woronora Plateau Gundungarra Elders Council (WPGEC)	A minimum of three RAP's to undertake the monitoring of the relevant sites in conjunction with a suitably qualified archaeologist.	Requirements for monitoring will be discussed with the RAP groups during the development of Extraction Plans, should the Project be approved.
	In relation to the site that can not be avoided (ACHA AGG-1) due to the proposed ventilation shaft. W.P.G.E.C recommend that prior to this occurring RAP groups get the opportunity to re visit the site with a suitably qualified archaeologist to help fence the site and take further pictures for their own records.	Requirements for monitoring will be discussed with the RAP groups during the development of Extraction Plans, should the Project be approved.
	In collaboration with Water NSW, Illawarra Coal & Niche try to establish an annual event to gain access for the Aboriginal community to visit numerous sites to further enhance and educate the local community and local cultural knowledge of this land.	This requirement can be discussed during the development of the Aboriginal Cultural Heritage Management Plan process, should the Project be approved. Many thanks for yours and Paul's assistance with the Aboriginal Cultural Heritage Assessment and survey efforts. Your feedback has been incorporated within the assessment report.

3.1.3.2 Review of Second Draft Report for the Previous Application

Due to the revision to the proposed longwall layout and undertaking additional field surveys, the Stage 4 Review of the draft Report was undertaken a second time for this assessment. As a result, a revised draft report was sent to the RAPs on the 2 October 2018 and 28 days was provided for comment on the draft ACHA. The closing date for these comments was 29 October 2018. There were no further comments provided by the RAPs on the second draft report.

3.1.3.3 Review of Final Report for the Previous Application

A copy of the final ACHA report was made available by the Department of Planning and Environment to all RAPs during the public exhibition period for the EIS for the previous application. During this exhibition period all RAPs had the opportunity to review and provide additional comment on the final ACHA report as well as any other part of the EIS (e.g. including the ecological and water assessments).

3.2 Current Community Consultation for the Project

3.2.1 Stage 1 – Notification of Project and Registration of Interest

Following the previous application, IMC re-designed the Project to reduce the overall footprint to reduce the potential impacts of the Project, and as such, a new process of consultation was initiated. As part of the current process of consultation, numerous agencies were contacted in order to identify any Aboriginal people or groups who may have a cultural interest in and/or possess cultural knowledge relevant to determining the cultural significance of Aboriginal objects or places within the Subject Area.

Project notifications were sent on 22 July 2021 to the following organisations:

- Heritage NSW;
- Native Title Services Corporation Limited (NTS Corp Limited);
- Office of the Registrar, Aboriginal Land Rights Act 1983;
- Tharawal LALC;
- Illawarra LALC;
- Greater Sydney Local Land Services;
- South East Local Land Services;
- Wollongong City Council;
- Wollondilly Shire Council; and
- Wingecaribbee Shire Council.

Responses to the Project notifications were received from the following organisations:

- Greater Sydney Local Land Services (23 July 2021);
- Heritage NSW (18 August 2021); and
- Illawarra LALC (5 August 2021).

As a result of the responses received, a total of 75 individuals and organisations were identified as potential knowledge holders for the Subject Area. A full record of all correspondence received from and sent to the Aboriginal community and the abovementioned organisations is contained in Appendix C. RAPs from the previous assessment were also included in this registration period, and all have continued to be consulted with as part of this current assessment.

All 75 individuals and organisations identified through the above correspondence were contacted in writing on 18 August 2021 and were invited to register an interest in the Project. Advertisements inviting the registration of Aboriginal persons or groups who hold cultural knowledge relevant to, or who have a right or interest in, determining the cultural heritage significance of Aboriginal object(s) and/or place(s) in the Subject Area were published in the following newspapers (Appendix C):

- *Illawarra Mercury* (18 August 2021); and
- *Campbelltown-Macarthur Advertiser* (18 August 2021).

As a result of the above consultation 30 individuals and organisations were registered as RAPs to the Project during the registration period (18 August – 1 September 2021). A copy of the list of the 30 RAPs, along with a copy of the written notifications and advertisements, were provided to Heritage NSW, Illawarra LALC and Tharawal LALC on 14 September 2021. A list of RAPs is provided in Table 3.

Table 8: Summary of Registered Aboriginal Parties for the Project

Registered Aboriginal Parties (registered during the registration period 18 August – 1 September 2021)		
Name	Name	Name
A1 Indigenous Services	Goobah Development PTY LTD (Murrin Clan/People)	South Coast People Native Title Claimants
Bellambi Indigenous Corporation Gandangara Traditional Owners	Gulaga	Tharawal LALC
Biamanga (Murrin Clan/Peoples)	Gumaraa	Thoorga Nura
Butucarbin Aboriginal Corporation	Illawarra LALC	Three Ducks Dreaming
Cubbitch Barta Native Title Claimants	Kamilaroi Yankuntjatjaka Working Group	Warra Bingi Nunda Gurri
Cullendulla (Murrin clan/Peoples)	Kawul Cultural Services	Woka Aboriginal Corporation
Didge Ngunawal Clan	Korewal Elouera Jerrungurah Tribal Elders Council	Wori Woilywa
Blaan Davies	Montaga	Woronora Plateau Gundungara Elders Council
James Davis	Murramarang (Murrin Clan/Peoples)	Wurrumay Consultants
Freeman and Marx	Peter Falk Consultancy	<i>Other unidentified party</i>

A consultation log detailing all Aboriginal community consultation undertaken for the Project is provided in Appendix B. A copy of relevant written correspondence sent and received is provided in Appendix C.

3.2.2 Stage 2 and 3 – Presentation of Project Information, Assessment Methodology and Gathering Information about the Cultural Significance of the Subject Area

3.2.2.1 Project Information and Assessment Methodology

The RAPs were provided with a letter outlining information about the project and an assessment methodology in accordance with the ACHCRs (DECCW 2010a) and the Code of Practice (DECCW, 2010b).

The purpose of the provided documents was to:

- Describe the project, outline the project scope, time frame and proposed works.
- Describe the environment of the Subject Area and information relevant to the ACHA process.
- Provide an opportunity for the RAPs to understand the process and comment on the proposed methodology.
- Set a time frame for providing feedback and comments on the methodology and project information.

The draft methodology was provided to the RAPs on 2 September 2021 and the closing date for comments was at 5 pm, 30 September 2021 (to meet the minimum 28 days review period). A copy of the methodology is included in Appendix D.

Due to COVID-19-related restrictions, an information session was held online through Microsoft Teams on 29 September 2021. At the information session, a representative of IMC provided a presentation on the nature of the longwall mining process and the typical form of mine subsidence. Niche described the survey methodology, including the targets of the survey and provided an update on the project including critical timelines for the completion of assessment activities and delivery of reports. Niche also provided a description of the roles, functions and responsibilities of participants and protocols for the management of any sensitive cultural heritage information. The information session also provided RAPs with an opportunity to raise any cultural issues or comments/perspectives and assessment requirements (if any) regarding the Project or the Proposed Methodology.

Feedback was provided by RAPs on the project information and assessment methodology, with comments and responses outlined in Table 9 and Table 10.

3.2.2.2 Reponses to Comments Received on Proposed Methodology

As part of the information session, several questions were raised by the registered parties and these are listed in Table 9.

Table 9: Verbal comments made by RAPs regarding the proposed methodology

Question	IMC/ Niche response
How can 29 sites be suitably surveyed in 5 days?	As the Subject Area has been previously been surveyed in detail, there will only be a rapid form of recording that is undertaken. This would include relocating registered sites and recording any changes that had occurred.
Has any consideration of intangible values been undertaken?	Niche acknowledged that there has been no discussion of intangible values at present, but recognised that such a process would be beneficial to the project. Additional consultation was undertaken for the Cultural Values Consultation process to explore the intangible values that relate to the Subject Area.

Several written responses were received with comments and suggestions for the proposed methodology. The content of these letters and the response by the IMC/ Niche are provided in Table 10.

Table 10: Written comments made by RAPs regarding the proposed methodology

Representative Group	Comment	IMC/ Niche Response
Cubbitch Barta Native Title Claimants	If no recorded Aboriginal sites are located within the proposed surface disturbance, there should still be a survey of the area if it has not previously been undertaken.	A survey of the surface disturbance areas will be undertaken.
	A map indicating the location of the proposed longwalls should be provided.	The proposed longwall layout is yet to be finalised.
A1 Indigenous Services Pty Ltd	There should be an experienced Indigenous woman present in all field work to help identify and protect any women's sacred places or objects.	Many thanks for this feedback we will endeavour to ensure that an Aboriginal woman is present on site.
	When employing Indigenous stakeholder groups, an attempt should be made to maintain equal gender equality in the workplace.	Many thanks for your feedback we will endeavour to ensure there is gender equality in the workforce.
Gulaga	Agreed with the methodology and asked to be included in the field work.	Advised that we would be in contact shortly to organise their involvement.
Thoorga Nura	Agreed with the methodology.	Acknowledged the organisation's support for the methodology.

3.2.2.3 Archaeological Survey

A targeted site survey was undertaken across 8 days in order to identify and attempt to relocate previously recorded Aboriginal cultural heritage sites within the Subject Area. The results of the site survey are described in detail in the accompanying Archaeological Report (Appendix A).

All RAPs were invited to participate in the field survey and were asked to provide insurance documents by 30 September 2021. Representatives from the following 15 RAPs participated in the survey:

- A1 Indigenous Services.
- Butucarbin Aboriginal Corporation.
- Cubbitch Barta Native Title Claimants.
- Didge Ngunawal Clan.
- Gulaga.
- Illawarra LALC.
- Kamilaroi Yankuntjatjaka Working Group.
- South Coast Native Title Claimants (through Woronora Plateau Gundangara).
- Thoorga Nura.
- Warra Bingi Nunda Gurri.
- Wodi Wodi Traditional Owners.
- Woka.
- Wori Woilywa
- Woronora Plateau Gundungara Elders Council.
- A RAP that does not wish to identify themselves in the report.

Aboriginal cultural heritage surveys were conducted over several periods, including the following dates:

- 6 October to 7 October 2021;
- 22 October 2021;
- 25 October to 26 October 2021;
- 1 November to 2 November 2021; and
- 5 November 2021.

Survey dates relied on weather conditions; due to both safety and restrictions on access to the Subject Area due to heavy rainfall there were extended delays at the beginning of October 2021.

Further details regarding the results of the survey and the survey coverage are provided in the Archaeological Report (Appendix A).

Table 11 summarises the survey dates and representatives of the RAPs who attended the surveys.

Table 11: Aboriginal Cultural Heritage Survey Attendance

Representative	Registered Aboriginal Party
6 October 2021	
Mark Pietruszewski	South Coast Native Title Claimants (through Woronora Plateau Gundangara)
Steven Hickey	A1 Indigenous Services
Marilyn Carroll-Johnson	Marilyn Carroll-Johnson
Joleen Smith	Joleen Smith
7 October 2021	
John Carriage	Thoorga Nura
Tom Butler	Warra Bingi Nunda Gurri
Marilyn Carroll-Johnson	Woka
Representative was invited however did not attend	Butucarbin
22 October 2021	
Chantelle Davis	Wodi Wodi Traditional Owners
Daniel Kennedy	Woronora Plateau Gundangara Elders Council
Cory Currell	Kamilaroi Yankuntjatjaka Working Group
Kirsty Lee Chalker	Cubbitch Barta Native Title Claimants
25 October 2021	
Daniel Kennedy	Woronora Plateau Gundangara Elders Council
Richard Dutton	Gulaga
Chantelle Davis	Wodi Wodi Traditional Owners (James Davis)
Other unidentified party	Other unidentified party
26 October 2021	
Other unidentified party	Other unidentified party
Daniel Kennedy	Woronora Plateau Gundangara Elders Council
Chantelle Davis	Wodi Wodi Traditional Owners (James Davis)
Cory Currell	Kamilaroi Yankuntjatjaka Working Group
1 November 2021	
James Davis	Wodi Wodi Traditional Owners
Kayla Williamson	Woronora Plateau Gundangara Elders Council
Other unidentified party	Other unidentified party
John Carriage	Thoorga Nura
2 November 2021	
John Carriage	Thoorga Nura
Representative was invited however did not attend	Gulaga
James Davis	Wodi Wodi Traditional Owners
Paul Cummins	Woronora Plateau Gundangara Elders Council

3.2.3 Stage 4 – Review of Daft Aboriginal Cultural Heritage Assessment Report

The draft of this ACHA report was submitted to the RAPs for review on the 13 December 2021. Further to this an online teleconference meeting (as face-to-face meeting was not available due to COVID-19 limitations) to discuss the draft ACHA was held on the 19 January 2022. The following RAPs had attendees at this meeting:

- Didge Ngunawal Clan
- Gumaraa.
- Illawarra LALC.
- Kamilaroi Yankuntjatjaka Working Group.
- Wori Woilywa.
- Woronora Plateau Gundungara Elders Council.
- *Other unidentified party.*

The feedback and responses to the feedback received during this meeting is outlined in Table 12.

All RAPs were provided with an electronic copy of the draft ACHA (including all supporting appendices). Printed copies were provided to those groups that asked for it. All RAPs were also advised if they wish to discuss anything within the draft ACHA (at any time during the consultation process) they could get in contact with Renée Regal (Niche) directly.

3.2.3.1 Comments Received on Draft Report and Consideration

Comments on the draft ACHA received during the 28 day review period (Section 3.1.2.3) included those from the following RAPs:

- Kamilaroi- Yankuntjatjara Working Group.
- Wori Woilywa.

Copies of the submissions are included in Appendix C. Responses to each submission received by the RAPs on the draft ACHA are provided in Table 13.

Table 12: Verbal comment made by RAPs regarding the draft ACHA

Representative Group	Comment	IMC / Niche Response
Kamilaroi Yankuntjatjaka Working Group	Do not necessarily agree with the Project and mining in general, as it contributes to the disturbance of and impact to the land/Country. If the Project does go ahead, what are the next steps for the Project and what future works would be performed (i.e. surveys, excavations), what information would be kept/ upheld for Aboriginal heritage values during the Project?	This feedback has been included in Executive Summary, Section 3, 4 and 9 and Appendix A.
	What future works would be performed for the borehole and is there potential for archaeological monitoring/ supervision by registered Aboriginal Parties of the construction process for the borehole? It is important to monitoring the soil profile that would be extracted for the construction of the borehole.	Niche and IMC noted the process moving forward: Finalisation of the ACHA, additional survey of the proposed borehole location and that should the Project be approved additional consultation would be undertaken with all of the RAP groups to develop and ACHMP and Monitoring Program that could include the monitoring the construction of the borehole (if required).
	With regards to intangible impacts, Aboriginal people have a spiritual connection to the land/Country and the care/management of the land. What is the next step for gathering creation stories and the making/ formation of the land?	As noted in Section 4, regardless of the Project approval, IMC would continue to engage with the Aboriginal community in regard to the intangible values of the region.
	The land/ native vegetation/ flora and fauna/ waterways are going to be impacted if the project proceeds. Aboriginal cultural that is considered highly significant to Aboriginal people would be lost and should be protected by Aboriginal people.	This feedback has been included in Executive Summary, Section 3, 4 and 9 and Appendix A.
	Re-iterated the cultural significance of the area is high and wants to ensure that the ACHA incorporates this.	This feedback has been included in the report within the Executive Summary, Section 3, 4 and 9 and Appendix A.
	If access to land cannot be provided (as it is restricted by WaterNSW), how can comments about the land on the ACHA be adequately provided by the Aboriginal people?	As IMC do not control access to the land within the Metropolitan Special Area, Niche described that access can be obtained through WaterNSW as outlined on their website: https://www.waternsw.com.au/water-quality/catchment/manage/special-areas/access
	With the sites that have been identified, what are the protections and are all the sites identified going to be harmed by the Project? Requested that she be ran through the potential impacts to the sites predicted to be impacted.	Niche outlined that this discussion has been included in Section 7. Both Niche and IMC would be available for further discussion around this should any of the RAPs wish to discuss.

Representative Group	Comment	IMC / Niche Response
Illawarra Local Aboriginal Land Council	Is there any additional surveys that will be conducted for the Project?	In accordance with Section 13.2.2 of Appendix A, additional surveys will be required for any additional ancillary infrastructure as there were access and COVID-19 limitations for the surveys. Additional baseline recording of sites would be required as part of the ACHMP process for the Project.
	ILALC concerns are no different to those previously raised.	Noted. Both IMC and Niche appreciate the time that Illawarra LALC takes to provide feedback on all assessments.
	TARPs and ACHMP's should be incorporated as part of the ACHA. Identification of the risks (in the form of a risk assessment matrix) should be included up front and how these sites should be managed for Aboriginal Heritage Impacts. Risk matrix needs to be developed for the Aboriginal heritage sites/values. Protection and avoidance of impacts to Aboriginal cultural heritage values are the first management measures that should be considered.	Section 8 and Figure 6 of this document outlines the mine development process to avoid impact to natural features and Aboriginal cultural heritage as well. Further to this a section in relation to the future development of TARPs has been included in Section 8.1.2.
	The risk matrix needs to consider that all Aboriginal heritage sites/ values/ whole landscape are high for Aboriginal people.	Noted and this high importance has been out lined in the Executive Summary, Section 3, 4 and 9 and Appendix A.
	Currently the ACHA seems to start with consideration of the scientific significance component of cultural significance however the ACHA in the first instance needs to lead with the significance to Aboriginal people as provided through consultation and acknowledge that all sites and the connection is of high cultural significance, and then consider other aspects of cultural significance (i.e scientific/ archaeological significance)	Section 6 outlines the cultural values of the associated with the Project area and surrounds and the specific sites and has been placed before the scientific (archaeological) significance as requested.
	Cultural landscape and values need to be addressed as part of the ACHA. The cultural values/ stories should not need to be defined in the ACHA, and it should be relied on the Aboriginal people that hold Country important.	This has been outlined in Section 6.
	Swamps should be considered Aboriginal heritage sites in the ACHA as these would have been used/ occupied by Aboriginal people with the landscape were used for gathering resources/ occupation.	This has been highlighted in Section 2.9.
	Connection between sites is an important aspect of the cultural significance that needs to be considered in the ACHA (.ie. link between waterways that provided resources and shelter sites during Aboriginal occupation). Impacts to waterways needs to be considered as the connection with Aboriginal heritage sites provided context/ history of Aboriginal occupation. If a sites is damaged in anyway, that site has been impacted and the context has been lost which needs to be included and considered in the ACHA.	This comment has been included and addressed in Section 13.5 of Appendix A. An assessment on the potential impacts of the Project to water resources has been prepared as part of the Subsidence Assessment, Groundwater Assessment and Surface Water Assessment for the EIS.
	Aboriginal people would like further assessment going beyond what is required by the legislation/ guidelines for ACHAs. ACHA needs to put greater importance on the voices of Aboriginal people and the information provided about the connection/context/history of the Aboriginal heritage sites, land and country.	This has been noted and additional consultation has been undertaken as part of the CVC process as outlined in Sections 3.2.4 and 4.

Representative Group	Comment	IMC / Niche Response
Wori Woilywa	There is still survey work to be completed, with comments on the draft ACHA to be provided by the 24 January 2022. How will the outcomes of the survey work be provided to the Registered Aboriginal parties and how can comments on this work be provided after the completion of the ACHA comment period?	This additional survey work will be undertaken post approval due to access and COVID-19 restrictions this assessment was unable to be undertaken.
	From a cultural values perspective, a lot of importance has been placed on the item's locations, but in terms of cultural values everything that is on the land holds relevance to Aboriginal culture. Sites are the story law, and everything that forms part of the land provides context to the story of the culture. It's about whole of country rather than specific sites.	This has been included in Section 6.2.1 of the report.
	What is the total area of mining, as for the cultural values all of this area would be affected?	The surface area located directly above the proposed longwalls in Area 5 is approximately 800 hectares.
	There seems to be a perception for cultural importance that needs to be recorded and written down, but the Aboriginal cultural heritage knowledge is not meant to be shared with the general public.	Noted.
	Draft recommendations seem to be based on business outcomes, and do not seem to give back to the Aboriginal community. It is the responsibility of Aboriginal people to care for the land and recognition of the voices of the Aboriginal community and whether the voices of Aboriginal people needs to be considered and recognised by the Proponent. It was further reiterated that the Proponent should give back to the community.	This has been noted. However the recommendations have been developed through consultation with the Aboriginal community and there are a number that speak to additional community consultation and access outside of whether or not this project should get approved.
	In the ACHA, the Aboriginal heritage sites need to be considered in the local/ regional/National context of Aboriginal heritage values and acknowledgement/ recognition from the Proponent needs to be provided.	Noted. The values of the sites have been outlined in Section 6 of this report and in accordance with the appropriate guidelines.

Table 13: Written comments made by RAPs in regards to the draft ACHA

Representative Group	Comment	IMC/ Niche Response
<p>Kamilaroi Yankuntjara Working Group</p>	<p>Thank you for your Draft ACHA for Dendrobium Extension. Kamilaroi Yankuntjara Working Group hold cultural knowledge of the whole of Sydney area for over fifty years, we hold a deep spiritual connection to Mother Earth. We aim the look after Mother Earth and conserve our land and cultural sites. These sacred sites are highly significant to us Aboriginal people. Aboriginal places, sacred sites, burials, rock art and objects are being destroyed all over Sydney, it is in our best interest the save these places and treat them with respect.</p> <p>Aboriginal people pass on their knowledge through generation-to-generation, through word of mouth and story. Aboriginal people followed a system of lore and have a kinship way of life; there is men’s and woman’s business. This way of life was about the land and spiritual connection to the land knowing how to find resources and surviving living a nomadic lifestyle, having an understanding for the land and the wildlife around them.</p> <p>Fire played a big part in the Aboriginal lifestyle as the flora needs to be burnt to rejuvenate, this was known by the Aboriginal people and was carried out seasonally. The Aboriginal people moved around seasonally and knew the land very well, in fact they could read the land navigating them around, like they used the sky to navigate around and to understand the weather from reading the sky and stars at night. We Aboriginal people hold a connection to the sky and many of our dreaming stories are told through the stars and consolations along with the land and wildlife.</p> <p>The water ways are of high significant to our people, as they provide a source of fresh water and natural resources. We use water ways for birthing, bathing, stone tool manufacturing and many other actives, without water we would not be here. Aboriginal people would perform ceremonies and dance in hope of rain or water to be flowing regularly. Water ways are used to guide us, marking tribal boundaries, but was shared with all owned by none.</p> <p>In the Aboriginal culture each clan has a totem this was our spirt animal or plant, our totem is the dingo for instance, and we must take care of our sacred totem. It was given to us by the lora, and we must follow this kingship. We must not eat our totem this is a way Aboriginal people achieved conservation. We continue to have this deep connection to the flora and fauna, and we continue to care for our mother earth. We Aboriginal people have a beautiful continuing culture, we practice dance, song, ceremonies and sacred men’s and women’s business.</p> <p>The study area is of high significant to our people it holds a large amount of our heritage, our cultural heritage. We as the first people of this land have not been heard for too long, something must change.</p> <p>This project is of concern to the us Aboriginal people due to the invasive destruction of flora and fauna and the impact on the land that mining has on the environment. We are consecrated that the project will disrupt the environment that Aboriginal people maintained for tens of thousands of years. it’s the tangible, intangible and the astatic aspects that are of importance we ask that these are</p>	<p>Many thanks for your feedback on the draft report. It should be noted that a number of your comments in relation to the Aboriginal communities spiritual connection has been included within Section 6. It should be noted that the high significance and importance of all Aboriginal heritage sites to the Aboriginal community has been outlined in the Executive Summary, Section 3, 4 and 9 and Appendix A.</p> <p>The ACHA also includes a statement of significance for Aboriginal heritage values that has been outlined in Section 6 and has been prepared in accordance with the following guidelines as required:</p> <ul style="list-style-type: none"> • <i>The Burra Charter</i> (Australia ICOMOS 2013). • <i>Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW</i> (OEH 2011). <p>Should the project be approved, further consultation would be undertaken regarding the recommendations for the baseline recording/monitoring (and potential test excavation of sites) as well as to include interpretation areas within close proximity to the Subject Area.</p> <p>Section 2.9 provides a description of the understanding of Aboriginal occupation and land use of the Subject Area. An assessment on the potential impacts of the Project to water resources has been prepared as part of the Subsidence Assessment, Groundwater Assessment and Surface Water Assessment for the EIS. An assessment on the potential impacts of the Project to biodiversity values (e.g. flora and fauna) has also been prepared as part of the Biodiversity Development Assessment Report for the EIS.</p> <p>As described in Section 4, IMC has initiated additional consultation with RAPs and other Aboriginal stakeholders to identify and better understand the cultural values of the Subject Area and wider Metropolitan catchment area, including both tangible and intangible values and Aboriginal objects. The process of consultation comprised multiple avenues that included the completion of a questionnaire and phone and video conversations that was conducted with participating stakeholders.</p>

Representative Group	Comment	IMC/ Niche Response
	<p>considered when undertaking an assessment. We have spiritual connection the the study area and there are cultural aspects that are of great importance to us, dreaming stories and sacred sites are understood within the area as Aboriginal people occupied and cared for country.</p> <p>If the project goes ahead interpretation of the study area is the next step to a better future an educated future, we now need to promote and highlight Aboriginal culture and heritage as it has not been achieved in the past to its full potential. This can be done in many ways even 3D imagery of the sites that have been identified and or going to be impacted. If this project goes a head more of our sites will be destroyed, it is key to protect and preserve them it is our lora the first peoples lora. These sites are so important to us Aboriginal people it holds our history. Other interpretation ideas are native gardens, artwork, digital displays, and design within in the development. If artifacts are unearthed, they should be a keeping place on country used as a path of knowledge for future generations to educate the wider community.</p> <p>We Aboriginal people have a spiritual connection to the areas to the land and this needs to be recognized in the interpretation. We are one of the oldest continuing cultures in the world, now that's impressive we must be doing something right. It is important to educate the wider community about our culture and our history before and after colonisation and assimilation. It is important to acknowledge the wars or battles between the Aboriginal people and the European people and how that has affected us today. We need to recognise all the achievements Aboriginal people have made after colonisation as we continue to thrive and succeed as the minority.</p> <p>Here at KYWG we also recommend further investigation of the whole study area before works permit if the projected is passed we recommend monitoring of works done by an Aboriginal person, along with testing and salvaging excavation also adequate recording of sits and the surrounding areas. We also recommend that sites are protected from harm before they are lost along with our cultural heritage, we would like to know how this would occur and what plans have been put into place to undertake this recommendation moving forward.</p> <p>We look forward to further consultation on this project.</p>	<p>If the Project is approved, it is recommended IMC continue to undertake further engagement with any Aboriginal stakeholders and First Nations people that may hold knowledge regarding cultural values in the Project area, including undertaking further interviews, conversations and 'on Country' engagement to further explore cultural values.</p>
Wori Woilywa	<p>Response to Draft aboriginal cultural heritage assessment</p> <p>I would firstly like to start by paying respects to mother earth for providing for us secondly biami father for looking over and protecting us and thirdly the sprits for teaching and guiding us.</p> <p>As cultural people we believe the language that we use and accept is very important. We and other family find that the word aboriginal to be offensive, disrespectful and words that have derived from this word have and are still being used as racist words to demoralise our people. Our self and other family find the words First nations people a lot more appropriate and respectful to the first people, culture of this land and would show a better understanding of our culture. In further to our response we will be using the words First nations people (FNP) or First nations family (FNF) where you have used the words aboriginal in your report. In today's understanding the word Art we believe generally</p>	<p>Many thanks for providing your feedback in regard to the Dendrobium Extension Project.</p> <p>The ACHA includes commentary from First Nations people that do not support the Project (and mining in the region), which has been noted and highlighted. This feedback has been included in the report within the Executive Summary, Section 3, 4 and 9 and Appendix A</p> <p>As requested reference to the specific name within Section 3.2.2 has been removed.</p>

Representative Group	Comment	IMC/ Niche Response
	<p>is taken in a creative context that could be undertaken from anyone or anything and could be seen in many ways. We believe the use of the word art of our cultural drawings shows a lack of cultural understanding and respect of our culture. We believe to the not so culturally aware person they generally would place it in the same context as what they currently perceive as art and as a result take away the importance of what it is. We believe a closer representation of our drawn imagers are the stories of the First nations families or country. This would start to show respect to our culture FNP and also start to educate the not so culturally aware.</p> <p>Firstly I would like to say that we do not agree with this project that will damage our mother and in return will have affects on us as people if it were to go ahead. Although we and other first nations families have indicated this during this process this cultural prospective has failed to be shown in this report. for example below is our thoughts on one of the consultation meetings held. As there is only 2 recommendations that are listed from the meeting held on 30-9-21 we do not believe that this is a true and accurate account of this meeting as we raised a number of other points that we believe have been deliberately left out. We did not get the feeling that this meeting was for consultation but more to inform of the upcoming works and the expectations of those being employed for the field survey work. We question the legitimacy of claiming that notes taken at the meeting are Minutes as we do not believe that any policies etc have been followed. As we have never been shown or have had access to these notes we believe that they are incorrect and demonstrate the low standard of consultation.</p> <p>From reading this report I have found it very upsetting to read a document that has a heading of FNP cultural heritage report when it feels like the cultural component has been missed.</p> <p>From our perspective the country is our mother we come from mother and we have the responsibility to look after her and everything on her so it is able to sustain everything and intern us. If we fail in this we will no long exist. So everything you see hear smell touch has purpose, meaning in our culture and is part of complex system. As the oldest culture on mother we are not separate or above anything we are a part of this complex system this is why we are the oldest. Our cultural lore holds the stories of our people and our country it gives us our identity, responsibilities and purpose.</p> <p>This proposed project is proposing to have potential impact on 1980 ha of country and from a cultural perspective this is what we consider the site. It is sad to see that white colonisation has and is failing to pay the respect and understanding of the FNP culture in which they claim to appreciate and respect. To indicate that only direct potential harm is when one only physically removes, damagers or alters a physical place and them actions that then cause indirect harm that has the potential to lead to the same result are different is a joke. I am trying to put this in a common prospective so does this mean that if I held an object at height and someone was to be underneath and I happened to drop this object as long as I am not touching it these actions would be considered indirect harm I am struggling to believe that they would. If you're proposed action have impact on someone or something you are ultimately responsible and should take action to avoid. I would like to know when</p>	<p>It should be noted that the high significance and importance of all heritage sites to the Aboriginal community has been outlined in the Executive Summary, Section 3, 4 and 9 and Appendix A.</p> <p>The ACHA also includes a statement of significance for Aboriginal heritage values that has been outlined in Section 6 and has been prepared in accordance with the following guidelines as required:</p> <ul style="list-style-type: none"> • <i>The Burra Charter</i> (Australia ICOMOS 2013). • <i>Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW</i> (OEH 2011). <p>As described in Section 4, IMC has initiated additional consultation with RAPs and other First Nations people to identify and better understand the cultural values of the Subject Area and wider Metropolitan catchment area, including both tangible and intangible values and objects. The process of consultation comprised multiple avenues that included the completion of a questionnaire and phone and video conversations that was conducted with participating stakeholders.</p> <p>If the Project is approved, it is recommended IMC continue to undertake further engagement with any First Nations people and groups that may hold knowledge regarding cultural values in the Project area, including undertaking further interviews, conversations and 'on Country' engagement to further explore cultural values.</p> <p>As described in Section 7.4, avoidance of key surface features associated with heritage values has been incorporated into the design of the Project. The surface infrastructure proposed by IMC would avoid all previously identified heritage sites, including rock shelters, grinding grooves and natural significant landscape features.</p> <p>Your recommendation that IMC continue to undertake further engagement with First Nations people should the Project be approved has been noted and included within the recommendations of the ACHA.</p>

Representative Group	Comment	IMC/ Niche Response
	<p>FNP have been consulted with to what they see as what they feel that the actions of the proposed project would have from there prospective. I am failing to see where in this report that it is captured. Before colonisation when the lore of the country and the FNP was being followed FNP identity and responsibilities were strong our family connections, responsibilities and story right across this country were understood and lived by. To indicate the potential cumulative impacts is only across the proposed subject area and those areas that directly adjoin we believe fails to appreciate, respect and understand our culture. Through colonisation and to present FNP across this nation have been impacted from stealing of country, destroying culture and destroying of physical places and objects. This report fails to even consider what these effects have had on just the dharawal family never the lese our connection across this nation. But any wonder that these type of prospective are present today when you read the FNP occupation & land use section. I feel that the type of prospective that are proposed through this section comes from a white colonist prospective. I find it very wrong that these prospective are put forward then followed by a statement that has some admission that it may be incorrect. As FNP like our fathers and mothers before us that walked there land caring for it and living FNP culture so it was able to sustain their children for perpetuity we are a part of circle. Through colonisation government and businesses have been using our country for their financial benefit. These actions have led to a lot of FNP across this country losing their identity, responsibilities and purpose and these actions have and still are slowly contributing to the breaking down of our culture. Which into day's terms contributes to suicide, higher rates of incarceration, lower living standards, lower life expectancy, mental health problems and the list goes on for FNP.</p> <p>Are you able to pretend that projects that are proposing to damage mother do not have an effect on FNP and are against our cultural values. Would it be ok to know about or me to go to your mother and remove an internal organ, contaminate her blood profit from it then walk away and whatever happens after hold no accountability, regret or remorse I would think not. When is the taking from our culture and FNP going to stop so our children can have their respect dignity and purpose back?</p> <p>In a cultural and heritage report in which is meant to be identifying cultural values I find this disrespectful that the location is written totally from a white colonized prospective. This type of approach is disrespectful to the FNP and shows little compassion to how we see our country.</p> <p>There is reference to my personal name in which in context I personally find disrespectful as no other registered FNF parties are referred to in that way. They have been referred to in the same way as they have registered in the context used.</p> <p>We believe the cultural values assessment failed to show cultural understanding and in turn failed to express a cultural prospective for this project and promotes a white scientific approach and outcomes. We believe all you need to ask yourself why is there first nation's family's stories across the proposed area and how they are connected to the plant, animal and people.</p> <ul style="list-style-type: none"> - The CVA statements has not identified any specific unique cultural vales 	

Representative Group	Comment	IMC/ Niche Response
	<ul style="list-style-type: none"> – Harm reduced on scientific significant rated sites – If the project is approved it is recommended IMC continue to undertake further engagement <p>With statements such as these and statements from other FNP in this report are you will to have the possibility of another Juukan gorge incident take place?</p> <p>Through the above points of concern that have been addressed we believe you need to ask yourself does this report really satisfy the minimum requirement for a FNPCHA and consultation requirement. We believe that it does not.</p> <ul style="list-style-type: none"> – Undertake consultation with Resisted FNP parties – Identify FNF sites – Identify cultural vales – Provide recommendations to reduce the extent & severity of harm were it can be avoided. <p>Also the FNPCHA consultation requirements</p> <ul style="list-style-type: none"> – Bring FNP together – Consider cultural perspective – Provide evidence – Accurately record clearly consultation findings <p>The current recommendations from this report we believe they are to fill the legislation requirements that would be put in place from the regulator if they were to give the approval for this project so they are actions that would need to be in place anyways. We believe the actions that would lead to the destruction, modification of 1980 ha of mother that has sustained our people and culture from the beginning needs to hold accountability. With Proper actions that will contribute to the promotion of first nations families culture across our country. In line with self-determination this should be independent and lead by FNP through holding workshops to establish what FNP see as recommendations from a cultural prospective that will contribute to the promotion of our culture.</p> <p>Please feel free to contact us with anything that you may wish to discuss further about our response or clarification on any of the points raised.</p>	

3.2.3.2 Review of Final Report

A copy of the final ACHA report will be made available by the Department of Planning and Environment to all RAPs during the public exhibition period for the Dendrobium Mine Extension Project EIS. During this exhibition period all RAPs will have the opportunity to review and provide additional comment on the final ACHA report as well as any other part of the EIS (e.g. including the ecological and water assessments).

3.2.4 Continuing Consultation

Consultation with the RAPs is planned to continue throughout the assessment period of the Project EIS.

During this period IMC will continue to consult with and work with the RAPs with regard to the Project, providing a further opportunity for further review and additional comment on the final ACHA Report as well as any other part of, or matter arising from the Project EIS.

Further to the requirements of the ACHCRs (DECCW 2010a) IMC have established a Reconciliation Action Plan working group, to undertake the following:

- include key IMC staff members, external and internal Aboriginal community representatives; and
- oversee the delivery of the targets of the Reconciliation Action Plan.

To date the working group has achieved the following:

- partnered with Warrigal Employment and investigating partnership with University of Wollongong (UoW) to improve career pathways;
- onboarded Aboriginal vendors and successfully engaging mid-level management to seek service/goods from the vendors;
- developed NAIDOC and National Reconciliation Week (NRW) activities in consultation with members of the Aboriginal community;
- Celebrating Aboriginal cultural heritage at our workplace with installation of artworks at the Regional Operations centre, and commissioning artworks by the Coomaditchie United Aboriginal Corporation for each of the Illawarra mine sites;
- developed a community grants program for Aboriginal communities to assist with capacity for Local Aboriginal community groups to build capacity for either business or cultural development activities;
- commenced work on Cultural Awareness Training package for the workforce with local Aboriginal community members; and
- delivered an Indigenous Participation Plan to assist with achieving future goals for the next three years, focusing on employment pathways and building capacity with local Aboriginal businesses.

As stated by Graham Kerr, Chief Executive Officer of South32 (South32: 2022):

Importantly, South32 will continue to tell our reconciliation story to our communities and our workforce so we are transparent about what we want to achieve, while seeking feedback on how we can improve.

4. Additional Consultation for Cultural Values

IMC has initiated additional consultation with RAPs and other Aboriginal stakeholders to identify and better understand the cultural values of the Subject Area and wider Metropolitan catchment area, including both tangible and intangible values and Aboriginal objects. The process of consultation comprised multiple avenues that included the completion of a questionnaire and phone and video conversations that was conducted with participating stakeholders. It should be noted that where quotes are presented in this ACHA from the Aboriginal community individuals names have been redacted to allow for anonymity.

The CVC questionnaire was sent out to all identified stakeholders for review and comment, with both. Verbal and written responses to the provided by the participating stakeholders.

One written response to the questionnaire was received and the other 12 identified stakeholders provided oral information by phone or video. Telephone and/or email contact was made with the RAPs, with conversations occurring in relation to the purposed of the additional consultation, the nomination of Aboriginal cultural knowledge holders, and wider concerns regarding the CVC process and the Project.

The additional consultation undertaken for the CVC process identified that access to 'Country' allows Traditional Custodians to maintain spiritual and cultural connections to 'Country'. Access to the Metropolitan Special Area has been restricted for approximately 120 years, and therefore recent Aboriginal generations have had limited ability to connect directly with the Project area. As part of the initial consultation regarding cultural values, Aboriginal stakeholders described access to 'Country' has only occurred through ongoing involvement in archaeological surveys. If the Project is approved, IMC would continue to assist with facilitation of access to the Project area for Aboriginal stakeholders in consultation with WaterNSW. Further, consultation for the ACHA highlighted that the Aboriginal community consider all Aboriginal heritage sites (including those within the Subject Area and surrounding landscape) to have high cultural significance. The Project is also seen as a further accumulation of impacts to Aboriginal cultural heritage that has previously been affected by the restricted access to the Metropolitan Special Areas and development of mining within the region.

It is noted the Subject Area and surrounding landscape contain cultural values (both tangible and intangible cultural values). Avoidance of key surface features associated with cultural values has been incorporated into the design of the Project. The surface infrastructure proposed by IMC would avoid all previously identified Aboriginal heritage sites, including rock shelters, grinding grooves and natural significant landscape features. IMC has proposed a Project design that would:

- not longwall mine beneath 3rd, 4th and 5th order (or above) streams;
- not longwall mine beneath previously identified high archaeological (scientific) significance Aboriginal cultural heritage sites;
- set longwall mining at a distance of at least 400 m from named watercourses (i.e. the Avon River, Cordeaux River, Donalds Castle Creek and Wongawilli Creek);
- avoid longwall mining beneath identified key stream features;
- avoid longwall mining beneath "Area 4" swamp cluster; and
- use existing infrastructure (namely the Dendrobium Pit Top, Kemira Valley Coal Loading Facility, Kemira Valley Rail Line, Dendrobium CPP, Shaft Sites Nos 1, 2 and 3 and the West Cliff Stage 3 Coal Wash Emplacement) which would reduce the requirement for additional surface disturbance.

The Project is located within the broader cultural landscape that is important to the local Aboriginal community historically, socially and spiritually. Initial consultation for the CVC process has not identified any specific unique cultural values within the Project area relative to the broader surrounding landscape, however, it is acknowledged that Aboriginal stakeholders have a connection to Country including within Area 5.

If the Project is approved, it is recommended IMC continue to undertake further engagement with any Aboriginal stakeholders that may hold knowledge regarding cultural values in the Project area, including undertaking further interviews, conversations and 'on Country' engagement to further explore cultural values.

5. Summary and Analysis of Background Information

For a more detailed discussion of the archaeological context see the Archaeological Report (Appendix A). The Subject Area consists of rugged sandstone ridgelines and escarpments, with moderate to steep slopes and narrow incised valleys around the Avon and Cordeaux Rivers that have had limited disturbance or modification due to the area being used as a water catchment. This landscape is most likely to contain sandstone overhangs that were used for shelter and for art. Those sandstone platforms located within the rivers, tributaries and adjacent to swamps are most likely to contain axe grinding grooves. Over the past few decades there have been a number of archaeological investigations within the current Subject Area and its surrounds including the assessment for the previous application (Niche 2020). These large data sets have enabled analysis of past spatial and occupational patterns of Aboriginal groups in the region.

The local archaeological studies fit more broadly into the wider Woronora Plateau area, which encompasses the entire Subject Area. The antiquity of Aboriginal occupation in the region is demonstrated through a number of archaeological excavations that have been undertaken in the region surrounding the Subject Area. The oldest recorded date for Aboriginal occupation of the plateau is 2,200 +/- 70 BP at Mill Creek 11 (Sefton 1998a), this early date may be attributable to the archaeological site preservation, as opposed to evidence of Aboriginal occupation in the area in antiquity.

Generally, Aboriginal sandstone shelters' occupation levels within the greater Sydney region date to between 3,000 and 5,000 years of age. Dibden (2003) attributes the apparent increase in population within the region to the sea level stabilisation after the last ice age at approximately 5,000 years ago.

The majority of these previous assessments have been undertaken in response to proposed mining works. As the Subject Area has been a catchment Special Area for the past 70 years, there had been previous limited archaeological investigations as the area is protected from development.

Searches of the Aboriginal Heritage Information Management System (AHIMS) returned a result of 103 Aboriginal cultural heritage sites, 28 of which fall within the Subject Area. The cultural heritage survey work undertaken for this ACHA found an additional three cultural heritage sites and revisited 27 of the known sites (Avon IF-1 AHIMS ID#52-2-3204, was not relocated during this assessment) resulting in a total of 31 Aboriginal heritage sites considered for the assessment. The site assemblage in the broader area is summarised in Table 14.

Table 14: Combined AHIMS search and assessment survey results

Site features	Total	Percentage
Artefact	6	6%
Grinding Groove	20	19%
Shelter with Art	54	51%
Shelter with Art and Deposit	1	1%
Shelter with Art and PAD	12	11%
Shelter with Deposit	6	6%
Shelter with PAD	7	7%
Total	106	100%

6. Cultural Heritage Values and Statement of Significance

6.1 Assessment Framework

The Burra Charter (Australia ICOMOS 2013) defines the basic principles and procedures to be observed in the conservation of important places. It provides the primary framework within which decisions about the management of heritage sites in Australia should be made.

The NSW Aboriginal cultural heritage regulatory framework supports the significance assessment of Aboriginal archaeological sites and provides guidelines for this ACHA within the *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW* (OEH 2011). The *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW* (OEH 2011) outlines two main themes in the overall Aboriginal cultural heritage significance assessment process, namely, the identification of the cultural/social significance of Aboriginal objects and/or places to Aboriginal people and the identification of the scientific (archaeological) significance to the scientific/research community. These themes encapsulate those aspects of the Burra Charter that are of particular relevance to Aboriginal objects and places.

6.2 Assessing Values and Significance

Assessment of cultural significance for identified Aboriginal heritage values and the preparation of a statement of significance is undertaken through consultation with Aboriginal people. The assessment of values is a discussion of what is significant and why. An assessment of values is more than simply restating the evidence collected during the background review and identification of the various stages of the Project. Rather, the assessment should lead to a statement of significance that sets out succinct and salient values that have been identified.

IMC has initiated additional consultation with RAPs and other Aboriginal stakeholders via a Cultural Values Consultation (CVC) process to identify and better understand the cultural values, including both tangible and intangible values and Aboriginal places, associated with the Project area and surrounding landscape. The CVC has highlighted that the Aboriginal community consider the significance of the Subject Area to be fundamentally connected to the surrounding Country and this has been reflected in the formulation of the Statement of Significance for the Subject Area (Section 6.4).

6.2.1 Cultural Significance

The Burra Charter defines cultural significance as being derived from the following values: aesthetic value, historic value, scientific value and social value. However, more precise categories may be developed as an understanding of a particular place or site increases. The values are outlined below in Table 15.

The cultural landscape within the Subject Area, whilst not as clearly defined as other landscapes within the wider Illawarra region such as those surrounding Mount Kembla and Mount Keira, is important to the contemporary Aboriginal community. This importance is reflected in the following quotes that were obtained through the additional consultation undertaken with the RAPs and Aboriginal community as part of the CVC process:

There are stories there, but no one has had access to put the stories back together again. Or the stories may have been lost through time. Don't know the Country well enough to talk about stories in this place. Lack of access has impacted this. Now with mobility issues, cannot access due to steep terrain.

Cubbitch Barta Native Title Claimants

My nan and grandfather used to tell me stories but didn't want them recorded. He said if we don't hold onto our information, our stories, what have we got left?

Wodi Wodi Traditional Owner

Dharawal have a strong and long-lasting spiritual connection to the Study Area. The cultural heritage is extremely sensitive to our people and culture.

Woronora Plateau Gundungara Elders Council

The study area is a very sacred and spiritual place. Many dreamtime stories have been shared from this area. The study area holds cultural knowledge which is still present today.

Gulaga

Mountains and escarpment are places for ceremonial practices, men's business and women's business. These areas are very important and significant to our people.

Gumaraa

From a cultural values perspective, a lot of importance has been placed on the item's locations, but in terms of cultural values everything that is on the land holds relevance to Aboriginal culture. Sites are the story law, and everything that forms part of the land provides context to the story of the culture. It's about whole of country rather than specific sites.

Wori Woilywa

Table 15: Values from which cultural significance is derived in accordance with the Burra Charter

Value type	Description
Aesthetic Value	Aesthetic value includes aspects of sensory perception for which criteria can and should be stated. Such criteria may include consideration of the form, scale, colour, texture and material of the fabric; the smells and sounds associated with the place and its use.
Historic Value	<p>Historic value encompasses the history of aesthetics, science and society, and therefore to a large extent underlies all of the terms set out in this section.</p> <p>A place may have historic value because it has influenced, or has been influenced by, an historic figure, event, phase or activity. It may also have historic value as the site of an important event. For any given place the significance will be greater where evidence of the association or event survives in situ, or where the setting are substantially intact, than where it has been changed or evidence does not survive. However, some events or association may be so important that the place retains significance regardless of subsequent treatment.</p>
Scientific Value	The scientific or research value of a place will depend upon the importance of the data involved, on its rarity, quality or representativeness (conservation value), and on the degree to which the place may contribute further substantial information.
Social Value	<p>Social or cultural value refers to the spiritual, traditional, historical or contemporary associations and attachments the place or area has for Aboriginal people. Social or cultural value is how people express their connection with a place and the meaning that place has for them.</p> <p>Places of social or cultural value have associations with contemporary community identity. These places can have associations with tragic or warmly remembered experiences, periods or events. Communities and individuals can experience a sense of loss should a place of social or cultural value be damaged or destroyed.</p>

6.2.2 Scientific Significance

The Burra Charter and *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW* (OEH 2011) specify that information about scientific (archaeological) values will be gathered through archaeological investigation carried out according to the Code of Practice (DECCW 2010b). The Code of Practice (DECCW 2010b) itself does not specify criteria for assessment of Aboriginal objects, but rather suggests to “identify the archaeological values and assess their significance.” The assessment must be supportable and the assessment criteria must reflect best practice assessment processes as set out in the Burra Charter. The scientific values described in the Burra Charter were considered further by the then NSW National Parks and Wildlife Service in their *Aboriginal Cultural Heritage Standards and Guidelines Kit* (DEC 1997). In lieu of specific criteria, the advice from the *Aboriginal Cultural Heritage Standards and Guidelines Kit* (DEC 1997) is summarised and paraphrased below in Table 16 to provide guidance to the assessment of scientific values.

Table 16: Criteria for assessing scientific value

Scientific value	Description
Research potential	It is the potential to elucidate past behaviour which gives significance under this criterion rather than the potential to yield collections of artefacts. Matters considered under this criterion include the intactness of a site, the potential for the site to build a chronology and the connectedness of the site to other sites in the archaeological landscape.
Representativeness	As a criterion, representativeness is only meaningful in relation to a conservation objective. Presumably all sites are representative of those in their class or they would not be in that class. What is at issue is the extent to which a class of sites is conserved and whether the particular site being assessed should be conserved in order to ensure that we retain a representative sample of the archaeological record as a whole. The conservation objective which underwrites the ‘representativeness’ criteria is that such a sample should be conserved.
Rarity	This criterion cannot easily be separated from that of representativeness. If a site is ‘distinctive’ then by definition, it will be part of the variability which a representative sample would represent. The criteria might best be approached as one which exists within the criteria of representativeness, giving a particular weighting to certain classes of site. The main requirement for being able to assess rarity is to determine what is common and what is unusual in the archaeological record, but also the way that archaeology confers prestige on certain sites because of their ability to provide certain information. Items may be common, uncommon or rare. The criterion of rarity may be assessed at a range of levels including local, regional, state, national, and global.
Educational potential	This criterion relates to the ability of the cultural heritage item or place to inform and/or educate people about one or other aspects of the past. It incorporates notions of intactness, relevance, interpretative value and accessibility. Where archaeologists or others carrying out cultural heritage assessments are promoting/advocating the educational value of a cultural heritage item or place it is imperative that public input and support for this value is achieved and sought. Without public input and support the educative value of the items/places is likely to not ever be fully realised.
Aesthetics	In relation to heritage places, aesthetic significance is generally taken to mean the visual beauty of the place. Aesthetic value is not inherent in a place but arises in the sensory response people have to it. The guidelines provide no expectation for archaeologists to consider aesthetic values, it is often the case that the aesthetics including the physical setting of an archaeological site or a landscape contributes to its cultural heritage significance. Examples of archaeological sites that may have high aesthetic values include rock art sites or sites located in environments that evoke strong sensory responses.

6.2.3 Grading Scientific Values

The gradations provided in Table 17, where a site or zone satisfies at least one criterion, have been applied to provide a measure of the values/significance for Aboriginal objects identified within the Subject Area, and to provide an overall assessment of the significance of each of the zones used that define the Subject Area in accordance with the relevant guidelines. However it is acknowledged that grading of heritage values, scientific or otherwise, is a process which does not have support of the RAPs as it can emphasise the values of individual components of a landscape rather than the importance of the cultural landscape as a whole.

Table 17: Criteria for grading scientific values

Gradation	Description
High	The site or object has value because it contains archaeological and/or contextual features which through further investigation may significantly contribute to our understanding of the past, both locally and on a regional scale. These features include, but are not limited to: Aboriginal ancestral remains; the site's relationship with landscape features or other Aboriginal archaeological sites or areas of identified heritage importance; diagnostic archaeological or landscape features that inform a chronology; and a very large assemblage of stone artefacts associated with other features such as oven remains or shell midden. Such sites will be relatively rare and will be representative of a limited number of similar sites that make up this class; hence they derive high representative and rarity values.
Moderate	The site or object derives value because it contains features, both archaeological and contextual, which through further investigation may contribute to our understanding of the local past. These features include but are not limited to the relationship with landscape features or other Aboriginal archaeological sites or areas of identified heritage importance; diagnostic archaeological or landscape features that inform a chronology; and a relatively large assemblage of stone artefacts. The presence of a diverse artefact and feature assemblage, and connectedness with landscape features and other notable sites provide relatively higher representative and rarity values than sites of low significance.
Low	The site or object contains only a single or limited number of features and has no potential to meaningfully inform our understanding of the past beyond what it contributes through its current recording (i.e. no or low research potential). The site or object is a representative but unexceptional example of the most common class of sites or objects in the region. Many more similar examples can be confidently predicted to occur within the Subject Area, and in the region.

6.3 Significance Assessment –Aboriginal Cultural Heritage Sites

Table 18 provides an assessment of scientific (archaeological) significance for individual Aboriginal sites within the Subject Area while Section 6.4 provides a statement of significance for the Subject Area as a whole.

Table 18: Scientific (archaeological) Significance Assessment- Individual sites within the Subject Area

AHIMS ID	Site Name	Features	Significance Statement	Research Potential	Representativeness	Rarity	Scientific Significance Rating
52-2-3204	Avon Dam IF1	Isolated Find	Avon Dam IF 1 is assessed to be of low scientific significance due to the low density nature of the isolated artefact, the moderate level of disturbance has removed the archaeological integrity of the deposit, and the common nature of the raw material.	Low	Low	Low	Low
52-2-4468	Dendrobium ACHA AGG-1	Axe Grinding Groove	Dendrobium ACHA AGG-1 is assessed to be of low scientific significance due to the site comprising of a single axe grinding groove only.	Low	Low	Low	Low
52-2-4467	Dendrobium ACHA AGG-2	Axe Grinding Groove	Dendrobium ACHA AGG-2 is assessed to be of low scientific significance due to the site comprising thirteen axe grinding grooves, each of the grooves are of a uniform length, as demonstrated at a number of sites within the Dendrobium Mine area.	Low	Low	Low	Low
52-2-4466	Dendrobium ACHA AGG-3	Axe Grinding Groove	Dendrobium ACHA AGG-3 is assessed to be of low scientific significance due to the site comprising a single axe grinding groove only.	Low	Low	Low	Low
52-2-4465	Dendrobium ACHA AGG-4	Axe Grinding Groove	Dendrobium ACHA AGG-4 is assessed to be of low scientific significance due to the site comprising six axe grinding grooves, each of the grooves are of a uniform length, as demonstrated at a number of sites within the Dendrobium Mine area.	Low	Low	Low	Low
Pending	Dendrobium ACHA AGG-5	Axe Grinding Groove	Dendrobium ACHA AGG-5 comprises four axe grinding grooves, as a result it is given a low scientific significance rating due to the low number of uniform axe grinding grooves.	Low	Low	Low	Low
52-2-1566	Donalds Castle Creek Site 5	Axe Grinding Groove	Donalds Castle Creek Site 5 comprises four axe grinding grooves, as a result it is given a low scientific significance rating due to the low number of uniform axe grinding grooves.	Low	Low	Low	Low
52-2-1568	Donalds Castle Creek Site 7	Axe Grinding Groove	Donalds Castle Creek Site 7 comprises seven axe grinding grooves, as a result it is given a low scientific significance rating due to the low number of uniform axe grinding grooves.	Low	Low	Low	Low
52-2-1592	Donalds Castle Creek Site 31	Axe Grinding Groove	Donalds Castle Creek Site 31 comprises 12 axe grinding grooves, as a result it is given a low scientific significance rating due to the low number of uniform axe grinding grooves.	Low	Low	Low	Low

AHIMS ID	Site Name	Features	Significance Statement	Research Potential	Representativeness	Rarity	Scientific Significance Rating
52-2-1729	Ricki Lee 1	Axe Grinding Groove	Ricki Lee 1 comprises two axe grinding grooves, neither of which are still visible, as a result it is given a low scientific significance rating due to the low number of uniform axe grinding grooves.	Low	Low	Low	Low
52-2-1730	Ricki Lee 2	Axe Grinding Groove	Ricki Lee 2 comprises 51 axe grinding grooves and a grinding stone, as a result it is given a moderate scientific significance rating due to the large number of uniform axe grinding grooves.	Moderate – due to large number of axe grinding grooves	Moderate – limited examples of platforms with this number of axe grinding grooves within the region	Moderate – limited examples of platforms with this number of axe grinding grooves within the region	Moderate
52-2-1779	Upper Avon 42	Axe Grinding Groove	Upper Avon 42 comprises seven axe grinding grooves, as a result it is given a low scientific significance rating due to the low number of uniform grinding grooves.	Low	Low	Low	Low
52-2-1781	Upper Avon 44	Axe Grinding Groove	Upper Avon 44 comprises three axe grinding grooves, as a result it is given a low scientific significance rating due to the axe grinding grooves no longer being visible.	Low	Low	Low	Low
52-2-1758	Upper Avon 54	Axe Grinding Groove	This site comprises two axe grinding grooves, on a sandstone platform within a creek bed. This shelter’s location could not be confirmed during this assessment, so the following details are taken from the original AHIMS recording form.	Low	Low	Low	Low
52-2-1567	Donald Castle Creek Site 6	Shelter with Art	Donald Castle Creek Site 6 is a rock shelter with a single panel with three indeterminate charcoal drawings on the back wall. All of these motif types are common within the area. As a result, this site is given a low scientific significance rating.	Low	Low	Low	Low
52-2-1570	Donald Castle Creek Site 9	Shelter with Art	Donald Castle Creek Site 9 is a rock shelter with art. Only two of the three artworks that were identified in the original recording in 1990 are still visible. All of these motif types are common within the area. As a result, this site is given a low scientific significance rating.	Low	Low	Low	Low
52-2-1591	Donald Castle Creek Site 30	Shelter with Art	Donald Castle Creek Site 30 is a rock shelter with art. Of the 15 artworks that were identified in the original recording in 1990, only 10 could be relocated. All of these motif types are common within the area, as a result, this site is given a low scientific significance rating.	Low	Low	Low	Low

AHIMS ID	Site Name	Features	Significance Statement	Research Potential	Representativeness	Rarity	Scientific Significance Rating
52-2-1780	Upper Avon 43	Shelter with Art	Upper Avon 43 comprises a sandstone shelter formed through cavernous weathering and block fall in antiquity. The art motifs are in the same condition as previously described by Sefton and comprise kangaroos, full frontal female and male figures, as well as a charcoal infill snake. One example of the full frontal female figure has her hands raised above her head- a motif not before seen within the Southern Coalfields. As a result of this grouping of motifs and their rareness to the area, this site has been given a high scientific significance.	High- Intactness of art motifs, high density of motifs with potential to provide evidence of local chronology	High-Uncommon layering and grouping of motifs	High-uncommon grouping of motifs	High
52-2-1782	Upper Avon 45	Shelter with Art	The shelter is formed out of Hawkesbury Sandstone by cavernous weathering and block fall in antiquity. The art is located on the back wall of the shelter and is in poor condition as recorded by Sefton. Art motifs were drawn in charcoal and red ochre with motifs comprising male frontal figures as well as a number of indeterminates. The art surfaces have heavy microflora growth due to waterwash and the location of the shelter within the landscape. The site has been given a low scientific significance due to the poor condition of the art.	Low	Low	Low	Low
52-2-1753	Upper Avon 48	Shelter with Art	Upper Avon 48 comprises a sandstone shelter that was formed through cavernous weathering and blockfall in antiquity. The art comprises an eel, a red ochre hand stencil and a charcoal indeterminate. All of these motif types are common within the area. As a result, this site is given a low scientific significance rating.	Low	Low	Low	Low
52-2-1755	Upper Avon 50	Shelter with Art	Upper Avon 50 comprises a sandstone shelter formed through cavernous weathering and blockfall in antiquity. The art comprises charcoal macropod and indeterminate lines. These motif types are common within the area and as a result this site is given a low scientific significance rating.	Low	Low	Low	Low
52-2-1756	Upper Avon 51	Shelter with Art	Upper Avon 51 comprises a sandstone shelter formed through cavernous weathering and blockfall in antiquity. The art comprises charcoal indeterminate lines. These motif types are common within the area and as a result this site is given a low scientific significance rating.	Low	Low	Low	Low
52-2-1761	Upper Avon 46	Shelter with Art and Deposit	Upper Avon 46 comprises a sandstone shelter formed through cavernous weathering and blockfall in antiquity. The art is in poor condition due to water wear and comprises charcoal indeterminates, two macropods and a partial male figure. These motifs are common within the region and as a result this site is given a low scientific significance.	Low	Low	Low	Low

AHIMS ID	Site Name	Features	Significance Statement	Research Potential	Representativeness	Rarity	Scientific Significance Rating
52-2-1752	Upper Avon 47	Shelter with Art and PAD	Upper Avon 47 is a sandstone shelter formed through cavernous weathering and blockfall. Whilst the art has faded due to pigment loss and some surface flaking, the red ochre motifs are in good condition generally, some of these motifs have been infilled with charcoal. The motifs comprise of macropods, gliders, kangaroos, goannas and 'bush tucker' these motifs are frequently superimposed. Whilst the motifs singly are not rare within the area, they are not often depicted together frequently, the bicolour nature of some of the depictions is also rare within the area. There is one example of a previously registered site within the region that has a bicolour macropod depicted, this site is Flat Rock Creek 305 (AHIMS ID #52-2-3497). As a result of this rarity, the site is given a high scientific significance.	High- Intactness of art motifs, high density of motifs with potential to provide evidence of local chronology	High-Uncommon large amount of animal and 'bush tucker' motifs	High-Uncommon large amount of animal and 'bush tucker' motifs	High, Local
52-2-1747	Upper Avon 53	Shelter with Art and PAD	Upper Avon 53 is a sandstone shelter formed through cavernous weathering and blockfall. The art at the shelter comprises a single red ochre, child's left-hand stencil. Red ochre hand stencils are a frequent motif within the area as a result the site is given a low scientific significance rating.	Low	Low	Low	Low
52-2-1759	Upper Avon 55	Shelter with Art and PAD	Upper Avon 55 is a sandstone shelter formed through cavernous weathering and blockfall. The art is in poor condition due to the rapid nature of the natural weathering processes at this site. Large sandstone blocks have fallen onto the floor of the site, there is only a single charcoal indeterminate still visible on the outside of the shelter. As a result of this the site is given a low scientific significance.	Low	Low	Low	Low
Pending	Dendrobium ACHA Shelter-3	Shelter with Art and PAD	Dendrobium ACHA Shelter-3 comprises a sandstone shelter formed through block fall and cavernous weathering. The art comprises a single panel with eleven (11) tally marks. A sandy deposit of unknown depth was identified.	Low	Low	Low	Low
Pending	Dendrobium ACHA Shelter-4	Shelter with Art and PAD	Dendrobium ACHA Shelter-4 comprises a sandstone shelter formed through block fall and cavernous weathering. Two panels of art with a total of 15 motifs were identified. A deposit of pale yellow-brown loamy sand extending to a maximum depth of 40cm was identified. Shelters with deposit are a frequent site type within the region and the art is of a poor quality. As a result, this site is given a low scientific significance rating.	Low	Low	Low	Low

AHIMS ID	Site Name	Features	Significance Statement	Research Potential	Representativeness	Rarity	Scientific Significance Rating
52-2-1754	Upper Avon 49	Shelter with Deposit	Upper Avon 49 comprises a sandstone shelter formed through blockfall in antiquity. The art at this shelter is in excellent condition and comprises at least 30 motifs. A number of these motifs are scratched into the sandstone, a technique that is not common within the region, however this has been seen previously within the Dendrobium Area 3B mining area at DM 21 (AHIMS ID#52-2-3645) where a circle is scratched between two red ochre hand stencils. The motifs at this shelter are layered and the application techniques vary from charcoal infill, white ochre hand and fist stencil, scratching and red ochre line drawings. Such a broad range of techniques is rare within the region.	High- uncommon layering of varied application techniques and motif types	High- uncommon motif types (white ochre hand stencils in the Dendrobium Mine area), uncommon application- in the form of scratching	High- uncommon motifs and application techniques	High
52-2-1757	Upper Avon 52	Shelter with Deposit	Upper Avon 52 comprises a sandstone shelter with art and deposit. Shelters with deposit are a frequent site type within the region as a result the site is given a low scientific significance.	Low	Low	Low	Low
52-2-3955	M2D PAD 2	Shelter with PAD	M2D PAD 2 comprises a sandstone shelter with art and PAD. The art is very worn due to water wash. Shelters with deposit are a frequent site type within the region and the art is of a poor quality, as a result the site is given a low scientific significance.	Low	Low	Low	Low

6.4 Statement of Significance for the Subject Area

Statements of significance for the Subject Area are presented in the following sub-sections. These statements of significance have been prepared in consideration of comments received from the RAPs during the consultation process for the ACHA as well as the additional consultation process that was completed as part of the CVC process, including those comments relating to the cultural significance of all sites and the interrelationships between the cultural and spiritual values with the natural landscape. All comments received from RAPs are considered in Section 3.2.

6.4.1 Social Value

The Subject Area is of social significance to the Aboriginal community because it contains landscapes and resources that help define the communities' identity and deepen connections with their ancestors. The Subject Area has a rich prehistory as demonstrated by the archaeological record. As outlined above in Section 6.2.1 the quotes gained during the CVC process, the Aboriginal community have strong spiritual connections to the escarpment and the mountains that dominate the landscape of the water catchment as well as rock shelters and waterways that often contain evidence of axe grinding grooves. The Subject Area and the region in which it is situated are meaningfully connected to the Dreamtime and the intangible values that embody these spiritual connections are strengthened by the continued practice of stakeholders passing on their cultural knowledge of the area. Mountains and the escarpment are places for ceremonial practices and for transmitting men's and women's business. These areas have special significance to Aboriginal people as they connect them with Country and the Dreamtime stories. The rock art that occurs within the Subject Area connects the community with these ancient systems of transmitting cultural knowledge. Contemporary connections are maintained to these places of cultural learning and they continue to be visited to undertake archaeological assessments.

Aboriginal people in the past used trails within the Subject Area to connect them to areas of fresh water and to access shelters, suitable toolmaking locations and resource gathering areas. The environment was interconnected and the connections that exist between sites is significant to the Aboriginal community.

6.4.2 Aesthetic Value

The Subject Area has aesthetic values as it is an environmentally intact section of the Woronora Plateau. This intactness is due to the restricted access of the Metropolitan Special Area controlled by WaterNSW. The sandstone shelters and axe grinding groove sites located within this landscape are set within such striking and intact landscapes which further adds to the strong sense of beauty and Aboriginal connectivity to the landscape. The intactness of the ecosystem within the Subject Area which is largely unaffected by invasive weeds, and which provides extensive range for native animals provides a rare example of the type of landscapes that would have existed throughout the escarpment prior to colonisation.

The study area is still quite isolated and untouched which is apparent from the sites still there. The study area also has significant, rare, and ancient rock art still visible. This shows that Aboriginal people utilised this area and documented their living through art. Rock art on the Eastern South Coast of NSW is extremely rare and needs to be managed and maintained the best way possible.

Representative from Gulaga

Walking tracks through this area led from the coast to the high Country.

Representative from Gumaraa

Previous assessments of the Woronora Plateau have demonstrated that the overall biodiversity of the Woronora Plateau contributes to Aboriginal cultural values because it provides a strong sense of place through the juxtaposition of Aboriginal heritage sites in a dramatic natural bushland setting, the presence of sites and the bush is well known to the community and is a touchstone of identity for Aboriginal people of the Illawarra region (Biosis Research 2009a: 78-79).

6.4.3 Historic Value

Whilst the Subject Area contains no identified historic values relating to Aboriginal heritage, the following quotes from the Aboriginal community demonstrate some of the historical values placed on the area by community.

There are stories there, but no one has had access to put the stories back together again. Or the stories may have been lost through time. Don't know the Country well enough to talk about stories in this place. Lack of access has impacted this. Now with mobility issues, cannot access due to steep terrain.

Representative of Cubbitch Barta Native Title Claimants

Walking tracks through this area led from the coast to the high Country.

Representative of Gumaraa

6.4.4 Scientific (Archaeological) Value

The Subject Area contains 31 identified Aboriginal archaeological and cultural heritage sites, including sandstone shelters, axe grinding groove sites and an isolated artefact. The archaeological sites within the Subject Area are predominately of low scientific (archaeological) value (approximately 87% of known), with one site assigned a moderate scientific (archaeological) value (approximately 3% of known sites) and three sites of high (archaeological) values (approximately 10% of known sites). The Subject Area has the potential to yield information that would contribute to a further understanding of the cultural history of the local area and region. In particular, the nature of past Aboriginal land-use of the Woronora Plateau, and the relationship between past Aboriginal land use and the available resources including the Cordeaux and Avon Rivers prior to the development of the dams - as expressed through archaeological sites and their context.

The rock art that is present in the Study Area depicts numerous animals and anthropomorphic figures and has the potential to provide insights into the spiritual and ceremonial connections that Aboriginal people upheld to the Country. The art directly connects Aboriginal people with the lives of their ancestors and has the potential to reveal information relating to rituals and beliefs that were transmitted across generations.

6.4.5 Summary

Twenty-seven of the 31 Aboriginal sites assessed during this ACHA were identified as having low scientific significance. One site was determined to be of moderate scientific significance site and three sites were determined to be of high scientific significance due to the rarity of their motifs and their application within the shelters. A list of Aboriginal sites in the Subject Area, their scientific significance rating and a statement of significance is presented in Table 19. A summary of scientific significance ratings is presented in Table 19.

Table 19: Summary of Scientific Significance Ratings for Aboriginal Sites

Scientific Significance Rating	Site Count	Percentage of Sites	Sites
Subject Area			
<i>Low Scientific Significance</i>	27	87%	Avon Dam IF 1 (52-2-3204), Dendrobium ACHA AGG-1 (52-2-4468), Dendrobium ACHA AGG-2 (52-2-4467), Dendrobium ACHA AGG-3 (52-2-4466), Dendrobium ACHA AGG-4 (52-2-4465), Dendrobium ACHA AGG-5 (AHIMS pending), Dendrobium ACHA Shelter-3 (AHIMS Pending), Dendrobium ACHA Shelter-4 (AHIMS pending), Donalds Castle Creek Site 5 (52-2-1566), Donald Castle Creek Site 6 (52-2-1567), Donalds Castle Creek Site 7 (52-2-1568), Donald Castle Creek Site 9 (52-2-1570) Donald Castle Creek Site 30 (52-2-1591), Donalds Castle Creek Site 31 (52-2-1592), M2D PAD 2 (52-2-3955), Ricki Lee 1 (52-2-1729), Upper Avon 42 (52-2-1779), Upper Avon 44 (52-2-1781), Upper Avon 45 (52-2-1782), Upper Avon 46 (52-2-1761), Upper Avon 48 (52-2-1753), Upper Avon 50 (52-2-1755), Upper Avon 51 (52-2-1756), Upper Avon 52 (52-2-1757), Upper Avon 53 (52-2-1747), Upper Avon 54 (52-2-1758) and Upper Avon 55 (52-2-1759)
<i>Moderate Scientific Significance</i>	1	3%	Ricki Lee 2 (52-2-1730)
<i>High Scientific Significance</i>	3	10%	Upper Avon 43 (52-2-1780), Upper Avon 47 (52-2-1752) and Upper Avon 49 (52-2-1754)
Total	31	100%	

7. The proposed activity

7.1 Proposed Activity

The Project would include the following activities:

- longwall mining of the Bulli Seam in a new underground mining area (Area 5);
- development of underground roadways from existing Dendrobium Mine underground areas (namely Area 3) to Area 5;
- use of existing Dendrobium Mine underground roadways and drifts for personnel and materials access, ventilation, dewatering and other ancillary activities related to Area 5;
- development of new surface infrastructure associated with mine ventilation and gas management and abatement, water management and other ancillary infrastructure;
- handling and processing of up to 5.2 Mtpa of ROM coal (no change from the approved Dendrobium Mine);
- extension of underground mining operations within Area 5 until approximately 2035;
- use of the existing Dendrobium Pit Top, Kemira Valley Coal Loading Facility, Dendrobium CPP and Dendrobium Shafts with minor upgrades and extensions until approximately 2041;
- transport of ROM coal from the Kemira Valley Coal Loading Facility to the Dendrobium CPP via the Kemira Valley Rail Line;
- handling and processing of coal from the Dendrobium Mine (including the Project) and IMC's other existing operation in the Southern Coalfield (i.e. the Appin Mine) to the Dendrobium CPP to 2041;
- delivery of coal from the Dendrobium CPP to Port Kembla for domestic use at the Port Kembla Steelworks and Liberty Primary Steel Whyalla Steelworks or export through the PKCT;
- transport of coal wash by road to customers for engineering purposes (e.g. civil construction fill) for other beneficial uses and/or for emplacement at the West Cliff Stage 3 and/or Stage 4 Coal Wash Emplacement;
- development and rehabilitation of the West Cliff Stage 3 Coal Wash Emplacement (noting that opportunities for beneficial use of coal wash would be maximised);
- continued use of the Cordeaux Pit Top for mining support activities such as exploration, environmental monitoring, survey, rehabilitation, administration and other ancillary activities;
- progressive development of sumps, pumps, pipelines, water storages and other water management infrastructure, including development of temporary water supply infrastructure for construction activities;
- controlled release of excess water in accordance with the conditions of EPL 3241 and/or beneficial use;
- monitoring, rehabilitation and remediation of subsidence and other mining effects; and
- other associated infrastructure, plant, equipment and activities.

The Project is proposed to commence as soon as practicable after all the necessary approvals have been obtained and any prerequisite conditions fulfilled.

7.2 Aboriginal Heritage Sites

A total of 6 registered Aboriginal heritage sites are located directly above the proposed longwalls and a further 10 additional sites are located beyond the mining area but within the Subject Area based on a 35° angle of draw (MSEC 2022). There are also an additional 10 sites which are identified within the Subject Area based on the 600m boundary which could experience valley-related subsidence. These were considered as part of the Subsidence Assessment (MSEC 2022).

7.3 Potential for Harm to Aboriginal Heritage Sites

The *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (OEH 2011) requires that both direct and indirect harm to Aboriginal objects and Aboriginal places be considered. Generally, direct harm refers to occasions where an activity physically impacts a site or objects and therefore affects the heritage values possessed by the site or objects. Indirect harm is usually taken to mean harm stemming from secondary consequences of the activity and may affect sites or objects as an indirect consequence of the activity. Examples of such indirect harm are increased visitors to a site, or increased erosion in an area as a result of an activity.

The proposed development has the potential to harm Aboriginal objects through surface disturbance and potentially via subsidence. Both surface and ancillary infrastructure planned as part of the mining extension have the potential to cause harm to sites and will be explored in detail. The potential impacts of the Project have been evaluated in consideration of comments received from the RAPs during the consultation process, including contributions made to the CVC process. These comments include those relating to the archaeological potential of landforms and the likelihood of occurrence and distribution of sites. All comments received from the RAPs are provided in Section 3.2 and Appendices C and D.

7.3.1 Potential Impacts from Surface Disturbance

7.3.1.1 Surface Infrastructure

A detailed description of the surface infrastructure components of the Project is provided in Section 1.2 and in the Main Text of the EIS.

The main surface infrastructure components of the Project that would be developed includes, but is not limited to, the development of the ventilation shaft site, ETL and proposed carpark extension at the Dendrobium Pit Top. Whilst detailed design of the surface infrastructure is not yet finalised, disturbance would only occur within the assessed footprint. For the purposes of this ACHA it is therefore conservatively assumed that the development of surface infrastructure for the Project would be wholly within the assessed footprint and would be of a nature that would cause direct harm to any Aboriginal objects or areas of cultural value located within the footprint.

The direct harm associated with surface disturbance activities is anticipated to cause either a total or partial loss of heritage value at effected sites, and would have a cumulative or landscape impact of partial loss of values for the area as a whole. The activities that may cause harm to Aboriginal objects or areas of cultural value would include:

- vegetation clearance and topsoil stripping;
- disturbance of soil units or the ground surface with Aboriginal objects on the surface or within the soil profile;
- changes to a site or place's context that has secondary impacts to the site or place, resulting in the loss of cultural values; and
- excavation works and the removal and redistribution of soil by heavy machinery during site regrading or development of suitable surface conditions for various construction activities.

The surface infrastructure proposed by IMC would avoid all known Aboriginal heritage sites, including rock shelters, grinding grooves and natural landscape features. Therefore, there would be no potential direct surface disturbance impacts to any known Aboriginal heritage sites for the Project.

7.3.1.2 Ancillary Infrastructure

In addition to the proposed surface disturbance works located within the surface investigation area, the Project also includes potential ancillary infrastructure. Ancillary infrastructure comprises minor surface infrastructure, although the location of such infrastructure cannot be determined at this stage in the Project. Ancillary infrastructure includes, for example, the following activities:

- Construction and/or maintenance of access tracks (e.g. for the installation and/or maintenance of surface infrastructure).
- Surface works associated with emergency and communication systems.
- Service boreholes (e.g. air, diesel and water supply) and related infrastructure.
- Subsidence monitoring and remediation works (where required).
- Surface rehabilitation works (where required).
- Other associated minor infrastructure, plant, equipment and activities.

The location and design of ancillary infrastructure would be flexible and would be located in areas to avoid Aboriginal heritage sites and areas of cultural sensitivity, as far as practicable. The location of the ancillary infrastructure would be determined as required over the life of the Project.

While the design and location of the ancillary infrastructure is somewhat flexible, some Aboriginal heritage sites may not be able to be avoided completely. Where this occurs, appropriate management measures would be implemented including salvage activities where necessary.

7.3.2 Potential Impacts from Subsidence

Subsidence predictions for the Subject Area (including specific predictions for Aboriginal heritage sites) have been provided by Mine Subsidence Engineering Consultants (MSEC) (2022). The subsidence predictions are informed by subsidence modelling, previous experience of underground mining in the region as well as an understanding of the geological formations in the Subject Area.

Longwall Mining

Longwall mining involves removing rectangular sections of coal from between supported underground roadways by cutting a wide, continuously retreating panel of the coal (the longwall). The roof of the mine is held up by hydraulic jacks, which are moved behind the retreating face where coal is cut. Once moved the jacks no longer support the roof and the roof collapses into the void left behind. This process can result in the subsidence of the ground surface above the mine (NSW Minerals Council 2013).

Impacts of Subsidence on Aboriginal Heritage

The potential for mine subsidence induced ground movements to harm Aboriginal objects or areas of Aboriginal cultural value is dependent on many factors, including the nature of the Aboriginal objects or areas of cultural value themselves. MSEC (2014:33) describes how longwall mining can result in the cracking, heaving and stepping at the ground surface. The magnitude of these effects is largely dictated by factors such as the mine's geometry, the depth of cover (how deep the coal is below the ground surface), the extracted seam thickness, the geology above the mine, and the presence of geological features such as joints or faults, especially near the ground surface.

In the case of Aboriginal cultural heritage, the nature of the heritage sites and features is also a very important consideration in the potential effects of subsidence induced ground movements. Whether a site is an open site with stone artefacts, or a culturally significant area, or whether the site is a rock shelter or grinding groove platform are important considerations in determining the likely impact, if any.

In the case of open sites that occur in an area with a soil profile, subsidence induced ground movements will result in stresses and strains generally within the tolerance limits of the soil profile (therefore showing little to no impact on the surface), although isolated cracking of soils at the surface may occur. If this cracking is coincident with a surface Aboriginal heritage site or object, then it could be impacted. This is considered a low risk and the greater risk to sites in this instance may be from remediation measures, such as minor earthworks as described below. Other possible impacts may be from changes to surface or sub-surface drainage, which may alter local erosion and potentially expose, slump or bury sites. Such cases, especially in respect of isolated objects, would be very difficult to predict. MSEC (2014:33) note that whilst cracks can occur above the longwall as the subsidence trough develops, larger cracks that may require remediation generally only occur on the surface at an area coincident with the perimeters of the longwalls. In some cases, where steep slopes are present, large surface cracks can develop due to downslope mass movement triggered by subsidence related ground movements.

For sites which occur on bedrock platforms, or in areas where the landscape is comprised of rock formations (such as sandstone and rock outcrops) the risks of harm to the sites are greater than for open sites on soil landscapes. These sites are mostly grinding groove platforms. When observed as surface effects, bedrock or rock formations will behave differently than soil to the strains and pressures associated with subsidence induced ground movements. For rock platforms there is a risk that the rock will buckle and deform, and the types of changes that can occur in this case are cracking or delamination of the surface strata (MSEC 2014). For rock shelters the types of changes can include cracking, delamination of surface rock, exfoliation, block fall and in some cases overhang collapse (although adverse impacts have never been documented within the Dendrobium Mine area) or slumping of rock.

For rock shelters, the types of changes will be similar or identical to those that would be expected due to natural weathering processes, but exacerbated by subsidence. For example, a naturally weathering block which will have detached and fallen at some point in time may be detached and fall sooner due to differential movements of the rock strata induced by subsidence (Biosis Research 2007: 29).

Monitoring of the effects of subsidence induced ground movements to Aboriginal heritage sites (such as rock shelters and grinding groove platforms) has been conducted since the 1990s (see Sefton 2000, Biosis Research 2007a, Biosis Research 2009a, ERM 2010, Kayandel 2008, Niche 2013 to 2021). Previous experience shows that approximately 1 in 10 rock-based sites that have been subjected to subsidence induced ground movements show demonstrable changes that can be attributed to subsidence. These changes take the form of block fall, exfoliation, cracking, opening and/or closing of existing faults and fissures (Biosis Research 2009).

Preventative management measures can be implemented in some circumstances, but for the most part the management of Aboriginal heritage sites relies on monitoring of the sites and implementing pre-arranged management responses should they be triggered by harm to the site. For most Aboriginal heritage sites there are often no suitable remediation measures as these can often be more intrusive and harmful to heritage value than the effects of the subsidence, which as described above is usually an extension or acceleration of pre-existing natural weathering processes. As an example, the process of accessing a site and cutting stress relief slots, which requires heavy drilling or sawing machinery, in close proximity to a grinding groove platform would be likely to be more damaging to the site and its cultural context than the subsidence induced cracking or shearing of surface strata.

For the Project, the consideration of potential harm to Aboriginal heritage sites from subsidence induced ground movements falls into three distinct categories:

- sites relatively more susceptible to harm from subsidence (e.g. grinding groove platforms, rock shelters);
- sites relatively less susceptible to harm from subsidence (e.g. open artefact sites); and
- other sites of cultural value where landscape changes (such as mass movement) may impact heritage values.

A total of six Aboriginal heritage sites have been identified directly above the proposed longwalls:

- Donalds Castle Creek Site 31, AHIMS ID# 52-2-1592 (Longwall 505)
- M2D PAD2, AHIMS ID# 52-2-3955 (Longwall 505)
- Upper Avon 53, AHIMS ID# 52-2-1747 (Longwall 502)
- Donalds Castle Creek Site 5, AHIMS ID# 52-2-1566 (Longwall 502)
- Upper Avon 54, AHIMS ID#52-2-1758 (Longwall 501)
- Upper Avon 45, AHIMS ID# 52-2-1782 (Longwall 509)

An additional 12 sites have been identified that are located outside of the area directly above the proposed longwalls but are still within the 35° angle of draw (MSEC 2022). There are also an additional 13 sites which are identified within the Subject Area based on the 600 m buffer from the proposed longwalls which could experience valley- related subsidence. The details of each sites predicted impacts from subsidence are outlined in Section 7.3.3.

An outline of the Aboriginal heritage sites which are at risk of subsidence-related movement are listed in Table 20.

Table 20: Summary of the Aboriginal Heritage Sites within the Subject Area which are at risk due to subsidence

Site Type	Number of sites located directly above the proposed longwalls	Number of sites located outside the area directly above the proposed longwalls and within the 35° angle of draw	Number of sites located outside the 35° angle of draw and within the 600m boundary
Isolated finds	0	0	1
Grinding groove sites	3	7	3
Rock shelters	3	5	9
Total	6	12	13

The following sections present the subsidence predictions for each of the Aboriginal heritage sites located within the Subject Area that would not otherwise be impacted by surface disturbance works associated with the surface and ancillary infrastructure.

7.3.2.1 Open Artefact Sites

There is one open site located within the Subject Area (which comprises of one stone artefact). Table 21 provides a summary of the subsidence predictions for Avon Dam IF 1 (AHIMS ID # 52-2-3204). Avon Dam IF 1 (AHIMS ID # 52-2-3204) is predicted to experience less than 20 mm vertical subsidence. Whilst the site may experience very low levels of vertical subsidence, it is not expected to experience measurable tilts, curvatures or strains (MSEC 2022). Avon Dam IF 1 (AHIMS ID # 52-2-3204) is located outside the 35° angle of draw of the proposed longwalls, and therefore, it is unlikely that cracking in the surface soils would occur in the location of the artefact, due to this distance. It is expected, therefore, that the isolated find would experience no adverse impacts due to the proposed mining (MSEC 2022).

Table 21: Subsidence Predictions for Artefact Scatters and Isolated Finds within the Subject Area

AHIMS ID	Site Name	Scientific Significance	Maximum Predicted Total Subsidence (mm)	Maximum Predicted Total Tilt (mm/m)	Maximum Predicted Hogging Curvature (km ⁻¹)	Maximum Predicted Sagging Curvature (km ⁻¹)
52-2-3204	Avon Dam IF1	Low	<20	<0.5	<0.01	<0.01

7.3.2.2 Rock Shelter Sites

There are 17 sandstone rock shelter sites identified within the Subject Area. Three of the rock shelters are located directly above the proposed longwalls, Upper Avon 53 [AHIMS ID # 52-2-1747], Upper Avon 45 [AHIMS ID # 52-2-1782] and M2D PAD2 [AHIMS ID # 52-2-3955]. The maximum conventional subsidence effects these sites are predicted to experience (i.e. at Upper Avon 53 [AHIMS ID # 52-2-1747]) includes up to 1750 mm vertical subsidence, 12 mm/m tilt, 0.13 km⁻¹ hogging curvature and 0.18 km⁻¹ sagging curvature (MSEC 2022). MSEC (2022) predicted that the proposed longwalls are likely to result in fracturing of the exposed bedrock along ridgelines and that this may result in rockfalls or instabilities in areas where the rock is marginally stable. This would in turn adversely impact the three rock shelters directly above the proposed longwalls.

They suggested that the likelihood of a rock fall or instability is difficult to fully quantify, but is affected by factors that include jointing, inclusions, weaknesses within the rock mass, groundwater pressure and seepage flow behind the rockface. As part of their report, they assessed that:

‘..between approximately 7 % and 10 % of the total length, or between 3% and 5% of the total face area of the cliffs located directly or partially above the proposed longwalls would be impacted by the mining of these longwalls.’ (MSEC 2022).

They concluded that the potential for mining-induced fracturing to cause adverse impacts on the three rock shelters directly above the proposed longwalls was unlikely (less than 10 % probability) for each of the sites.

Five additional rock shelters are located outside of the proposed longwalls and within the 35° angle of draw. These are Upper Avon 51 [AHIMS ID # 52-2-1756], Upper Avon 52 [AHIMS ID # 52-2-1757], Upper Avon 55 [AHIMS ID # 52-2-1759], Upper Avon 43 [AHIMS ID # 52-2-1780] and Dendrobium ACHA Shelter-4 [AHIMS ID # Pending]. These sites are predicted to experience vertical subsidence of less than 20 mm, apart from Upper Avon 55 [AHIMS ID # 52-2-1759] which is predicted to experience vertical subsidence of 30 mm.

Though these sites are expected to experience some vertical subsidence, they are not expected to experience measurable conventional tilts, curvatures, strains or valley- related subsidence or compressive strains (MSEC 2022). The potential for mining-induced fracturing causing adverse impacts on the five rock shelters located outside the proposed longwalls and within the 35° angle of draw has been assessed as *rare* (i.e. less than 5 %) for each of these sites (MSEC 2022).

The remaining nine rock shelters are located outside of the 35° angle of draw but within the 600 m buffer from the proposed longwalls. They are Donald Castle Creek Site 6 [AHIMS ID # 52-2-1567], Donald Castle Creek Site 9 [AHIMS ID # 52-2-1570], Donald Castle Creek Site 30 [AHIMS ID # 52-2-1591], Upper Avon 47 [AHIMS ID # 52-2-1752], Upper Avon 48 [AHIMS ID # 52-2-1753], Upper Avon 49 [AHIMS ID # 52-2-1754], Upper Avon 50 [AHIMS ID # 52-2-1755], Upper Avon 46 [AHIMS ID # 52-2-1761] and Dendrobium ACHA Shelter-3 [AHIMS ID # Pending]. These sites range in distances from 230 m and 470 m from the mining area and are not predicted to experience measurable conventional subsidence or valley-related effects (MSEC 2022). The potential for mining-induced fracturing causing adverse impacts on the nine rock shelters located outside the 35° angle of draw has been assessed as *very rare* (i.e. less than 1 %) for each of these sites (MSEC 2022).

Table 22 provides the subsidence predictions for the rock shelter sites within the Subject Area.

Table 22: Subsidence Predictions for the Rock Shelters within the Subject Area

AHIMS ID	Site Name	Scientific Significance	Maximum predicted total vertical subsidence (mm)	Maximum predicted total tilt (mm/m)	Maximum predicted total hogging curvature (km ⁻¹)	Maximum predicted total sagging curvature (km ⁻¹)
52-2-1567	Donalds Castle Creek Site 6	Low	<20	<0.5	<0.01	<0.01
52-2-1570	Donald Castle Creek Site 9	Low	<20	<0.5	<0.01	<0.01
52-2-1591	Donald Castle Creek Site 30	Low	<20	<0.5	<0.01	<0.01
52-2-1747	Upper Avon 53	Low	1750	12	0.13	0.18
52-2-1752	Upper Avon 47	High	<20	<0.5	<0.01	<0.01

AHIMS ID	Site Name	Scientific Significance	Maximum predicted total vertical subsidence (mm)	Maximum predicted total tilt (mm/m)	Maximum predicted total hogging curvature (km ⁻¹)	Maximum predicted total sagging curvature (km ⁻¹)
52-2-1753	Upper Avon 48	Low	<20	<0.5	<0.01	<0.01
52-2-1754	Upper Avon 49	High	<20	<0.5	<0.01	<0.01
52-2-1755	Upper Avon 50	Low	<20	<0.5	<0.01	<0.01
52-2-1756	Upper Avon 51	Low	<20	<0.5	<0.01	<0.01
52-2-1757	Upper Avon 52	Low	<20	<0.5	<0.01	<0.01
52-2-1747	Upper Avon 53	Low	1750	12	0.13	0.18
52-2-1759	Upper Avon 55	Low	30	1.5	0.06	<0.01
52-2-1761	Upper Avon 46	Low	<20	<0.5	<0.01	<0.01
52-2-1780	Upper Avon 43	High	<20	<0.5	<0.01	<0.01
52-2-1782	Upper Avon 45	Low	875	15	0.25	0.30
52-2-3955	M2D PAD 2	Low	1600	8	0.1	0.17
AHIMS Pending	Dendrobium ACHA Shelter-3	Low	<20	<0.5	<0.01	<0.01
AHIMS Pending	Dendrobium ACHA Shelter-4	Low	<20	<0.5	<0.01	<0.01

7.3.2.3 Axe Grinding Grooves

There is a total of 13 grinding groove sites identified within the Subject Area, including one previously unrecorded grinding groove site. Three of these axe grinding groove sites (Donalds Castle Creek Site 5 [AHIMS ID # 52-2-1566], Donalds Castle Creek 31 [AHIMS ID # 52-2-1592] and Upper Avon 54 [AHIMS ID#52-2-1758]) are located above the proposed longwalls. MSEC (2022) has predicted that these sites are likely to experience “up to 1550 mm vertical subsidence, 11 mm/m tilt, 0.25 km⁻¹ hogging curvature and 0.17 km⁻¹ sagging curvature”.

The extraction of the proposed longwalls is likely to result in the fracturing of exposed bedrock along waterways. The fracturing is “expected to occur predominately above the proposed longwalls and, to lesser extents, outside the longwalls and within the 35° angle of draw. Minor and isolated fracturing could occur up to approximately 400 m from the proposed longwalls.” (MSEC 2022). The potential for mining- induced fracturing causing adverse impacts to these three grinding groove sites (Donalds Castle Creek Site 5 [AHIMS ID # 52-2-1566], Donalds Castle Creek 31 [AHIMS ID # 52-2-1592] and Upper Avon 54 [AHIMS ID#52-2-1758]) directly above the longwalls has been assessed as unlikely (less than 10%) (MSEC 2022).

A further seven grinding groove sites are located outside the proposed longwalls and within the 35° angle of draw. These sites are Donald Castle Creek Site 7 [AHIMS ID # 52-2-1568], Ricki Lee 1 [AHIMS ID # 52-2-1729], Ricki Lee 2 [AHIMS ID # 52-2-1730], Upper Avon 42 [AHIMS ID # 52-2-1779), Upper Avon 44 [AHIMS ID # 52-2-1781], Dendrobium ACHA AGG-4 [AHIMS ID # 52-2-4465] and Dendrobium ACHA AGG-1 [AHIMS ID # 52-2-4468].

These sites are located between 30 m and 230 m outside of the mining area and are predicted to experience vertical subsidence of less than 20 mm, apart from Donalds Castle Creek Site 7 [AHIMS ID # 52-2-1568] which is predicted to experience vertical subsidence of 40 mm (MSEC 2022). They are not expected to experience measurable conventional tilts, curvatures or strains, but may experience compressive strains due to valley closure effects in the order of 2 mm/m. The potential for mining-induced fracturing to cause adverse impacts on these six grinding sites has been assessed as rare (less than 5%) (MSEC 2022).

The remaining three sites are located outside of the 35° angle of draw. They are Dendrobium ACHA AGG-3 [AHIMS ID # 52-2-4466], ACHA AGG-2 [AHIMS ID # 52-2-4467] and Dendrobium ACHA AGG-5 [AHIMS ID # Pending]. At distances of between 270 mm and 510 mm outside of the mining area, they are not predicted to experience measurable conventional subsidence effects but may experience compressive strains due to valley closure effects in the order of 0.5 mm/m. The potential for mining-induced fracturing to cause adverse impacts on these three grinding groove sites has been assessed as very rare (less than 1%) (MSEC 2022).

Table 23 provides the subsidence predictions for axe grinding groove sites within the Subject Area.

Table 23: Subsidence Predictions for Grinding Groove Sites within the Subject Area

AHIMS ID	Site Name	Scientific Significance	Maximum Predicted Total Vertical Subsidence (mm)	Maximum Predicted Total Tilt (mm/m)	Maximum Predicted Hogging Curvature (km ⁻¹)	Maximum Predicted Sagging Curvature (km ⁻¹)
52-2-1566	Donalds Castle Creek Site 5	Low	475	11.0	0.25	0.09
52-2-1568	Donalds Castle Creek Site 7	Low	40	0.5	0.02	<0.01
52-2-1592	Donalds Castle Creek Site 31	Low	1550	8.0	0.09	0.17
52-2-1729	Ricki Lee 1	Low	<20	<0.5	<0.01	<0.01
52-2-1730	Ricki Lee 2	Moderate	<20	<0.5	<0.01	<0.01
52-2-1758	Upper Avon 54	Low	875	3.5	0.14	0.05
52-2-1779	Upper Avon 42	Low	<20	<0.5	<0.01	<0.01
52-2-1781	Upper Avon 44	Low	<20	<0.5	<0.01	<0.01
52-2-4465	Dendrobium ACHA AGG-4	Low	<20	<0.5	<0.01	<0.01
52-2-4466	Dendrobium ACHA AGG-3	Low	<20	<0.5	<0.01	<0.01
52-2-4467	Dendrobium ACHA AGG-2	Low	<20	<0.5	<0.01	<0.01
52-2-4468	Dendrobium ACHA AGG-1	Low	<20	<0.5	<0.01	<0.01
AHIMS Pending	Dendrobium ACHA AGG-5	Low	<20	<0.5	<0.01	<0.01

7.3.3 Summary of Potential Impacts

For the purposes of this ACHA, some Aboriginal heritage sites located within the underground investigation areas have the potential to be impacted by subsidence.

7.3.3.1 Potential Impacts

Table 24 provides a summary of the potential impacts of the Project on Aboriginal heritage sites within the Subject Area, including the potential type of impact on each site (i.e. surface impacts, subsidence impacts or no impacts).

Table 24: Summary of Potential Impacts of the Project on Aboriginal Heritage Sites and Summary of Potential Harm

AHIMS ID	Site Name	Site Type	Scientific Significance	Impact Type	Likelihood of Impact	Type of Harm (Direct/Indirect/None) ¹	Degree of Harm (Total/Partial/None)	Consequences of Harm (Total Loss of Value/Partial Loss of Value/No Loss of Value) ²
52-2-4468	Dendrobium ACHA AGG-1	Axe Grinding Groove	Low	Potential subsidence	Rare (less than 5%)	Indirect	Partial	Partial Loss of Value (aesthetic/visual)
52-2-4467	Dendrobium ACHA AGG-2	Axe Grinding Groove	Low	Potential subsidence	Very rare (less than 1%)	Indirect	Partial	Partial Loss of Value (aesthetic/visual)
52-2-4466	Dendrobium ACHA AGG-3	Axe Grinding Groove	Low	Potential subsidence	Very rare (less than 1%)	Indirect	Partial	Partial Loss of Value (aesthetic/visual)
52-2-4465	Dendrobium ACHA AGG-4	Axe Grinding Groove	Low	Potential subsidence	Rare (less than 5%)	Indirect	Partial	Partial Loss of Value (aesthetic/visual)
52-2-1566	Donalds Castle Creek Site 5	Axe Grinding Groove	Low	Potential subsidence	Unlikely (less than 10%)	Direct	Partial	Partial Loss of Value (aesthetic/visual)
52-2-1568	Donalds Castle Creek Site 7	Axe Grinding Groove	Low	Potential subsidence	Rare (less than 5%)	Indirect	Partial	Partial Loss of Value (aesthetic/visual)
52-2-1592	Donalds Castle Creek Site 31	Axe Grinding Groove	Low	Potential subsidence	Unlikely (less than 10%)	Direct	Partial	Partial Loss of Value (aesthetic/visual)
Pending	Dendrobium ACHA AGG-5	Axe Grinding Groove	Low	Potential subsidence	Very rare (less than 1%)	Indirect	Partial	Partial Loss of Value (aesthetic/visual)
52-2-1729	Ricki Lee 1	Axe Grinding Groove	Low	Potential subsidence	Rare (less than 5%)	Indirect	Partial	Partial Loss of Value (aesthetic/visual)
52-2-1730	Ricki Lee 2	Axe Grinding Groove	Moderate	Potential subsidence	Rare (less than 5%)	Indirect	Partial	Partial Loss of Value (aesthetic/visual)
52-2-1779	Upper Avon 42	Axe Grinding Groove	Low	Potential subsidence	Rare (less than 5%)	Indirect	Partial	Partial Loss of Value (aesthetic/visual)
52-2-1781	Upper Avon 44	Axe Grinding Groove	Low	Potential subsidence	Rare (less than 5%)	Indirect	Partial	Partial Loss of Value (aesthetic/visual)
52-2-1758	Upper Avon 54	Axe Grinding Groove	Low	Potential subsidence	Unlikely (less than 10%)	Direct	Partial	Partial Loss of Value (aesthetic/visual)

AHIMS ID	Site Name	Site Type	Scientific Significance	Impact Type	Likelihood of Impact	Type of Harm (Direct/Indirect/None) ¹	Degree of Harm (Total/Partial/None)	Consequences of Harm (Total Loss of Value/Partial Loss of Value/No Loss of Value) ²
52-2-3204	Avon Dam IF1	Isolated Find	Low	Potential subsidence	Very rare (less than 1%)	Indirect	Partial	Partial Loss of Value (aesthetic/visual)
52-2-1567	Donald Castle Creek Site 6	Shelter with Art	Low	Potential subsidence	Very rare (less than 1%)	Indirect	Partial	Partial Loss of Value (aesthetic/visual)
52-2-1570	Donald Castle Creek Site 9	Shelter with Art	Low	Potential subsidence	Very rare (less than 1%)	Indirect	Partial	Partial Loss of Value (aesthetic/visual)
52-2-1591	Donald Castle Creek Site 30	Shelter with Art	Low	Potential subsidence	Very rare (less than 1%)	Indirect	Partial	Partial Loss of Value (aesthetic/visual)
52-2-1780	Upper Avon 43	Shelter with Art	High	Potential subsidence	Rare (less than 5%)	Indirect	Partial	Partial Loss of Value (aesthetic/visual)
52-2-1782	Upper Avon 45	Shelter with Art	Low	Potential subsidence	Unlikely (less than 10%)	Direct	Partial	Partial Loss of Value (aesthetic/visual)
52-2-1753	Upper Avon 48	Shelter with Art	Low	Potential subsidence	Very rare (less than 1%)	Indirect	Partial	Partial Loss of Value (aesthetic/visual)
52-2-1755	Upper Avon 50	Shelter with Art	Low	Potential subsidence	Very rare (less than 1%)	Indirect	Partial	Partial Loss of Value (aesthetic/visual)
52-2-1756	Upper Avon 51	Shelter with Art	Low	Potential subsidence	Rare (less than 5%)	Indirect	Partial	Partial Loss of Value (aesthetic/visual)
52-2-1761	Upper Avon 46	Shelter with Art and Deposit	Low	Potential subsidence	Very rare (less than 1%)	Indirect	Partial	Partial Loss of Value (aesthetic/visual)
52-2-1752	Upper Avon 47	Shelter with Art and PAD	High	Potential subsidence	Very rare (less than 1%)	Indirect	Partial	Partial Loss of Value (aesthetic/visual)
52-2-1747	Upper Avon 53	Shelter with Art and PAD	Low	Potential subsidence	Unlikely (less than 10%)	Direct	Partial	Partial Loss of Value (aesthetic/visual)
52-2-1759	Upper Avon 55	Shelter with Art and PAD	Low	Potential subsidence	Rare (less than 5%)	Indirect	Partial	Partial Loss of Value (aesthetic/visual)
Pending	Dendrobium ACHA Shelter-3	Shelter with Art and PAD	Low	Potential subsidence	Very rare (less than 1%)	Indirect	Partial	Partial Loss of Value (aesthetic/visual)

AHIMS ID	Site Name	Site Type	Scientific Significance	Impact Type	Likelihood of Impact	Type of Harm (Direct/Indirect/None) ¹	Degree of Harm (Total/Partial/None)	Consequences of Harm (Total Loss of Value/Partial Loss of Value/No Loss of Value) ²
Pending	Dendrobium ACHA Shelter-4	Shelter with Art and PAD	Low	Potential subsidence	Rare (less than 5%)	Indirect	Partial	Partial Loss of Value (aesthetic/visual)
52-2-1754	Upper Avon 49	Shelter with Deposit	High	Potential subsidence	Very rare (less than 1%)	Indirect	Partial	Partial Loss of Value (aesthetic/visual)
52-2-1757	Upper Avon 52	Shelter with Deposit	Low	Potential subsidence	Rare (less than 5%)	Indirect	Partial	Partial Loss of Value (aesthetic/visual)
52-2-3955	M2D PAD 2	Shelter with PAD	Low	Potential subsidence	Unlikely (less than 10%)	Direct	Partial	Partial Loss of Value (aesthetic/visual)

¹ Sites located outside the predicted 20mm subsidence contour, with the exception of those located near or within valley bases for example axe grinding grooves are unlikely to experience direct or indirect impacts. Sites located near valley bases could potentially be affected by valley closure effects. Minor and isolated fracturing have been observed up to 400 m away from mining within the Southern Coalfield. The likelihood of the fracture to be coincidence with the sites located outside the Subject Area is considered to be very low. As a result, indirect harm is attributed in this case as it is an impact to the surrounding landscape as opposed to the actual Aboriginal cultural heritage site.

² The code does not provide definitions for these categories, however they are taken to mean:
 Type of harm: Direct- the object will or may be subject to direct physical disturbance. Indirect- there may be secondary consequences from the activity, resulting in harm. None- neither the object nor its context will be altered.

Degree of harm: Total: the object(s) will be directly harmed in their entirety. Partial- some objects will be directly or indirectly harmed, however a portion of a site may remain unaffected. None- there will be no harm.

Consequence of harm: Total loss of value- no heritage values will remain subsequent to the harm. Partial loss of value- some heritage values will remain subsequent to the harm. No loss of value- there will be no harm, and no loss of value.

7.3.3.2 Potential Harm

The *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW* (OEH 2011) requires that both direct and indirect harm be considered. Generally, direct harm refers to occasions where an activity physically impacts a site or objects and therefore affects the heritage values possessed by the site or objects. Indirect harm is usually taken to mean harm stemming from secondary consequences of the activity, and may affect sites or objects as a consequence of the activity. Examples of such indirect harm are increased visitors to a site, or increased erosion in an area.

The Project has the potential to harm Aboriginal objects and Aboriginal cultural values during both the development phase and the operational phase. During the development phase potential harm and impacts may result from the development of surface infrastructure (e.g. land clearing and ground disturbance for the establishment of transport corridors and facilities), although no known Aboriginal heritage sites were identified within the proposed surface disturbance areas for the Project. During the operational phase of the Project potential harm and impacts may be derived from subsidence induced ground movements and may also be derived from any works associated with subsidence remediation or ancillary infrastructure such as goaf gas drainage or environmental monitoring locations.

As required by the Code of Practice (DECCW 2010b), the likely impacts (and partial loss of value) to Aboriginal heritage sites as a result of the Project is presented in Table 24.

7.3.4 Potential Cumulative Impacts

The Project would cause a minor increase to the cumulative development impact on the Aboriginal cultural heritage of the region and local area. The Aboriginal heritage of the area has had limited impacts to it due to the area being used as a water catchment for the past 100 years. Sites that have been impacted within the catchment area have, for the large majority, been impacted by subsidence that is a result of longwall mining or by environmental processes. Within the Southern Coalfield, Sefton (2000) conducted a long-term monitoring program that reviewed the effects of longwall mining to sandstone shelter sites over a ten year period. During the assessment Sefton monitored 52 Aboriginal sites; prior to, during and after longwall mining had been completed (Sefton 2000:15). The results of this study were:

- Five of the 52 sites monitored during the assessment (Sefton 2000) had evidence of impacts that related to longwall extraction methods.
- Impacts associated with longwall mining can be grouped into four distinct categories:
 - cracking;
 - movement along existing joints and/or bedding planes;
 - changes to the water seepage patterns through the sandstone; and
 - blockfalls.
- Elements of shelters that were associated with the highest risk of impact were:
 - Size of the overhang, including the length of the ridgeline.
 - Wetness of the overhang.
 - Location in regards to the valley base.
 - Location of the shelter, in regards to the goaf.
 - Shelters formed through blockfall.
- During Sefton's monitoring program, there were no collapsed shelters identified.
- No shelters with an area of less than 50 cubic metres (m³) had been impacted due to subsidence.
- Not all shelters that were identified as being larger than 50 m³ had been impacted.

- Any impacts caused by subsidence were not observed until at least three months after the completion of extraction.
- ‘The over-riding factor which appears to be significant is overhang size, where large overhangs are at greater risk’ (Sefton 2000:38).

The *Impacts of Underground Coal Mining on Natural Features in the Southern Coal Field: Strategic Review* (NSW Department of Planning 2008) considered past and potential impacts of mine related subsidence on significant natural features within the Southern Coalfield. The objectives of the inquiry were to:

- Undertake a review of the impacts of longwall extraction within the Southern Coalfields significant natural features (rivers, significant streams, swamps and cliff lines), concentrating on risks to water flow, quality and ecosystems.
- Provide advice on best practise in regards to subsidence impacts, avoidance and/or minimising impacts on significant natural features; as well as the management, monitoring and remediation of any adverse effects.
- Report on the social and economic significance of the coal resources within the region.

In relation to Aboriginal heritage the summary of the report states that ‘Aboriginal heritage sites are most at risk of subsidence impacts where they are located in cliff lines and/or rock overhangs. The Panel was not made aware of any significant impacts having occurred on Aboriginal heritage features in the Southern Coalfields since the 1980s’ (NSW Department of Planning 2008: 2).

Impacts on natural features such as cliff lines, watercourses and valleys were described during the inquiry as having been associated with ‘non-conventional’ subsidence (NSW Department of Planning 2008: 82). The measures for predicting valley closure and upsidence were judged to be the most valuable when determining impacts on these landforms.

The *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW* (OEH 2011) defines ecologically sustainable development and inter-generational equity as follows, ‘the principle of inter-generational equity holds that the present generation should make every effort to ensure the health, diversity and productivity of the environment – which includes cultural heritage – is available for the benefit of future generations’. When considered against the principles of inter-generational equity and ecologically sustainable development, the potential impacts of the Project can be considered relatively minor because they directly longwall under a relatively small number of sites of low scientific value.

During the CVC process, a number of stakeholders identified that the declaration of the Metropolitan Special Areas in 1880 resulted in intergenerational issues of a lack of access to their significant sites. This lack of access excluded Aboriginal people from visiting places in which traditional practices of transmitting cultural knowledge were maintained. This has resulted in a loss of knowledge and has impacted their ability to maintain spiritual and cultural connections to Country. One stakeholder identified that there is now a “disconnection with the stories of the rock art” Representative of the Woronora Plateau Gundungara Elders Council. Numerous stakeholders indicated their wish to have easier access to these areas in order to reinstate and maintain the connections that they feel to the Subject Area. IMC have identified their willingness to facilitate better access to these sites to enable Aboriginal people to connect to these important places.

7.3.4.1 Potential Cumulative Impacts - Within the Southern Coalfield

Since the monitoring work completed by Sefton between 1990 and 2000, archaeological monitoring programs have continued in the Southern Coalfield at the majority of underground mines. Monitoring programs have been undertaken at the Dendrobium Mine and at Tower, Appin, West Cliff, Elouera, Cordeaux, Tahmoor and Metropolitan Collieries. The following discussion outlines the results of these monitoring programs in comparison to Sefton’s original conclusions.

Aboriginal cultural heritage site monitoring programs have been developed and implemented across the Southern Coalfield in the past 22 years (Biosis Research 2008, 2009a, 2009b, 2009c, 2011, 2013, 2015, EMM 2020, Gun and Kayandel Archaeological Services 2007, Kayandel Archaeological Services 2012, Niche 2011, 2012, 2013a, 2013b, 2013c, 2014a, 2014b, 2014c, 2015a, 2015b, 2015c, 2016a, 2016b, 2016c, 2017a and 2017b and Sefton 2000, 2002a, 2002b, 2002c). The methodology of these programs is very similar to that outlined in Sefton (2000). Initial baseline recording is completed on those sites that are identified by subsidence consultants as having potential to be affected by subsidence. Site types that are subject to baseline recording in the Southern Coalfield include sandstone shelter sites with art and/or potential archaeological deposit, stone artefacts, deposits, engravings and sandstone platforms that include engravings (often of animals, humans, anthropomorphic figures and ancestral beings) and/or axe grinding grooves. Sandstone platform sites can be located within creek and river beds on large plateaus, often within or at the edge of swamps on platforms that make up shelter roofs. Stone artefact scatters, isolated artefacts and scarred trees are often not monitored routinely as they are highly unlikely to be affected by subsidence, and hence the risk attributed to these site types is negligible.

At the completion of baseline recording, Aboriginal cultural heritage sites are often monitored a second time in line with the individual project’s monitoring requirements, generally within 6 months of the completion of a longwall extraction. Monitoring programs are generally continued in this fashion until the Aboriginal cultural heritage site is no longer subject to subsidence movements.

Within the Southern Coalfield a total of 244 Aboriginal cultural heritage sites have been monitored since 1990. The site types that have been monitored are outlined in Table 25 below.

Table 25: Aboriginal cultural heritage site types monitored within the Southern Coalfields

Site type	Number of type	Percentage
Sandstone Shelter with Art	116	48%
Sandstone Shelter with Deposit	38	16%
Sandstone Shelter with Art and Deposit	34	14%
Single Axe Grinding Groove	4	2%
Axe Grinding Grooves	17	7%
Engraving	1	0.4%
Scarred Tree	1	0.4%
Sandstone Shelter with Art, Deposit and Axe Grinding Groove	3	1%
Shelter with Art and PAD	4	2%
Sandstone Shelter with PAD	23	9%
Sandstone Shelter with Art, PAD and Deposit	1	0.4%
Shelter with Art, Axe Grinding Grooves and PAD	1	0.4%
Sandstone Shelter with Deposit and PAD	1	0.4%
Totals	244	100%

Of the 244 Aboriginal cultural heritage sites monitored, 25 sites were identified as having impacts or changes that may be attributable to subsidence, environmental factors or a combination of both (Table 26). This number equates to approximately 10.2 % of all the Aboriginal cultural heritage sites monitored.

Twenty-one of the Aboriginal heritage sites in Table 26 sustained structural effects³ to either the sandstone shelter or the sandstone platform, with eight of these sites having also sustained environmental effects such as, root jacking from trees growing on top of the shelter, water seepage as a result of this root jacking and natural wind and bush fire exposure and micro and macro fauna growth within shelters. The effects at two sites could not be attributed decisively as either subsidence or environmental.

Of the 25 sites identified as having impacts attributable to subsidence (Table 26), two are noted as having adverse consequences to the physical fabric which supports the sites heritage values as a result of underground mining. These adverse consequences were cracking that occurred across or adjacent to the art panels. The cracks adjacent to art panels have caused changes to water seepage above the panel, causing water flow to redirect over the art. The percentage of sites with impacts to art panels in this instance is approximately 1% of the 144 sites with art, assessed across the southern coalfield considerably less than the 10% originally predicted by Sefton in 2000. The remaining twenty-three sites have experienced subsidence related impacts to their structure (either the sandstone shelter or rock platform), which equates to approximately 10% of all Aboriginal sites monitored within the Southern Coalfield.

The smaller observed number of adverse consequences on heritage values compared to the predictions of Sefton (2000) could be an indicator of a number of things not originally considered in the study. Sefton's initial sample size was much less than the total number of Aboriginal heritage sites currently being monitored within the Southern Coalfield, as sandstone shelter sites with PAD and/or deposit as well as sandstone platforms with engravings and/or axe grinding grooves were not originally considered for monitoring due to the lack of predicted impacts to these site types.

Potential cumulative impacts to Aboriginal cultural heritage values as a result of the Project should consider the aforementioned monitoring programs in conjunction with the data provided for the Subject Area by MSEC (2022) (Section 7.3.2). There are 31 Aboriginal cultural heritage sites located within the Subject Area, six of which (three rock shelter sites and three axe grinding groove sites) are located directly over proposed longwalls. As 31 Aboriginal cultural heritage sites identified are within the 600 m buffer of the proposed longwalls for the Subject Area, it is recommended that these sites would be added to future monitoring programs bringing the total number of sites monitored in the Southern Coalfield to 237.

³ In the case of Aboriginal Heritage Trigger Action Responses, for the purposes of End of Panel assessments within the Southern Coalfields structural effects are not constituted as harm, as it does not effect the art panel.

Table 26: Aboriginal sites within the Southern Coalfields observed to have subsidence related changes, during monitoring programs

AHIMS number	Site name	Site type	Observed changes/ impacts	Is the art panel or heritage value affected	Reference
52-2-0094	Flat Rock Creek 4	Sandstone shelter with art	Opening of existing bedding planes, along the roof/ rear wall and minor roof fall.	No	Kayandel Archaeological Services 2008
52-2-0106	Flat Rock Creek 10	Sandstone shelter with art	Cracks in rear wall, potential for altered seepage to impact art- mitigated with an artificial drip-line.	No	Kayandel Archaeological Services 2008
52-2-0089	Flat Rock Creek 11	Sandstone shelter with art	Exfoliation and block fall at rear wall.	No	Kayandel Archaeological Services 2008
52-2-0154	Flat Rock Creek 49	Sandstone shelter with art	Minor block fall from rear wall and ceiling.	No	Kayandel Archaeological Services 2008
52-2-0258	Flat Rock Creek 57	Sandstone platform with engraving and axe grinding grooves	Crack in sandstone platform.	No	Kayandel Archaeological Services 2008
52-2-0176	Flat Rock Creek 152	Sandstone shelter with art	Cracking and minor block fall at rear wall.	No	Sefton 2000 and Kayandel Archaeological Services 2008
52-2-1638	Browns Road Site 24	Sandstone shelter with art	Minor block fall at rear wall.	No	Sefton 2000
52-2-1625	Browns Road Site 10	Sandstone shelter with art	Cracking and minor blockfall at rear wall.	No	Sefton 2000
AHIMS number could not be confirmed	Wedderburn Road 1	Sandstone shelter with art	Cracking in floor and rear wall.	No	Sefton 2000

AHIMS number	Site name	Site type	Observed changes/ impacts	Is the art panel or heritage value affected	Reference
52-2-1300	Wedderburn Road 2	Sandstone Shelter with art	Opening of crack in back wall.	No	Sefton 2000
52-2-1162	Stokes Creek Site 67	Sandstone shelter with art	Opening of the bedding plane above the art and increased water seepage as a result.	No	Sefton 2000
52-2-2252	Dendrobium 4	Sandstone shelter with art	Opening of crack along the back wall.	No	Comur 2009
52-2-0195	Flat Rock Creek 34	Sandstone shelter with art	Horizontal cracking visible on the ceiling of the shelter. Cracking occurred over the most southern hand stencil on the back panel. Crack across hand stencil 40cm long. Crack along the roof of the shelter 1-2.5 m off ground, and 5 m long.	Yes ¹	Niche 2017b
52-2-3083	Flat Rock Creek 281	Sandstone shelter with art	Thin cracking adjacent to the hand stencil at the northern end of the shelter.	Yes ¹	Kayandel Archaeological Services 2012
52-2-3086	Flat Rock Creek 284	Sandstone shelter with art	Fractured a corner of a buttress-like formation on the rear wall.	No	Kayandel Archaeological Services 2012
52-2-2243	Georges River No. 2	Sandstone shelter with art	Thin vertical cracking in the shelter ceiling, adjacent to the art panel.	No	Niche 2013a
52-2-0396	Flat Rock Creek 15	Sandstone shelter with art	The large vertical fissure in the central back wall had increased in width (opened) and shifted laterally.	No	Niche 2013b
52-2-2244	Georges River No.3	Sandstone shelter with art and axe grinding grooves	Opening of the horizontal bedding plane. Cracking and exfoliation along the back wall.	No	Niche 2014
AHIMS number could not be confirmed	MET 1	Sandstone shelter with art	Vertical cracking and cracks along the roof.	No	Niche 2015a
52-2-0826	Flat Rock Creek 176	Sandstone shelter with art	Vertical cracking at the northern and southern ends of the shelter.	No	Niche 2015b
52-2-3077	Flat Rock Creek 275	Sandstone shelter with art	The horizontal bedding plane joins along the back of the shelter have been noted as opening, three hairline cracks have formed, running vertical from the bedding plane.	No	Niche 2016a

AHIMS number	Site name	Site type	Observed changes/ impacts	Is the art panel or heritage value affected	Reference
52-2-3486	Flat Rock Creek 301	Sandstone platform with axe grinding groove	A large crack was observed running east to west along the entire rock platform. Crack is approximately 3.08 m to the north of the grinding groove and is approximately 25 m long and continues past the rock platform.	No	Niche 2017a
52-2-1626	Browns Road Site 11	Sandstone Shelter with Art	The main area of cracking caused by subsidence related effects due to the extraction of Longwall 14 was observed in the southern floor area of the shelter. The diagonal cracking measures to an approximate length of 70 cm and a width of 3 cm. The Art Panels located at the northern extent of the shelter were not impacted. The latest inspection identified new subsidence related impacts due to the extraction of Longwall 15. New areas of joint opening and fissuring were observed in areas surrounding the two Art Panels to the north of the shelter	No	Niche 2019 and Niche 2020
52-2-3645	DM 21	Sandstone Shelter with Art	The landscape surrounding the shelter site has experienced a range of subsidence impacts from the extraction of Longwall 15 such as localised rockfalls to the upper ridgelines (South 32 2020). The northern exterior of the shelter has experienced fracturing as result of subsidence from the extraction of Longwall 15. Four main instances of vertical and diagonal cracking were observed. The largest crack at the base of the ridgeline measures 3.7 cm in width. The interior cavern of the shelter did not have any direct impacts from subsidence.	No	Niche 2019 and Niche 2020
52-2-2068	Stonequarry Creek 1, SC-1	Sandstone platform with axe grinding grooves	Fracturing to the rock bar which has lead to rock shearing off the platform	No	EMM 2021

¹ The sites highlighted have experienced adverse consequences as a result of mining that are highlighted in their individual projects TARP. This means that the art panels at these sites have experienced cracking.

7.3.4.2 Potential Cumulative Impacts - Within the Dendrobium Mine Area

As demonstrated in Table 26, there have been three Aboriginal cultural heritage sites (Dendrobium 4 [AHIMS ID #52-2-2252], Browns Road Site 11 [AHIMS ID#52-2-1626] and DM 21 [AHIMS ID#52-2-3645]) impacted as a result of subsidence movements at Dendrobium Mine. Dendrobium 4 (AHIMS ID #52-2-2252) has had impacts recorded along the back wall and horizontal bedding planes of the sandstone shelter (Comur 2009). Browns Road Site 11 (AHIMS ID#52-2-1626) experienced cracking at the southern end of the shelter, as well as some minor block fall (as outlined in Table 26). DM 21 (AHIMS ID#52-2-3645) has had cracking occur on the northern exterior of the shelter, the interior of the cavern did not have any direct impacts from subsidence. This movement did not affect the art located within each of these shelters. Adding the 31 sites identified within the Subject Area for this ACHA, there would be a total of 85 sites monitored for the Mine.

7.4 Project Justification

The Southern Coalfield is renowned for producing world-class metallurgical coal, which remains a vital ingredient (along with iron ore) for steelmaking both in Australia and globally and is the only metallurgical coal resource in NSW. Mining has been undertaken in the Southern Coalfield for more than 100 years and continues to do so through the existing operational mines. Due to access to high quality metallurgical coal resources in the Illawarra, steelmaking operations were established at Port Kembla and have occurred in parallel to mining in the Southern Coalfield for more than 100 years.

The Project proposes to extend the mine life at the Dendrobium Mine to 31 December 2041 through underground mining operations within Area 5 until approximately 2035, as well as use of the existing Dendrobium Mine surface facilities to 2041 to allow receipt of coal mined in approved Area 3C.

The Project would create an additional 50 operational jobs, as well as an additional 100 jobs during construction, and support the ongoing employment of approximately 1,800 direct employees across IMC's operations (i.e. Dendrobium Mine and Appin Mine), with more than 90% living locally in the Illawarra region. Accordingly, the Project is significant to both the Illawarra region and domestic steelmaking in Australia.

Avoidance of key surface features associated with Aboriginal heritage values has been incorporated into the design of the Project. The surface infrastructure proposed by IMC would avoid all previously identified Aboriginal heritage sites, including rock shelters, grinding grooves and natural significant landscape features. IMC has proposed a Project design that would:

- not longwall mine beneath 3rd, 4th and 5th order (or above) streams;
- not longwall mine beneath previously identified high archaeological (scientific) significance Aboriginal cultural heritage sites;
- set longwall mining at a distance of at least 400 m from named watercourses (i.e. the Avon River, Cordeaux River, Donalds Castle Creek and Wongawilli Creek);
- avoid longwall mining beneath identified key stream features;
- avoid longwall mining beneath "Area 4" swamp cluster; and
- use existing infrastructure (namely the Dendrobium Pit Top, Kemira Valley Coal Loading Facility, Kemira Valley Rail Line, Dendrobium CPP, Shaft Sites Nos 1, 2 and 3 and the West Cliff Stage 3 Coal Wash Emplacement) which would reduce the requirement for additional surface disturbance.

7.5 Risk Assessment

An Environmental Risk Assessment has been prepared for the Project (Risk Mentor 2022) which forms part of the EIS and identifies the key potential environmental risks associated with the Project, including potential risks to Aboriginal heritage sites. The risk measures of probability and consequence were used as a basis for ranking each of the potential environmental risks, including potential subsidence impacts to Aboriginal heritage sites. The risks to all Aboriginal heritage sites were ranked 'As Low as Reasonably Practicable'.

Further information on the risk assessment undertaken for the Project is available in Appendix M of the EIS.

8. Avoiding and Minimising Harm

8.1 Conservation Principles and Management Framework

The two founding principles behind the Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW (OEH 2011:12) are ecologically sustainable development and intergenerational equity. These principles hold that “the present generation should make every effort to ensure the health, diversity and productivity of the environment – which includes cultural heritage – is available for the benefit of future generations”.

The strong emphasis, as in the Burra Charter, is to quantify and understand the heritage values of a place, a site, or an object and exhaust avenues of avoiding harm to those values. If harm cannot be avoided, then there must be consideration and implementation of strategies to minimise harm (OEH 2011:13).

It follows that the hierarchy for consideration in terms of the management strategies available for surface stone artefacts and subsurface stone artefacts and areas of archaeological potential, fall into four general categories, in order of preference from a conservation perspective:

- avoidance and in-situ conservation;
- partial avoidance and partial in-situ conservation (includes partial harm);
- harm caused with mitigating circumstances such as collection or salvage; and
- unmitigated harm.

The four general categories (described above) have been considered in the following subsections with regard to both direct impacts (e.g. surface disturbance and potential direct subsidence-induced impacts) and indirect impacts (e.g. monitoring activities and potential indirect subsidence-induced impacts).

8.1.1 Detailed Design to Avoid Harm

The surface infrastructure proposed by IMC would avoid all known Aboriginal heritage sites, including rock shelters, grinding grooves and natural landscape features.

As described in Section 7.4, avoidance of key surface features associated with Aboriginal heritage values has been incorporated into the design of the Project. The surface infrastructure proposed by IMC would avoid all previously identified Aboriginal heritage sites, including rock shelters, grinding grooves and natural significant landscape features. IMC has proposed a Project design that would (Figure 6):

- not longwall mine beneath 3rd, 4th and 5th order (or above) streams;
- not longwall mine beneath previously identified high archaeological (scientific) significance Aboriginal heritage sites;
- set longwall mining at a distance of at least 400 m from named watercourses (i.e. the Avon River, Cordeaux River, Donalds Castle Creek and Wongawilli Creek);
- avoid longwall mining beneath identified key stream features;
- avoid longwall mining beneath “Area 4” swamp cluster; and
- use existing infrastructure (namely the Dendrobium Pit Top, Kemira Valley Coal Loading Facility, Kemira Valley Rail Line, Dendrobium CPP, Shaft Sites Nos 1, 2 and 3 and the West Cliff Stage 3 Coal Wash Emplacement) which would reduce the requirement for additional surface disturbance.

Figure 6: Dendrobium Mine Extension Project Mine Design Plan (Source: IMC and Heritage NSW)

Not included in this version.

During detailed design of the proposed ventilation shaft site and the location of any other surface and ancillary infrastructure, it is recommended IMC give consideration to the known Aboriginal heritage sites identified by this ACHA (noting that no known Aboriginal heritage sites are within areas of proposed surface infrastructure). As such, this process should include consideration any unidentified Aboriginal heritage sites, and whether or not surface infrastructure can be designed in a way that avoids harm, and if harm cannot be avoided that harm be caused to as few sites as possible, within design and operational constraints. Depending on the site type (e.g. artefact scatter or grinding groove) and scientific significance rating, further management measures such as archival recording and fencing may be undertaken prior to harm, in consultation with a suitably qualified archaeologist and representatives of the RAPs.

This approach is consistent with the Heritage NSW requirements of ecologically sustainable development and intergenerational equity.

8.1.2 Development of Trigger Action Response Plans

Implementation of avoidance, minimisation, mitigation and offsetting in respect of heritage values will be through the development of Trigger Action Response Plans (TARPs). The TARPs relate to identifying, assessing and responding to potential impacts to heritage values (including intangible values) from the Project. These TARPs are developed in consultation with RAPs using knowledge gained from previous mining at Dendrobium, as well as other mining areas similar to Dendrobium conditions. The TARPs for the Project will be finalised in the ACHMP, in consultation with RAPs.

The TARPs represent reporting and management actions to be taken upon reaching defined trigger levels. TARPs include Corrective Management Actions (CMA) developed in consultation with RAPs in order to manage any impact in accordance with relevant approvals. The ACHMP provides a basis for the design and implementation of any mitigation and remediation requirements.

Monitoring of cultural heritage aspects provides key data when determining any reporting and CMAs outlined in the TARPs. The triggers are based on comparison of pre-mining (baseline) and during and post mining (impact) monitoring results. Triggers are developed prior to any mining (if approved) and reviewed and revised as required during the mining in consultation with RAPs. Where improvements for the triggers are required, they will be reviewed, and changes proposed in in consultation with the RAPs. Any changes to the triggers would require approval of DPIE.

Where a TARP is triggered it results in actions, including further investigations and reporting by appropriately qualified Archaeologists and will include additional consultation with RAPs. Assessment reports will include:

- Scope and objectives.
- Consideration of relevant aspect from the ACHMP.
- Analysis of trends and assessment of any impacts compared to prediction.
- Root cause analysis of any change or impact.
- Assessment of the need for contingent measures and management options.
- Any recommended changes to the ACHMP.
- Appropriate consultation.

TARPs will be developed in consultation with RAPs and will be structured and include the aspects below in Table 27.

Table 27: TARPs that will be developed in consultation with the RAPs

Feature	Performance Measure	Predicted Impacts	How Monitored	How Managed	Contingent Measures
Each Aboriginal cultural value (including tangible and intangible aspects) will be assessed	Specific performance measures for values (should the Project be approved)	Demonstrate through detailed assessment and prediction how the performance measure will be met	How the Aboriginal cultural value will be monitored (including involvement of RAPs)	Including avoidance, minimisation, mitigation and offsetting	Measures that would be employed should performance measures for Aboriginal cultural values not be met

8.1.3 Subsidence Monitoring

Monitoring prior to and after longwall mining should be implemented for Aboriginal heritage sites within the Subject Area that may be subject to impacts from mining induced subsidence. The subsidence monitoring program should be in accordance with the relevant approved Extraction Plan and AHMP. Monitoring should be undertaken by a suitably qualified archaeologist and representatives of the RAPs.

9. Conclusion and Recommendations

9.1 Conclusion

This ACHA has been prepared in accordance with the *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in New South Wales* (OEH 2011). The objectives of the assessment are to identify Aboriginal cultural heritage sites that may be harmed by the Project, to undertake consultation with registered Aboriginal parties, to identify the cultural values connected with the Subject Area and to provide recommendations to reduce the extent and severity of harm that will be caused by the Project where it cannot be avoided.

Avoidance of key surface features associated with Aboriginal heritage values has been incorporated into the design of the Project. The surface infrastructure proposed by IMC would avoid all previously identified Aboriginal heritage sites, including rock shelters, grinding grooves and natural significant landscape features. IMC has proposed a Project design that would:

- not longwall mine beneath 3rd, 4th and 5th order (or above) streams;
- not longwall mine beneath previously identified high archaeological (scientific) significance Aboriginal heritage sites;
- set longwall mining at a distance of at least 400 m from named watercourses (i.e. the Avon River, Cordeaux River, Donalds Castle Creek and Wongawilli Creek);
- avoid longwall mining beneath identified key stream features;
- avoid longwall mining beneath “Area 4” swamp cluster; and
- use existing infrastructure (namely the Dendrobium Pit Top, Kemira Valley Coal Loading Facility, Kemira Valley Rail Line, Dendrobium CPP, Shaft Sites Nos 1, 2 and 3 and the West Cliff Stage 3 Coal Wash Emplacement) which would reduce the requirement for additional surface disturbance.

Within the Subject Area, 28 previously recorded Aboriginal heritage sites were identified, comprising a combination of 12 Axe Grinding Groove sites, 1 Isolated Find and 15 Sandstone Shelters with Art, Deposit, Potential Archaeological Deposit or a combination of all types. A field survey was undertaken to revisit these sites and the results of the survey are included in Appendix A. An additional 3 sites were identified during the field survey and fall within the Subject Area. They include two rock shelters with art and a Potential Archaeological Deposit (PAD) and one Axe Grinding Groove site.

A total of six Aboriginal cultural heritage sites have been identified directly above the proposed longwalls. An additional 12 sites have been identified that are located outside of the area directly above the proposed longwalls but within the 35° angle of draw (MSEC 2022). There are also an additional 13 sites which are identified within the Subject Area based on the 600 m buffer from the proposed longwalls which could experience valley- related effects.

The potential for mining-induced fracturing on these sites has been assessed by MSEC (2022) as:

- Six sites located over longwalls - unlikely (<10%).
- 12 sites within 35-degree angle of draw - rare (<5%).
- outside 35-degree angle of draw - very rare (<1%).

IMC has initiated additional consultation with RAPs and other Aboriginal stakeholders via a CVC process to identify and better understand the cultural values, including both tangible and intangible values and Aboriginal places, associated with the Project area and surrounding landscape. Initial consultation for the CVC process did not identify any specific unique cultural values within the Project area relative to the broader surrounding landscape, however, it is acknowledged that Aboriginal stakeholders have a connection to ‘Country’ including within Area 5.

9.2 Recommendations

Table 18 provides the recommendations for the management of Aboriginal heritage values within the Subject Area for the Project. Detailed discussion of the recommendations are outlined in Appendix A. It is important to note that though these recommendations were developed in consideration of feedback received from the RAPs during the consultation process. It has been clearly communicated by the RAPs that they do not support the Project, or mining in general.

Table 28: Recommendations

Recommendations	
1.	Protocols for the involvement of the RAPs in cultural heritage works conducted under the Aboriginal Heritage Management Plan (AHMP). This protocol should focus on members of the RAPS identified during this ACHA’s consultation process.
2.	A communications protocol that describes clear methods of communication, including expectations of suitable notification and response time, between the proponent and the RAPs.
3.	A protocol to allow for reasonable access to identified significant Aboriginal heritage sites associated with this Project (noting that access is also subject to the requirements of WaterNSW).
4.	Procedures to establish, maintain and update a current GIS database of Aboriginal heritage sites identified within the Subject Area (i.e. the Project Sites Database).
5.	A protocol for the determination of the final location of ancillary infrastructure, including systematic survey of the relevant area(s) (in consultation with the RAPs) if the area has not already been surveyed.
6.	A subsidence monitoring program to be implemented progressively over the life of the Project. The subsidence monitoring program should include monitoring of all Aboriginal cultural heritage sites located with Subject Area. The program should include (but not be limited to) the following: <ul style="list-style-type: none"> • A schedule for undertaking the subsidence monitoring at the nominated sites. • Appropriately detailed baseline and archival site recordings, including high resolution digital photographs. • An impact TARP specific to each of the sites being monitored.
7.	A protocol for the discovery and management of human remains, including stop work provisions and notification protocols.
8.	Procedures for the management and reporting of previously unknown Aboriginal heritage sites that may be identified during the life of the Project.
9.	Heritage awareness training to be incorporated into site inductions for employees and contractors who may be conducting works that have the potential to impact on any Aboriginal heritage sites. Consideration should be given to involving the RAPs in the development and presentation of cultural awareness training.
10.	A regular review process for the AHMP.
11.	AHIMS Site cards to be submitted for newly recorded sites.
12.	Copies of the final report should be made available to each RAP, DPIE and Heritage NSW.
13.	If the Project is approved, it is recommended IMC continue to undertake further engagement with Aboriginal stakeholders that may hold knowledge regarding cultural values in the Project area, including undertaking further interviews, conversations and ‘on Country’ engagement to further explore cultural values.

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Appendix A: Archaeological Report

Excellence in your environment



Appendix A: Archaeological Report Dendrobium Mine Extension Project

**Wollongong, Wingecarribee and Wollondilly Local Government Areas
Prepared for Illawarra Metallurgical Coal**

Prepared by Niche Environment and Heritage Pty Ltd | 15 February 2022



Document control

Project number	Client	Project Manager	LGA
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Executive summary

Illawarra Coal Holdings Pty Ltd (Illawarra Metallurgical Coal [IMC]), a wholly owned subsidiary of South32 Limited, is seeking an Infrastructure Approval for the Dendrobium Mine Extension Project (the Project), which would support the extraction of approximately 31 million tonnes of run-of-mine coal from Area 5, within Consolidated Coal Lease (CCL) 768. The life of the Project includes longwall mining in Area 5 up to approximately 31 December 2034, and ongoing use of existing surface facilities for handling of Area 3C RoM coal until 2041.

Extension of the underground mining operations would be supported by existing Dendrobium Mine infrastructure and the development of additional surface infrastructure proposed as part of the Project.

Niche Environment and Heritage Pty Ltd (Niche) was commissioned by Illawarra Metallurgical Coal (hereafter referred to as ‘the Proponent’), to prepare an Aboriginal Cultural Heritage Assessment (ACHA) and Archaeological Report.

This Archaeological Report (AR) presents the results of an archaeological assessment, including a survey program completed by Niche and representatives from 12 Registered Aboriginal Parties (RAPs), to inform the ACHA.

A targeted site survey was carried out (including representation by the RAPs) over eight (8) days to identify and attempt to relocate previously recorded Aboriginal cultural heritage sites within the Subject Area and along the proposed surface disturbance. Areas that were not previously surveyed were also targeted. A full list of previously identified and newly discovered sites are listed in Table 5. The survey program was undertaken between October and November 2021. A total of 63 ha was surveyed within the Survey Area. The survey sampled a range of landforms including open depressions and gullies, slopes, ridges and crests. The survey predominately sampled slopes that were gently inclined (41.6%), moderately inclined (35%) and very gently inclined (10.7%).

A total of 28 previously identified Aboriginal cultural heritage sites were located within the Subject Area, including 12 axe grinding groove sites, 15 rock shelters and one isolated find. An additional three new sites were identified as part of this assessment, comprising two shelters with art and a PAD and an axe grinding groove site. The grinding groove site comprises four axe grinding grooves. The first newly identified sandstone rock shelter features a single art panel with 11 charcoal tally marks. The second newly identified shelter features 15 charcoal indeterminates across two art panels, though the art is in a moderate to poor condition. All three of the newly identified sites have low scientific (archaeological) significance. Including the 28 sites previously recorded in the Aboriginal Heritage Information Management System (AHIMS), a total of 31 identified Aboriginal heritage sites occur within the Subject Area.

All Aboriginal heritage sites are regarded by the Aboriginal community to have high cultural significance (including those within the Project area and surrounding landscape). The Project is also seen as a further accumulation of impacts to Aboriginal cultural heritage that has previously been affected by the restricted access to the Metropolitan Special Areas and development of the catchment areas and mining within the region

Table 1 outlines the draft recommendations that have been made.

Table 1: Draft recommendations

Draft recommendations	
1.	Protocols for the involvement of the RAPs in cultural heritage works conducted under the Aboriginal Heritage Management Plan (AHMP). This protocol should focus on members of the RAPs identified during this ACHA's consultation process.
2.	A communications protocol that describes clear methods of communication, including expectations of suitable notification and response time, between the proponent and the RAPs.
3.	A protocol to allow for reasonable access to identified significant Aboriginal heritage sites (noting that access is also subject to the requirements of WaterNSW).
4.	Procedures to establish, maintain and update a current GIS database of Aboriginal heritage sites identified within the Subject Area (i.e., the Project Sites Database).
5.	A protocol for the determination of the final location of ancillary infrastructure, including systematic survey of the relevant area(s) (in consultation with the RAPs) if the area has not already been surveyed.
6.	A subsidence monitoring program to be implemented progressively over the life of the Project. The subsidence monitoring program should include monitoring of all Aboriginal sandstone shelter sites and grinding groove sites located within the angle of draw of the Project. The program should include (but not be limited to) the following: <ul style="list-style-type: none"> • A schedule for undertaking the subsidence monitoring at the nominated sites. • Appropriately detailed baseline and archival site recordings, including high resolution digital photographs. • An impact TARP specific to each of the sites being monitored.
7.	A protocol for the discovery and management of human remains, including stop work provisions and notification protocols.
8.	Procedures for the management and reporting of previously unknown Aboriginal heritage sites that may be identified during the life of the Project.
9.	Protocols for heritage awareness training to be incorporated into the mine site inductions for both employees and sub-contractors who may be conducting works that have the potential to impact on any Aboriginal heritage sites. Consideration should be given to involving the RAPs in the development and presentation of the cultural awareness training.
10.	A regular review process for the AHMP.
11.	AHIMS Site cards to be submitted for newly recorded sites.
12.	Copies of the final report should be made available to each RAP, the DP&E and the Heritage NSW.
13.	If the Project is approved, it is recommended IMC continue to undertake further engagement with any Aboriginal stakeholders that may hold knowledge regarding cultural values in the Project area, including undertaking further interviews, conversations and 'on Country' engagement to further explore cultural values.

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1 Introduction

1.1 Background and need for the project

The Dendrobium Mine is an existing underground coal mine located in the Southern Coalfield of NSW. Illawarra Coal Holdings Pty Ltd (Illawarra Metallurgical Coal [IMC]), a wholly owned subsidiary of South32 Limited (South 32), is seeking an Infrastructure Approval for the Dendrobium Mine Extension Project (the Project), which would support the extraction of approximately 31 million tonnes of run-of-mine (ROM) coal from Area 5, within Consolidated Coal Lease (CCL) 768. The life of the Project includes longwall mining in Area 5 up to approximately 31 December 2034, and ongoing use of existing surface facilities for handling of Area 3C ROM coal until 2041.

Extension of the underground mining operations would be supported by existing Dendrobium Mine infrastructure and the development of additional surface infrastructure proposed as part of the Project. These areas will be assessed in combination with the proposed underground mining as part of the Aboriginal Cultural Heritage Assessment.

Niche Environment and Heritage Pty Ltd (Niche) was commissioned by the Proponent to prepare an Aboriginal Cultural Heritage Assessment (ACHA) report and Archaeological Report (AR).

This Archaeological Report (AR) presents the results of an archaeological assessment, including a survey program completed by Niche and representatives of the Registered Aboriginal Parties (RAPs), to inform the ACHA. This report has been prepared in accordance with the following guidelines:

- *Aboriginal cultural heritage consultation requirements for proponents 2010 (ACHCRs)* (NSW Department of Environment, Climate Change and Water [DECCW] 2010a).
- *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW 2010b).
- *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW* (NSW Office of Environment and Heritage [OEH] 2011).
- Describe the aims of the project and the rationale for the archaeological assessment.
- Present a feasible and appropriate methodology for the archaeological survey and other investigations.
- Present the findings and interpretation of the results within a wider context of archaeological knowledge and Aboriginal history.
- Ensure that the findings and interpretation of the results support the assessment the archaeological significance of the Subject Area.

The Subject Area is comprised of two elements (Figure 2a and Figure 2b):

- Area 5 that includes a 600 m buffer around the longwalls (Figure 2a), (e.g., the area that could experience subsidence effects associated with mining of the Bulli Seam).
- Areas of indicative surface disturbance (Figure 2a and Figure 2b), including an electricity transmission line (ETL), proposed mine ventilation infrastructure, extensions to the Dendrobium Pit Top car park and other ancillary infrastructure).

The extent of the Subject Area includes the proposed Project activities and encompasses the relevant underground and surface infrastructure investigation areas. Full and detailed descriptions of the proposed activities within the Subject Area are presented in the Main Text of the Environmental Impact Statement (EIS).

This Archaeological Report assesses the potential impacts of the Project on Aboriginal objects and sites within the Subject Area. Based on the results of the field survey, this report will assess the significance of the Aboriginal objects and sites that may be harmed as part of the Project and will make recommendations to avoid and mitigate this potential harm.

Figures 3a to 5b provide an overview of known Aboriginal cultural heritage sites in the Subject Area and surrounds. The proposed development has the potential to harm Aboriginal objects and sites through subsidence induced impacts and through surface disturbance associated with the development of surface and ancillary infrastructure (as outlined in Section 7 of the ACHA). Section 13 will include an assessment of the potential harm and Section 14 outlines a range of management and mitigation measures that have been recommended to minimise this harm.

2 Investigator and Contributors

The contributors to this AR and their project roles are listed in Table 3 below.

This report was written by Renée Regal (Discipline Manager- NSW Heritage), Carly Todhunter (Heritage Consultant) and Stella Quast (Heritage Consultant) of Niche and reviewed by Renée Regal.

A total of 30 Registered Aboriginal Parties (RAPs) were consulted with and invited to provide advice on Aboriginal cultural heritage values during the assessment. They are identified in Table 2.

Table 2: Summary of Registered Aboriginal Parties for the Project

Registered Aboriginal Parties (registered during the registration period 18 August – 1 September 2021)		
Name	Name	Name
A1 Indigenous Services	Goobah Development PTY LTD (Murrin Clan/People)	South Coast People Native Title Claimants
Bellambi Indigenous Corporation Gandangara Traditional Owners	Gulaga	Tharawal Local Aboriginal Land Council
Biamanga (Murrin Clan/Peoples)	Gumaraa	Thoorga Nura
Butucarbin Aboriginal Corporation	Illawarra Local Aboriginal Land Council	Three Ducks Dreaming
Cubbitch Barta Native Title Claimants	Kamilaroi Yankuntjatjaka Working Group	Warra Bingi Nunda Gurri
Cullendulla (Murrin clan/Peoples)	Kawul Cultural Services	Woka Aboriginal Corporation
Didge Ngunawal Clan	Korewal Elouera Jerrungurah Tribal Elders Council	Wori Woilywa
Blaan Davies	Montaga	Woronora Plateau Gundungara Elders Council
James Davis	Murramarang (Murrin Clan/Peoples)	Wurrumay Consultants
Freeman and Marx	Peter Falk Consultancy	<i>Other unidentified party</i>

A number of individuals and organisations were involved in the development of the ACHA and AR. They are identified in Table 3.

Table 3: Contributors, affiliations, and contributions

Contributor	Affiliation	Contribution	Qualification	Years' experience
Renée Regal	Niche	Project Manager, Author and Reviewer	BA (Hons)	16
Carly Todhunter	Niche	Author	BA, BSc (Hons)	6
Rebecca Chalker	Niche	Survey participant	B App Sc	21
Stella Quast	Niche	Survey participant and author	Ba (Hons)	3
Samuel Ward	Niche	Survey participant	BA (Hons)	4
Neil Berry	Niche	GIS, Mapping	BSc (Hons)	7
Garry Brassington	South 32 IMC	Project Manager		
Chris McEvoy	South 32 IMC	Project Manager		
Carolyn Hickey	A1 Indigenous Services	RAP		
Kim Moran	Bellambi Indigenous Corporation Gandangara Traditional Owners	RAP		
Seli Storer	Biamanga (Murrin Clan/peoples)	RAP		

Contributor	Affiliation	Contribution	Qualification	Years' experience
Lowanna Gibson and Jennifer Beale	Butucarbin Aboriginal Corporation	RAP		
Glenda Chalker	Cubbitch Barta Native Title Claimants	RAP		
Corey Smith	Cullendulla (Murrin clan/peoples)	RAP		
Lilly Carroll and Paul Boyd	Didge Ngunawal Clan	RAP		
Blaan Davies	Blaan Davies	RAP		
James Davis	James Davis	RAP, participated in the field survey		
Clive Freeman	Freeman and Marx	RAP		
Basil Smith	Goobah Development PTY LTD (Murrin Clan/people)	RAP		
Wendy Smith	Gulaga	RAP		
Richard Campbell	Gumaraa	RAP		
Paul Knight	Illawarra Local Aboriginal Land Council	RAP		
Phillip Khan	Kamilaroi Yankuntjatjaka Working Group	RAP		
Kelly and Vicki Slater	Kawul Cultural Services	RAP		
George Villaflor,	Korewal Elouera Jerrungurah Tribal Elders Council	RAP		
Aileen Blackburn	Montaga	RAP		
Roxanne Smith	Murramarang (Murrin Clan/Peoples)	RAP		
Peter Falk and Duncan Falk	Peter Falk Consultancy	RAP		
Sandy Chalmers and Isobel Brinin	South Coast People Native Title Claimants	RAP		
Denise Ezzy and Leonie Mitchell	Tharawal Local Aboriginal Land Council	RAP		
John Carriage	Thoorga Nura	RAP, participated in the field survey		
Leonard Wright	Three Ducks Dreaming	RAP		
Nathanial Kennedy	Warra Bingi Nunda Gurri	RAP, participated in the field survey		
Steve Johnson	Woka Aboriginal Corporation	RAP		
Kayla Williamson and Paul Cummins	Woronora Plateau Gundungara Elders Council	RAP, participated in the field survey		
Kerrie Slater	Wurrumay Consultants	RAP		
Anonymous	Another organisation that doesn't wish to be identified	RAP		
Steven Hickey	A1 Indigenous Services	Survey participant		
Kirsty Lee Chalker	Cubbitch Barta Native Title Claimants	Survey participant		
Richard Dutton	Gulaga	Survey participant		
Tom Butler	Illawarra Local Aboriginal Land Council Warra Bingi Nunda Gurri	Survey participant		
Cory Currell	Kamilaroi Yankuntjatjaka Working Group	Survey participant		
Mark Pietruszewski	South Coast Native Title Claimants (through Woronora Plateau Gundangara) Woronora Plateau Gundangara Elders Council	Survey participant		

Contributor	Affiliation	Contribution	Qualification	Years' experience
John Carriage	Thoorga Nura	Survey participant		
Chantelle Davis	Wodi Wodi Traditional Owners	Survey participant		
James Davis	Wodi Wodi Traditional Owners	Survey participant		
Daniel Kennedy	Woronora Plateau Gundangara Elders Council	Survey participant		
Kayla Williamson	Woronora Plateau Gundangara Elders Council	Survey participant		
Paul Cummins	Woronora Plateau Gundangara Elders Council	Survey participant		
Anonymous	Another organisation that doesn't wish to be identified	Survey participant		
Anonymous	Another organisation that doesn't wish to be identified	Survey participant		

3 Description of development proposal

3.1 Project location

The Dendrobium Mine is located in the Southern Coalfield of NSW, approximately 8 km west of Wollongong. The Subject Area is within the Local Government Areas of Wollongong, Wingecarribee and Wollondilly. The Subject Area is located within the catchments of the Avon and Cordeaux Rivers, which are within the Metropolitan Special Area. Area 5 is located directly east of the Avon River, with an area of approximately 792 hectares (ha) directly above the longwalls and an area of approximately 1,980 ha for the Subject Area (e.g. 600 metres [m] buffer area potentially subject to subsidence effects associated with mining of the Bulli Seam). See Figure 1, Figure 2a and Figure 2b. for detailed mapping of the Subject Area.

3.2 Proposed activity

The Project would include the following activities:

- longwall mining of the Bulli Seam in a new underground mining area (Area 5);
- development of underground roadways from existing Dendrobium Mine underground areas (namely Area 3) to Area 5;
- use of existing Dendrobium Mine underground roadways and drifts for personnel and materials access, ventilation, dewatering and other ancillary activities related to Area 5;
- development of new surface infrastructure associated with mine ventilation and gas management and abatement, water management and other ancillary infrastructure;
- handling and processing of up to 5.2 Mtpa of ROM coal (no change from the approved Dendrobium Mine);
- extension of underground mining operations within Area 5 until approximately 2035;
- use of the existing Dendrobium Pit Top, Kemira Valley Coal Loading Facility, Dendrobium CPP and Dendrobium Shafts with minor upgrades and extensions until approximately 2041;
- transport of ROM coal from the Kemira Valley Coal Loading Facility to the Dendrobium CPP via the Kemira Valley Rail Line;
- handling and processing of coal from the Dendrobium Mine (including the Project) and IMC's Appin Mine (if required) to the Dendrobium CPP to 2041;
- delivery of coal from the Dendrobium CPP to Port Kembla for domestic use at the Port Kembla Steelworks and Liberty Primary Steel Whyalla Steelworks or export through the Port Kembla Coal Terminal (PKCT);
- transport of coal wash by road to customers for engineering purposes (e.g. civil construction fill) for other beneficial uses and/or for emplacement at the West Cliff Stage 3 and/or Stage 4 Coal Wash Emplacement;
- development and rehabilitation of the West Cliff Stage 3 Coal Wash Emplacement (noting that opportunities for beneficial use of coal wash would be maximised);
- continued use of the Cordeaux Pit Top for mining support activities such as exploration, environmental monitoring, survey, rehabilitation, administration and other ancillary activities;
- extension of the Pit Top carpark, including an access track from Cordeaux Road and a core shed;
- progressive development of sumps, pumps, pipelines, water storages and other water management infrastructure, including development of temporary water supply infrastructure for construction activities;
- development of an Electricity Transmission Line (ETL) laydown area that has been nominated near Cordeaux Dam in an area preferred for such a purpose by WaterNSW. This would involve no ground clearing and would utilise a previously cleared track and Picnic Area;
- controlled release of excess water in accordance with the conditions of Environmental Protection Licence (EPL) 3241 and/or beneficial use;

- monitoring, rehabilitation and remediation of subsidence and other mining effects; and
- other associated infrastructure, plant, equipment and activities.

In order to supply water for the construction of the vent shaft, three design options have been proposed, namely:

- The development of an underground pumping system and pipeline to supply recycled mine water from the Dendrobium Mine underground workings via existing boreholes. The pipeline and infrastructure required at the existing borehole site would be located within existing disturbance areas, where possible; or
- The development of a temporary pumping station at the Cordeaux River crossing and water supply pipeline along Fire Trail 6 (subject to agreement to purchase water from WaterNSW). The pipeline would be located along existing disturbed corridors, where possible; or
- The delivery of potable water via water truck to Ventilation Shaft Site No. 5A along Fire Trail 6.

For the first option mentioned above, the proposed pipeline route would be situated on a previous borehole track extending approximately one kilometre in length. The track is currently being rehabilitated and would require the use of machine to remove branches and logs from the track and to pull the poly pipe into position. The works would include the trampling of regrowth and the selective secondary clearing of vegetation at some locations to a width of 3m. The existing borehole site extends approximately 60m x 60m and has been utilised as the site of S2002.

The *Environmental Planning and Assessment Act 1979* (EP&A Act) and *Environmental Planning and Assessment Regulation 2021* (EP&A Regulation) generally set the framework for planning and environmental assessment in NSW. Approval for the Project will be sought under the State Significant Infrastructure (SSI) provisions (i.e., Division 5.2) under Part 5 of the EP&A Act.

As the Project has been declared to be SSI and may be carried out without obtaining Development Consent under Part 4 of the EP&A Act, the Project requires assessment and approval under Part 5, Division 5.2 of the EP&A Act. The NSW Minister for Planning is the approval authority for SSI developments (including the Project) under Part 5 of the EP&A Act.

In order to supply water for the construction of the ventilation shafts at Ventilation Shaft Site 5A a set of three design options have been proposed, namely:

1. The development of an underground pumping system and pipeline to supply recycled mine water from the Dendrobium Mine underground workings via existing boreholes. The pipeline and infrastructure required at the existing borehole site would be located within existing disturbance areas, where possible; or
2. The development of a temporary pumping station at the Cordeaux River crossing and water supply pipeline along Fire Trail 6 (subject to agreement to purchase water from WaterNSW). The pipeline would be located along existing disturbed corridors, where possible; or
3. The delivery of potable water via water truck to Ventilation Shaft Site 5A along Fire Trail 6.

The proposed pipeline route would be situated on a previous borehole track extending approximately 1 km in length. The track is currently being rehabilitated and would require the use of machine to remove branches and logs from the track and to pull the poly pipe into position. The works would include the trampling of regrowth and the selective secondary clearing of vegetation at some locations to a width of 3m. The existing borehole site extends approximately 60 m x 60 m and has been utilised as the site of S2002.

4 Previous archaeological work

4.1 Heritage registers

4.1.1 Aboriginal Heritage Information Management System (AHIMS)

An extensive search of the Aboriginal Heritage Information Management System (AHIMS) was carried out on the 4 June 2021 (AHIMS Client ID# 596365). Additional searches of AHIMS were undertaken on 26 August 2021 (AHIMS Client ID# 617300 and 617304). During these searches a total of 103 sites were identified. A summary of the site features represented by the registered Aboriginal cultural heritage identified as part of the AHIMS searches is provided in Table 4.

Table 4: Summary of AHIMS site features within the AHIMS search area

Site features	Total	Percentage
Artefact	6	6%
Grinding Groove	19	18%
Shelter with Art	54	52%
Shelter with Art and Deposit	1	1%
Shelter with Art and PAD	10	10%
Shelter with Deposit	6	6%
Shelter with PAD	7	7%
Total	103	100%

A total of 28 Aboriginal cultural heritage sites were identified within the Subject Area (Figure 3a and Figure 3b) There were no Aboriginal cultural heritage sites identified directly on the proposed surface disturbance of either the proposed ventilation shaft, the preferred borehole location or Dendrobium Pit Top carpark locations. The closest Aboriginal cultural heritage site within 200 m of the proposed ventilation shaft is Donald Castle Creek Site 30 (AHIMS ID# 52-2-1591) and is recorded as a Shelter with Art. No Aboriginal cultural heritage sites have been recorded within 1km of the proposed carpark extension. Of the 28 previously identified Aboriginal cultural heritage sites identified within the Subject Area, the most common site type is Shelter with Art (n=8) and Axe Grinding Groove (n=12). The least common site type is Isolated ind (1), Shelter with Art and Deposit (n=1) and Shelter with PAD (n=1).

The total list of Aboriginal cultural heritage sites including the 3 newly identified sites that were identified during the survey is provided in Table 5.

4.1.1.1 Assessment of robustness AHIMS data

It must be noted that care should be taken when using the AHIMS database to reach conclusions about site prevalence or distribution. The distribution of registered sites does not reflect patterns of occupation, but rather is often indicative of survey coverage and conditions. It should also be noted when reviewing Figure 3a that site AHIMS ID#52-2-4465 is registered on AHIMS with erroneous coordinates. When the newly identified sites are accessioned into AHIMS these coordinates will be corrected to be inline with where the site is located on Figures 3a, 4b and 5.

Table 5: Aboriginal cultural heritage sites within the Subject Area

Site Name	AHIMS ID#	Aboriginal Site Types	Site Description
Dendrobium ACHA AGG-1	52-2-4468	Axe Grinding Groove	Dendrobium ACHA AGG-1 is a single grinding groove located on a sandstone platform. The site was originally recorded in 2017 by Niche. The platform extends for 2 x 4 m and is located in a creek bed. The grinding groove measured 290 mm x 70 mm x 20 mm. The grinding groove was relocated in the present survey and was found to be in a good condition.
Dendrobium ACHA AGG-2	52-2-4467	Axe Grinding Groove	Dendrobium ACHA AGG-2 comprises 14 grooves on a sandstone platform. The site was originally recorded in 2017 by Niche. The platform on which the grinding grooves are situated is 5.7 x 12.5 m and is located in a creek bed. In the 2017 recording 13 grinding grooves were identified. In the most recent survey, all 13 grinding grooves could be relocated, and an additional grinding groove was recognised.
Dendrobium ACHA AGG-3	52-2-4466	Axe Grinding Groove	Dendrobium ACHA AGG-3 is a single grinding groove that is located on a sandstone platform. The site was originally recorded in 2017 by Niche. The platform on which the grinding grooves are situated is 2 m x 4 m and is situated in a creek bed. The grinding groove was relocated in the present survey. The groove measured 29 mm x 70 mm x 10 mm.
Dendrobium ACHA AGG-4	52-2-4465	Axe Grinding Groove	Dendrobium ACHA AGG-4 comprises 6 grinding grooves located on a sandstone platform. The platform on which the grinding grooves are situated is 8 m x 8 m and is located in a creek bed. The largest groove measured 320 mm x 100 mm x 25 mm. This site could not be relocated during the present field study.
Dendrobium ACHA AGG-5	AHIMS Pending	Axe Grinding Groove	Dendrobium ACHA AGG-5 comprises three grinding grooves located on a sandstone platform within a creek bed. The site was first recorded as part of this assessment on 25/10/2021. The grinding grooves are in good condition.
Donald Castle Creek Site 5	52-2-1566	Axe Grinding Groove	Donald Castle Creek Site 5 comprises 4 grooves on a sandstone platform. The site was originally recorded by the IPG on 22/5/1990. The platform on which the grinding grooves are situated is 12 m x 7 m and is located within a creek bed. The average groove size is 350 mm x 70 mm x 8 mm.
Donald Castle Creek Site 7	52-2-1568	Axe Grinding Groove	Donald Castle Creek Site 7 comprises 11 grinding grooves located on a sandstone platform. The site was originally recorded by Caryll Sefton and the IPG on 22/5/1990. Only 8 grinding grooves were identified in the original recording. The platform on which the grinding grooves are situated is 7 m x 8 m and is located within a creek bed. The grinding grooves are in good condition.
Donald Castle Creek Site 31	52-2-1592	Axe Grinding Groove	Donald Castle Creek Site 31 comprises 10 grinding grooves located on a sandstone platform. The site was originally recorded by Caryll Sefton and the IPS on 12/6/1990. The platform on which the grinding grooves are situated is 15 m x 3 m and is situated within the creek bed. The average groove size is 400 mm x 120 mm x 20 mm. In the original recording in 1990, 14 grinding grooves were identified. In the most present survey, 10 grinding grooves were relocated. The remainder could not be reidentified due to the presence of leaf litter at the site.
Ricki Lee 1	52-2-1729	Axe Grinding Groove	Ricki Lee 1 comprises 2 grinding grooves located on a sandstone platform. The site was originally recorded by the IPG on 15/5/1995. The platform on which the grinding grooves are situated is 4 m x 4 m and is located in the small flow on the site of the outcrop which is above a small waterfall.
Ricki Lee 2	52-2-1730	Axe Grinding Groove	Ricki Lee 2 comprises 51 grinding grooves located on a sandstone platform. The site was originally recorded by the IPG on 15/5/1995. The platform on which the grinding grooves are situated is 6 m x 4 m and is located within the creek bed on a small waterfall. Of the 20 grinding grooves originally recorded at the site, only 15 could be relocated by Niche in 2017. In the most recent field survey, a total of 51 grinding grooves and a grinding stone were identified at the site. The site has been reclassified as having a medium scientific significance due to the increased number of grinding grooves that have been identified at the site.

Site Name	AHIMS ID#	Aboriginal Site Types	Site Description
Upper Avon 42	52-2-1779	Axe Grinding Groove	Upper Avon 42 comprises seven grinding grooves located on a sandstone platform. The site was originally recorded by the IPG, though the date is unknown. The site could not be relocated by Niche in 2017, nor in the most recent field survey.
Upper Avon 44	52-2-1781	Axe Grinding Groove	Upper Avon 44 comprises 3 grinding grooves located on a sandstone platform. The site was originally recorded by the IPG on 15/5/1995. The platform on which the grinding grooves are situated is 7 m x 9 m and is located south of the creek.
Upper Avon 54	52-2-1758	Axe Grinding Groove	Upper Avon 54 comprises 2 grinding grooves located on a sandstone platform. The site was originally recorded by the IPG; however, the date is unknown. The platform on which the grinding grooves are located is 13 m x 4 m. At the time of recording, the grooves were identified as being located on a level outcrop in the water seepage area of a creek. The site could not be relocated by Niche in 2017. At the time, the survey participants explored the entire drainage line where the site is registered on AHIMS. It was therefore removed from the assessment in Niche's 2017 ACHA.
Avon Dam IF1	52-2-3204	Isolated Find	Avon Dam IF1 is a single isolated artefact that had been identified by Dominic Steele Consulting Archaeology on 11/1/2001. The artefact was a white quartzite core, measuring 25 mm x 20 mm x 30 mm. The core had several negative flake scars however it was identified as unlikely to have been in situ due to the location off Fire Road 6. During a site visit by Niche in 2017, the artefact could not be relocated. The extended length of time between its original identification in 2017 and the attempt to relocate it in 2017 likely exposed it to erosion and it was suggested to have been washed further down the track during a rain event. The site will be investigated on the final day of the field survey.
Donald Castle Creek Site 6	52-2-1567	Shelter with Art	Donald Castle Creek Site 6 is a sandstone rock shelter formed by cavernous weathering and block fall in antiquity. The site was originally recorded by the IPG on 5/6/1990. The rock shelter is a NE facing sandstone overhang with dimensions 7 m x 2.5 m x 4 m. The site was described in 1990 as containing a PAD. The deposit extended 45 cm in depth and contained a cream loamy and undisturbed deposit formed by weathering and slopewash. The deposit was reidentified in the present survey. The deposit is likely to have been partially eroded due to the steep ridgeline at the site. The rock shelter has a single panel with three indeterminate charcoal drawings on the back wall. The art is faded however was dry at the time of the field survey.
Donald Castle Creek Site 9	52-2-1570	Shelter with Art	Donald Castle Creek Site 9 is a sandstone rock shelter formed by block fall and cavernous weathering. The site was originally recorded by the IPG on 5/6/1990. The rock shelter is a NW facing sandstone overhang with dimensions 8 m x 3.7 m x 5 m. A small living area with dimensions 2 m x 1 m were identified in the 1990 survey, however no level area was present in front of the shelter. The site was identified in 1990 as containing a 5cm deep cream loamy sand deposit which is undisturbed and has formed from weathering. The deposit was reidentified in the present field study and did not contain any visible artefacts. The site was recorded in 1990 as containing 2 charcoal outline and infill indeterminates and 1 charcoal outline and infill small frontal human figure. The art was described in 1990 as being in fair to poor condition. As part of the present survey, two motifs could be located. They are located 1 m from the base of the shelter. Both are charcoal outlines with infill and depict frontal figures.

Site Name	AHIMS ID#	Aboriginal Site Types	Site Description
Donald Castle Creek Site 30	52-2-1591	Shelter with Art	<p>Donald Castle Creek Site 30 is a sandstone rock shelter formed by block fall and cavernous weathering. The site was originally recorded by the IPG on 22/5/1990. The shelter is a S facing sandstone overhang with dimensions 9 m x 4 m. There is little or no living area in the shelter, however there is a large level area situated 20 m below the site. The shelter was described in 1990 as containing a deposit approximately 50 cm in depth, consisting of a grey soil which has been undisturbed and formed from slope wash and weathering. Numerous artworks were identified in 1990, including (from left to right):</p> <ul style="list-style-type: none"> 1 charcoal outline and infill indeterminate 3 charcoal outline and infill indeterminate 1 charcoal outline and infill kangaroo 2 charcoal outline and infill figures 3 charcoal outline and infill birds (?) 1 charcoal outline and infill kangaroo 2 charcoal outline and infill indeterminate 1 frontal human figure with breasts, eyes and vulva in charcoal outline and infill, and 1 charcoal outline and infill indeterminate <p>The site was relocated during the present field survey and 10 motifs were identified across three panels. They included:</p> <ul style="list-style-type: none"> Panel 1: 1 charcoal indeterminate Panel 2: 1 macropod (likely wallaby), 2 charcoal indeterminates Panel 3: 1 charcoal outline with infill indeterminate, 1 marsupial, 1 macropod, 1 lyrebird, 1 indeterminate and 1 frontal female figure
Upper Avon 43	52-2-1780	Shelter with Art	<p>Upper Avon 43 is a sandstone rock shelter with art and deposit. The site was originally recorded by Sefton and the IPG, though the date is unknown. The rock shelter is formed from blockfall and cavernous weathering. In the 1990 recording of the site an undisturbed deposit of yellow-cream loamy sand was identified. The deposit was relocated as part of the current field survey. Numerous motifs were identified on the northern side and roof of the shelter in the 1990 recording. The art was described as being in a poor condition due to granular loss from the substrate and general weathering. Seven art panels were identified in the current field survey. Panel 1 had a single motif, Panel 2 had two motifs and Panel 3 had six motifs. More indeterminate charcoal art was identified than had been previously recorded but was in a poor condition. Salts/granular loss and, spalling/exfoliation and block fall were identified as present threats.</p>
Upper Avon 45	52-2-1782	Shelter with Art	<p>Upper Avon 45 is a sandstone rock shelter with art. The rock shelter extends 17 m x 4 m x 3.4 m and has two living areas (10 m x 2 m and 4 m x 1 m). Numerous motifs were identified in the shelter in the original recording by Sefton and the IPG, though the date is unknown. The art was described as being in a reasonable to poor condition. In the most recent survey, the art was in the same condition as previously described. A hammerstone/ grinding stone was found towards the NW side of the shelter. Four flakes were also discovered. They were from silcrete, quartz quartzite and petrified wood.</p>
Upper Avon 48	52-2-1753	Shelter with Art	<p>Upper Avon 48 is a sandstone rock shelter. The site was originally recorded by Sefton and IPG, though the date is unknown. The shelter extends 8 m x 4 m x 2 m with a living area extending 5 m x 3 m. A deposit of cream loamy sand was identified in the original recording and was described as being undisturbed. On the lower wall of the shelter one faint red hand stencil was identified in the original recording. Further to this, on the upper wall there were 2 charcoal indeterminates and 1 faint red ochre kangaroo. The site is in the same location and condition as previously documented.</p>

Site Name	AHIMS ID#	Aboriginal Site Types	Site Description
Upper Avon 50	52-2-1755	Shelter with Art	Upper Avon 50 could not be relocated during the present field study. Upper Avon 50 is a sandstone rock shelter formed by cavernous weathering and blockfall in antiquity. The site was originally recorded by Sefton and the IPG, though the date is unknown. The shelter extends 11 m x 3 m x 3 m and has a small living area 1 m x 2 m. A 50 cm deep deposit of cream sandy clay was identified at the shelter. Two charcoal outline and infill indeterminates were identified on the rear wall in the original recording.
Upper Avon 51	52-2-1756	Shelter with Art	Upper Avon 51 is a sandstone rock shelter formed by blockfall and cavernous weathering. The site was originally recorded by Sefton and the IPG, though the date is unknown. The shelter contains a deposit of yellow-cream loamy sandy extending approximately 30 cm deep and formed from shelter weathering. One charcoal outline and infill indeterminate was identified in the original recording on the underside of the sloping roof or backwall. The art is described as being in poor condition. The site is in the same location and condition as previously documented.
Upper Avon 46	52-2-1761	Shelter with Art and Deposit	Upper Avon 46 is a sandstone rock shelter. The site was originally identified by Sefton and the IPG, though the date is unknown. The site contains several outline and infill charcoal motifs and was highly faded in its original recording. The condition of the art was faded and in poor condition in the most recent survey.
Upper Avon 47	52-2-1752	Shelter with Art and PAD	Upper Avon 47 is a sandstone rock shelter formed by cavernous weathering and block fall in antiquity. The site was originally identified by the IPG on 15/5/1995. The rock shelter contains art on the back wall of the shelter. All art except the 'indeterminate' charcoal drawing originally described by Sefton were found in a 2017 survey by Niche to have weathered away, due to the overgrowth of microvegetals and the active chemical weathering at the site. Some of the red ochre figures on the roof are in excellent condition while others are faded due to pigment loss and some surface flaking the surface is generally not fresh and is weathered. The red wall drawings and charcoal drawings on the roof are generally in poor condition due to pigment loss. Deposit undisturbed.
Upper Avon 53	52-2-1747	Shelter with Art and PAD	Upper Avon 53 is a sandstone rock shelter formed by cavernous weathering and block fall in antiquity. The site was originally identified by the IPG on 15/5/1995. The art is located at the back wall of the shelter and comprises a worn red ochre hand stencil. The site is in the same location and condition as previously documented.
Upper Avon 55	52-2-1759	Shelter with Art and PAD	Upper Avon 55 is a sandstone rock shelter formed by cavernous weathering and block fall in antiquity. The site was originally identified by the IPG; however, the date was not specified. The art is located on the back wall of the shelter. All art except the 'indeterminate' charcoal drawing initially described by Sefton were found in a field survey by Niche in 2017 to have weathered away, due to the overgrowth of microvegetals and the active chemical weathering at the site. The art was in the same condition as described in 2017.
Dendrobium ACHA Shelter-3	AHIMS Pending	Shelter with Art and PAD	Dendrobium ACHA Shelter-3 is a sandstone rock shelter with art and PAD. The art comprises 11 tally marks in a single panel located approximately 75cm above the floor deposit. A sandy deposit of unknown depth was identified in the field survey.
Dendrobium ACHA Shelter-4	AHIMS Pending	Shelter with Art and PAD	Dendrobium ACHA Shelter-4 comprises a sandstone shelter formed through block fall and cavernous weathering. Two panels of art with a total of 15 motifs were identified. A deposit of pale yellow-brown loamy sand extending to a maximum depth of 40cm was identified. The art is in a moderate to poor condition.
Upper Avon 49	52-2-1754	Shelter with Deposit	Upper Avon 49 is a sandstone rock shelter formed by blockfall and cavernous weathering. The site was originally recorded by Sefton and IPG, though the date is unknown. The shelter extends 14 m x 4 m x 3 m with a living area extending 3 m x 3 m. A 40 cm deep deposit of cream loamy sand formed from shelter weathering was identified in the original recording. Three quartz bipolar flakes were identified in this survey, situated on the dripline. The site is in the same location and condition as previously documented.

Site Name	AHIMS ID#	Aboriginal Site Types	Site Description
Upper Avon 52	52-2-1757	Shelter with Deposit	Upper Avon 52 is a sandstone rock shelter with no visible art. It was originally recorded by the IPG on 15/5/1989. As part of the original listing, the site was identified as containing 6 artefacts which were left on the stone shelf. As part of the current field study several artefacts were identified. They include 3 quartz cores, 40 quartz flakes, 1 petrified wood flake, 2 red silcrete flakes and 9 other flakes (fine-grained, likely chert).
M2D PAD2	52-2-3955	Shelter with PAD	M2D PAD2 is a sandstone rock shelter formed by cavernous weathering and block fall in antiquity. The site was originally identified by the Navin Officer Heritage Consultants on 15/1/2013. Originally the site was registered on AHIMS as containing only a PAD. During a site survey in 2017 by Niche, several art motifs were identified. The art is located on the back wall of the shelter and were identified at the time as being highly weathered.

Source: AHIMS – Aboriginal Heritage Information Management System.

4.1.2 Other registers

Searches of the Australian World Heritage Database, the Commonwealth Heritage List, National Heritage List, State Heritage Register, State Heritage Inventory, the *Wollongong Local Environmental Plan (2009)*, *Wingecarribee Local Environmental Plan (2010)* and the *Wollondilly Local Environmental Plan (2011)* were conducted in September 2021.

The searches of the Australian World Heritage Database, the Commonwealth Heritage List, National Heritage List, State Heritage Register and State Heritage Inventory concluded that there are two (2) recorded historical or Aboriginal heritage items in close proximity to the Subject Area (Table 6). These have been assessed as part of the Historic Heritage Assessment (Appendix G of the EIS).

Table 6: Listed heritage items in proximity to the Subject Area

Heritage Register	Items in the Subject Area
Australian World Heritage Database	Nil
Commonwealth Heritage List	Nil
National Heritage List	Nil
State Heritage Register	Yes- 2 listings Avon Dam Cordeaux Dam
State Heritage Inventory	Yes- 2 listings Avon Dam Cordeaux Dam
Local Environmental Plans	Yes – 7 listings

The seven local heritage listings that were identified as part of the search are identified in Table 7, however, there are no local heritage listings relevant to Aboriginal cultural heritage values and therefore these have been assessed as part of the Historic Heritage Assessment for the EIS.

Table 7: Heritage Sites in Proximity to Subject Area

Item Name (Item number)	Item Type	Item Address	Approximate Distance from Project Area
Avon Dam (I224)	Item General	Avon Dam Road, Avon Dam, NSW	Partially located within Area 5.
Cordeaux Dam (I56)	Item General	Cordeaux River, Cordeaux, NSW	Surface Infrastructure located within this curtilage.
Nebo Colliery (7104)	Archaeological Site	Lot 1, DP 1103781 and Lot 3, DP 1103666	The Dendrobium Pit Top is wholly located within this item
Site of Pioneer Kerosene Works (6411)	Archaeological Site	Part Lot 4, DP 751278 Between American Creek and Cordeaux Road	Dendrobium Pit Top is partially located within this item
Former St Clement's Roman Catholic Church (5944)	Item General	Lot 1, DP 230082 356 Cordeaux Road	Approximately 150m east of the Dendrobium Pit Top
Former post office (5946)	Item General	Part Lot 160, DP 751278 Harry Graham Drive	Approximately 100 m west of the Dendrobium Pit Top

Item Name (Item number)	Item Type	Item Address	Approximate Distance from Project Area
Mine manager's residence (5947)	Item General	Part Lot 74, DP 751278	Approximately 100 m north of the Dendrobium Pit Top
Kembla Heights Mining Village	Heritage Conservation Area – General	–	The Dendrobium Pit Top area is partially located within the Heritage Conservation Area
Illawarra Escarpment Landscape Area	Heritage Conservation Area – Landscape	–	Approximately 300 m west of the Dendrobium Pit Top area

Part of the proposed scope of works includes the development of an ETL laydown area (as described in Section 3.2) which will be located in an area preferred for such a purpose by WaterNSW. The laydown area will nonetheless be located within the Cordeaux Heritage curtilage. The site has previously been used as a Picnic Area and also the location of a Construction Carpark for Vent Shaft Site 2 and 3, with no long-term impacts on the heritage item. Previous heritage and archaeological assessments

4.1.3 Previous assessments in the Subject Area

The majority of the Subject Area has been assessed as part of the previous application for the *Dendrobium Mine - Plan for the Future: Coal for Steelmaking* which was completed by Niche Environment and Heritage in 2019. The previous survey covered approximately 279 ha of the landscape, including areas within the current Subject Area. The *Dendrobium Mine - Plan for the Future: Coal for Steelmaking Aboriginal Cultural Heritage Assessment* (Niche 2019) resulted in identification of a number of Aboriginal cultural heritage sites.

The majority of the archaeological assessments that have been undertaken within close proximity to the Subject Area are the result of environmental impact assessments for proposed mining activities within the Southern Coalfield. A summary of these assessments is provided in Table 8.

Table 8: Previous archaeological assessments within close proximity to the Subject Area

Assessment and date	Summary of findings
Sefton 1998a	<p>Sefton completed a post graduate thesis that focused on the artefact and Aboriginal archaeological site patterns of the Woronora Plateau. The data used for this assessment had been collected by the Illawarra Prehistory Group between 1970 and 1998.</p> <p>The associations considered by Sefton included the relationship between sites, the material evidence remaining and their location within the landscape. This assessment focussed on sandstone overhangs, axe grinding grooves and rock engravings.</p> <p>During her assessment, Sefton argues that site density within the plateau area can be used to indicate the spatial distribution or density of the Aboriginal population within the study area using multivariate analysis (Sefton 1998a: 62).</p> <p>In analysing the shelter sites with their attributes, clear patterns form between shelters, their attributes and the drainage basins of the Woronora Plateau and the inland/coastal associations of the shelter sites (Sefton 1998a:166). According to Sefton these changes indicate a difference in settlement patterns across the plateau.</p>
Sefton 1990	<p>An assessment of the Cordeaux and Woronora River was completed with a grant received from the Australian Institute of Aboriginal and Torres Strait Islander Studies. A total of 89 archaeological sites were identified during this assessment. Sefton provided useful statistical data about the site types and art techniques.</p>
Sefton 1994	<p>Sefton received a further grant from the Australian Institute of Aboriginal and Torres Strait Islander Studies to complete an assessment of the Avon River. The surveys focused on sandstone outcrops and formed a model of site types that would be present within the Subject Area, which is of the same topography as the current Subject Area. Site types that were highlighted were stone arrangements, grinding grooves, groove channels and rock engravings, overhangs with art and/or deposit, grinding grooves.</p> <p>During this assessment 53 sandstone shelter sites, 13 grinding groove sites, two stone arrangements and one engraved channel were assessed.</p>
Sefton 2000	<p>Sefton completed an overview of the monitoring of sandstone overhangs for the effects of mining subsidence for Illawarra Coal. The purpose of this assessment was to develop a monitoring program to gauge the effects of subsidence on sandstone overhangs and to relate these effects to the following parameters:</p> <ul style="list-style-type: none"> Topographic location Overhang shape and size and overhang formation process The presence of jointing in bedding planes Mining subsidence Comprehensive and tensile strains and tilts Overhang location relative to longwalls and geological anomalies <p>This assessment has been used as a template for Aboriginal archaeological site monitoring programs within the Southern Coalfield and the principles outlined for site recording will be used during this assessment.</p>
Navin Officer Heritage Consultants 2000	<p>Navin Officer conducted a cultural heritage assessment for the Dendrobium Coal Project within Area 1. Large trees were assessed for scarring and ridgelines and open sandstone platforms were surveyed. During this assessment 19 AHIMS sites were assessed, and 11 previously unrecorded sites were identified. The sites comprised of sandstone shelters with art and/or deposit and PAD, open artefact scatter sites, and a stone arrangement.</p>
Niche Environment and Heritage 2019	<p>Niche Environment and Heritage were commissioned to complete the Dendrobium Mine - Plan for the Future: Coal for Steelmaking Project which included the current Subject Area and a proposed additional Area referred to as Area 6. A total of 58 Aboriginal heritage sites were identified within the Subject Area, including six newly recorded sites and 52 previously recorded sites. Consultation was completed with 17 Registered Aboriginal Parties for this assessment.</p>

4.1.4 Local and regional assessments

A number of archaeological models for the distribution of material evidence of Aboriginal use of the landscape have been developed for the region. The purpose of archaeological models is to assist in the prediction of what Aboriginal cultural heritage sites may be present in the landscape and where they might be located.

The local archaeological studies fit more broadly into the wider Woronora Plateau area, which encompasses the entire Subject Area. The antiquity of Aboriginal occupation in the region is demonstrated through a number of archaeological excavations that have been undertaken in the region surrounding the Subject Area. The oldest recorded date for Aboriginal occupation of the plateau is 2,200 +/- 70 BP at Mill Creek 11 (Sefton 1998a), this early date may be attributable to the archaeological site preservation, as opposed to evidence of Aboriginal occupation in the area in antiquity.

Generally, Aboriginal sandstone shelters' occupation levels within the greater Sydney region date to between 3,000 and 5,000 years of age. Dibden (2003) attributes the apparent increase in population within the region to the sea level stabilisation after the last ice age at approximately 5,000 years ago.

A number of archaeological studies have been undertaken within the Subject Area and surrounds. The details of these archaeological assessments and surveys are outlined in Table 9.

Table 9: Summary of past Aboriginal archaeological assessments and surveys undertaken within the Subject Area and surrounds

Assessment and date	Summary of findings
Sefton 1990 1989-1990 <i>Archaeological Survey of the Cordeaux River by the Illawarra Prehistory Group</i>	An assessment of the Cordeaux and Woronora River was completed with a grant received from the Australian Institute of Aboriginal and Torres Strait Islander Studies. A total of 89 archaeological sites were identified during this assessment. Sefton provided useful statistical data about the site types and art techniques.
McDonald 1994 <i>Dreamtime Superhighway: An analysis of Sydney Basin Rock Art and Prehistoric Information Exchange</i>	Jo McDonald completed a PhD thesis on the prehistoric rock art within the Sydney region. This thesis highlighted that shelter sites with art have greater visibility to a broader section of the community and had the potential to function in a different fashion to the engraved art of the region, which is not associated with habitation debris (McDonald 1994: 124). The thesis highlights the motif types present within the region and observes that within inland areas land animals make up a high percentage of motifs used. In conclusion, McDonald demonstrates that there are also a number of major variations in art techniques and motif type between the southern areas of the Woronora Plateau and the eastern and northern areas of the Sydney basin.
Sefton 1994 1993-1994 <i>Archaeological Survey of the Avon River by the Illawarra Prehistory Group</i>	Sefton received a further grant from the Australian Institute of Aboriginal and Torres Strait Islander Studies to complete an assessment of the Avon River. The surveys focused on sandstone outcrops and formed a model of site types that would be present within the Subject Area, which is of the same typography as the current Subject Area. Site types that were highlighted were stone arrangements, grinding grooves, groove channels and rock engravings, overhangs with art and/or deposit, grinding grooves. During this assessment 53 sandstone shelter sites, 13 grinding groove sites, two stone arrangements and one engraved channel were assessed.

Assessment and date	Summary of findings
<p>Sefton 1998a <i>Site and Artefact Patterns on the Woronora Plateau</i></p>	<p>Sefton completed a post graduate thesis that focused on the artefact and Aboriginal archaeological site patterns of the Woronora Plateau. The data used for this assessment had been collected by the IPHG between 1970 and 1998.</p> <p>The associations considered by Sefton included the relationship between sites, the material evidence remaining and their location within the landscape. This assessment focussed on sandstone overhangs, axe grinding grooves and rock engravings.</p> <p>During her assessment, Sefton argues that site density within the plateau area can be used to indicate the spatial distribution or density of the Aboriginal population within the study area using multivariate analysis (Sefton 1998a: 62).</p> <p>In analysing the shelter sites with their attributes, clear patterns form between shelters, their attributes and the drainage basins of the Woronora Plateau and the inland/coastal associations of the shelter sites (Sefton 1998a:166). According to Sefton these changes indicate a difference in settlement patterns across the plateau.</p>
<p>Navin Officer 2000 <i>Dendrobium Coal Project: Cultural Heritage Assessment</i></p>	<p>In 2000 Navin Officer completed a cultural heritage assessment for the Dendrobium Coal Project, which included Longwalls 1 to 3 within Dendrobium Area 1; which is to the southeast of the current Subject Area. The survey sample for this assessment was confined to areas that were proposed to have impacts associated with them. Similar to this current assessment sites that were registered on AHIMS were reassessed; Large trees were assessed for scarring and ridgelines and open sandstone platforms were surveyed. During this assessment 19 AHIMS accessioned sites were assessed, and 11 previously unrecorded sites were identified. These site types comprised of sandstone shelters with art and/or deposit and PAD, open artefact scatter sites, and a stone arrangement.</p>
<p>Sefton 2000 <i>Overview of the monitoring of sandstone overhangs for the effects of mining subsidence in the Illawarra Coal Measures</i></p>	<p>Sefton completed an overview of the monitoring of sandstone overhangs for the effects of mining subsidence for Illawarra Coal. The purpose of this assessment was to develop a monitoring program to gauge the effects of subsidence on sandstone overhangs and to relate these effects to the following parameters:</p> <ul style="list-style-type: none"> ▪ Topographic location ▪ Overhang shape and size and overhang formation process ▪ The presence of jointing in bedding planes ▪ Mining subsidence ▪ Comprehensive and tensile strains and tilts ▪ Overhang location relative to longwalls and geological anomalies <p>This assessment has been used as a template for Aboriginal archaeological site monitoring programs within the Southern Coalfield and the principles outlined for site recording will be used during this assessment.</p>
<p>Sefton 2002 <i>Archaeological Survey of longwall 9 and 10 Application Elouera Colliery</i></p>	<p>Sefton was commissioned to complete an assessment of previously identified sites for Illawarra Coal and to provide management strategies and comment on their archaeological significance.</p>
<p>Biosis Research 2004 <i>Dendrobium Area 3 Lake Cordeaux foreshore seismic testing REF: Archaeological survey</i></p>	<p>Dendrobium Area 3 and Lake Cordeaux foreshore seismic testing REF: Archaeological survey</p>
<p>Biosis Research 2007b <i>West Cliff colliery Stage 3 Coal Wash Emplacement Archaeological and Cultural Heritage Assessment</i></p>	<p>This assessment was completed in 2004 as part of the proposed Stage 3 West Cliff Colliery Coal Wash Emplacement works. This assessment was used to assist with the development of the predictive modelling and survey methodology for the current project as the Subject Area was also located within the WaterNSW catchment area.</p>

Assessment and date	Summary of findings
Biosis Research 2007a	<p>In 2007 Biosis Research was commissioned by BHP Billiton to complete an assessment of Dendrobium Area 3 for Aboriginal and European Heritage. The Subject Area for this assessment is located to the south-east of Dendrobium Area 5. During this assessment a total of 65 Aboriginal cultural heritage sites were identified. Of these 65, 14 were located within Dendrobium Area 3A, 24 were located within Dendrobium Area 3B and 18 were located within Dendrobium Area 3C. Similar to Navin Officer 2000 and the current study the site types identified comprised of sandstone shelters with art and/or deposit, deposit, Isolated artefacts, axe grinding grooves and a suspected stone arrangement.</p> <p>As a result of this assessment, it was recommended that an Aboriginal Heritage Impact Permit be applied for a number of the Aboriginal cultural heritage sites.</p>
Biosis Research 2009a <i>Bulli Seam Operations Aboriginal Cultural Heritage Assessment</i>	<p>Biosis Research Pty Ltd was commissioned by Illawarra Coal to conduct an Aboriginal Cultural Heritage Assessment for the proposed Bulli Seam Operations Project. During this assessment a total of 646 previously recorded and 45 newly identified sites were identified. The survey methodology for this assessment included targeted survey of previously recorded AHIMS sites and associated ridgelines. This assessment is of a similar to the scope as the current assessment and has been used to assist with developing the current predictive model and survey methodology.</p>
Niche Environment and Heritage 2012	<p>Dendrobium Area 3 Archaeological Assessment supporting the Dendrobium Area 3 Subsidence Management Plan (SMP).</p>
Niche Environment and Heritage 2009-2021	<p>Dendrobium Exploration Review of Environmental Factors (REF): Aboriginal Cultural Heritage Due Diligence Assessments. On behalf of Illawarra Coal Niche has completed five exploration REFs. These exploration works comprise of seismic line and exploration borehole works. These assessments have been carried out within Dendrobium Areas 3B, 3C, 3D, 4 and 5. The assessment for these works included assessing all ridgelines and creek beds within close proximity to the proposed works and relocating works within 100 m of AHIMS registered Aboriginal sites. During these investigations there have been no previously unregistered AHIMS sites located.</p>

These assessments have been considered in formulating the survey predictions that are outlined in Section 7 of this report.

5 Landscape context

Understanding the past and present environmental contexts of a Subject Area is requisite in any Aboriginal archaeological and cultural heritage investigation (DECCW 2010a). The landscape context may provide insight as to areas of land that may have been more intensively used by Aboriginal people in the past due to the presence of resources such as water, stone, plants and animals and other raw materials or landscape features associated with sustenance, shelter, tool manufacture and cultural activities. Furthermore, the landscape provides the context within which the material remains of past Aboriginal occupation may be preserved and detectable due to the movement of soil through geomorphic processes such as erosion or its removal from the landscape through past land use and disturbance (DECCW 2010a: 8). By considering these factors, an Aboriginal cultural heritage investigation may develop a sampling strategy for identifying any tangible Aboriginal heritage values within the Subject Area. It allows for an understanding of what activities would likely have taken place across the Subject Area in the past and the likelihood that any trace of these would have survived below the surface. The following section provides details of the environmental characteristics of the Subject Area. Plates 1 – 4 depict typical vegetation and ground exposure for the Subject Area.

The Subject Area has experienced little change since colonisation. The sandstone landscape and sterile soils deterred settlers from colonising the area. During the late 1800's the land was gazetted as part of the Sydney Water Metropolitan Catchment Area which has restricted public access and has led to the damming of Avon, Cataract, Cordeaux, Nepean waterbodies. The consequences from damming and restricted access to Aboriginal people undertaking traditional burning practices has likely altered streamflow and vegetational communities within the Subject Area (Dibden 2019: 31).

Despite the landscape changes the Subject Area may have faced since colonisation, the restricted access of this area has led to the preservation of its native biodiversity and Aboriginal cultural heritage.

5.1 Geology and geomorphology

Broadly the Subject Area is located on the southern Woronora Plateau within the Cordeaux and Avon Reservoir catchment areas (Figure 1 and Figure 2). The Project is located within the southern portion of the Permo-Triassic Sydney Basin. The terrain of the Subject Area is characterised by Middle Triassic Hawkesbury Sandstone, which is comprised of overlapping beds of quartz-rich sandstone. Under the sandstone formations the substrates comprise of deep Permian Coal Measures that consist of shale sandstone, conglomerates, tuff, chert and coal (Branagan and Packhan 2000). These formations are divided into colluvial and residual landscapes.

5.2 Colluvial Soil Landscapes

In colluvial landscapes the dominant form of landscape formation is mass movement (rock fall) hazard with steep sloped, rock outcrops with shallow stony high permeable soil (Hazelton and Tille 1990:45). There are two colluvial soil landscapes within the Subject Area; the Hawkesbury soil landscape and the Illawarra Escarpment soil landscape.

The Hawkesbury sandstone soil landscape ranges from rolling and rugged hills to very steep sandstone escarpment and ridges. Within this landscape sandstone outcrops are very common and often occur as horizontal benches and broken scarps up to 10 m high. Rock outcrops and surface boulders and cobbles make up to half of the ground surface (Hazelton and Tille 1990:45-46). This outcropping is evident around Wongawilli Creek and Cordeaux Reservoir. The soils comprise of shallow sandy lenses; up to 30 cm deep. The topsoil of colluvial landscapes has low erodibility, consisting of permeable, loose, coarse sands and organic matter. The Hawkesbury soil landscape is highly susceptible to concentrated flow erosion. This landscape is the most archaeologically sensitive within the Subject Area, as the blocks and weathered scarps provide suitable overhangs to be used for shelter. Within these overhangs there is often suitable surfaces for Art, as well as floor space for the accumulation of archaeological deposit. There is, however, limited space for a deep accumulation of stratified subsurface deposits due to the size of many of the overhangs, as evidenced by the number of shelter sites recorded. The distribution of Aboriginal cultural heritage sites within the Subject Area is associated with landforms suitable for overhangs for shelter and art surfaces.

The vegetation within this landscape is mostly uncleared woodland and open forest with some areas of tall open forest, and rainforest within the sheltered gullies. On the open crests and ridges, woodland and open forest contains red bloodwood, narrow leaved stringy bark, snappy gum, hard-leaved scribbly-gum, blue mountains mallee ash and old man banksia. Sheltered side slopes of the landscape are characterised by open-forest containing silver top ash, Sydney peppermint, smooth-barked apple and black she-oak with an understorey of Epacridaceae, Myrtaceae, Fabaceae and Proteaceae (Hazelton and Tille 1990: 46).

The Illawarra Escarpment soil landscape comprises of debris mantle covering the upper slopes and benches on steep to very steep slopes. Large landslips are very common as well as large surface and subsurface boulders, and streamlines are unidirectional (Hazelton and Tille 1990:58). The dominant soils are dark sandy clays. The topsoil of colluvial landscapes has low erodibility, consisting of permeable, loose, coarse sands and organic matter. The Illawarra Escarpment soil landscape is also highly susceptible to concentrated flow erosion, in addition to mass movement such as major slumping and landslips. The blocks and weathered scarps of this landscape provide suitable overhangs to be used for shelter. Within these overhangs there is often suitable surfaces for art, as well as floor space for the accumulation of archaeological deposit. Similar to the Hawkesbury soil landscape there is limited space for a deep accumulation of stratified subsurface deposits due to the size of the majority of the overhangs, as evidenced by the number of shelter sites previously recorded within the Subject Area.

The vegetation within this landscape is mostly uncleared tall open forest and rainforest. Tall open forest is dominated by blackbutt and includes lilly pilly, sandpaper fig, moreton bay fig, small-leaved fig, port jackson fig, deciduous fig, coachwood and red cedar. Rainforest of the escarpment includes grey myrtle, brush bloodwood, whitewood and cabbage tree palm (Hazelton and Tille 1990, 58-59).

5.3 Residual Soil Landscapes

The dominant geomorphic process in residual soil landscapes is the *in-situ* weathering of parent rock and soil material. The landscape comprises of shallow, highly permeable soils, with isolated rock outcrops (Hazelton and Tille 1990: 20). Two residual landscapes occur within the Subject Area, the Lucas Heights and Volcanic soil landscapes.

The Lucas Heights soil landscape consists of gently undulating crests, ridges and plateaus of the Mittagong Formation, that alternates between bands of shale and fine-grained sandstones, rock outcrop is absent within this landscape, with slopes of less than 10%. Unlike the aforementioned Hawkesbury Landscape, the soil of this landscape comprises of moderately deep hard setting yellow soils on ridge and plateau surfaces (Hazelton and Tille 1990: 23). There is some archaeological potential associated with this landscape, however the site types found within it often comprise of isolated artefacts rather than large open camp sites with multiple stone artefacts present.

The vegetation within this landscape is eucalypt low open-forest and eucalypt low woodland with a shrub understorey. The most dominant tree species include turpentine, smooth-barked apple, red bloodwood, silvertop ash, scribbly gum and Sydney peppermint (Hazelton and Tille 1990: 23).

The Volcanic landscape is an associated soil landscape of the Hawkesbury formation and makes up less than 5% of the Subject Area landform. It consists of gently undulating valley floors surrounded by steep colluvial side slopes formed on volcanic intrusions within the Hawkesbury Sandstone and Wianamatta Group Shales. The soils are moderately reactive subsoils with low wet bearing strength; erosion and mass movement hazards on steep slopes (Hazelton and Tille 1990:143).

Due to its high erodibility and hard setting tendencies this soil landscape has limited archaeological potential.

This landscape is difficult to distinguish from the Hawkesbury Landscape with its vegetation comprising of tall open forest on the side slopes with Sydney blue gum, cabbage gum, deans gum, scattered Australian red cedar, turpentine and burrawang being the dominate species. The understorey comprises of ferns and bracken (Hazelton and Tille 1990: 144).

A summary of the soil landscapes present within the Subject Area is provided in Table 10.

Table 10: Summary of soil landscapes within the Subject Area

Land System	Landforms and Soils	Vegetation
Hawkesbury	<p>This land system is generally associated with rugged, rolling to very steep hills on Hawkesbury Sandstone. The land is characterised by slopes of <25%. Valleys are narrow (20-100m) and incised. Rock outcrops are common and surface boulders and cobbles can cover up to 50% of the ground surface.</p> <p>Geomorphologically this landform is characterised by medium- to coarse- grained quartz sandstone with minor shale and laminate lenses.</p> <p>Soils include shallow lithosols/siliceous sands associated with rock outcrop, earthy sands, yellow earths and locally deep sands on inside of benches and along joints and fractures, localised Yellow Podzolic Soils and Red Podzolic Soils, and siliceous sands on narrow valley flats.</p>	<p>Vegetation commonly identified within this landscape includes uncleared eucalypt woodland, open-forest (dry sclerophyll forest) and tall open forest (wet sclerophyll forest). Occasional closed forest (rainforest) are present in sheltered gullies.</p> <p>On exposed crests and ridges, woodland and open-forest contain red bloodwood, narrow-leaved stringybark, snappy gum, hard-leaved scribbly gum, blue mountains mallee ash and old man banksia. In more sheltered areas on side-slopes, open-forest (dry sclerophyll forest) containing silvertop ash, Sydney peppermint, smooth-barked apple and black she-oak dominates.</p>

Land System	Landforms and Soils	Vegetation
Lucas Heights	<p>This land system is generally associated with residual soils. The landscapes tend to be characterised by gently undulating crests, ridges and plateau surfaces of the Mittagong Formation. The land is characterised by gently undulating plateau surfaces and ridges, with level to gently inclined slope gradients (<10%). Geomorphologically this landform is characterised by inter-bedded shale, laminate and fine- to medium-grained quartz sandstone. The Mittagong Formation is typically quite shallow. Minor areas of Hawkesbury Sandstone and Ashfield Shale emerge sporadically within this landscape. Localised laterite outcrops also occur.</p> <p>Soils are moderately deep (50-150cm) and include hard setting Yellow Podzolic Soils, yellow Soloths on ridges and plateau surfaces, Lateritic Podzolic Soils on ridges, plateau surfaces and crests, yellow earths on shoulders of plateau and ridges and earthy sands on valley flats.</p>	<p>Vegetation commonly identified within this landscape includes low open-forest and eucalypt low woodland with sclerophyllous shrub understorey. Dominant tree species include turpentine smooth-barked apple red bloodwood, silvertop ash, snappy gum and Sydney peppermint.</p>
Volcanic	<p>This land system is generally associated with residual soils. The landscapes tend to be gently inclined valley floors which are surrounded by steep colluvial side slopes formed on volcanic intrusions within the Hawkesbury Sandstone and Wianamatta Group shales. Where diatremes are surrounded by Hawkesbury Sandstone, volcanic topography is distinguished from the gently inclined valley floors by steep, colluvial sideslips. Slope gradients range from 5-60%. Where diatremes are surrounded by shales, the topography can be hard to distinguish from surrounding landforms. They are gently inclined plateau surfaces with slopes of 10%.</p>	<p>Vegetation commonly identified within this landscape includes Sydney blue gum, cabbage gum, deanes gum, scattered Australian red cedar, scattered rough-barked apple, cabbage palm, turpentine, burrawang.</p>



Plate 1: Typical vegetation cover for the Hawkesbury colluvial soil landscape.



Plate 2: Typical vegetation cover for the Hawkesbury colluvial soil landscape.



Plate 3: Exposed sandstone platform near to LA13F; facing north-west.



Plate 4: Typical sandstone ridgeline within the Subject Area, close to Avon Dam. The vegetation here had experienced recent backburning.

5.4 Disturbance and Modification

The above soil landscapes have been subject to limited impacts over time, due to the area being used as water catchment and therefore excluded from development. Land use impacts include:

- creation of the Avon and Cordeaux Dams;
- installation of services (powerlines, pipes, roads, railway corridor); and
- exploration drilling and seismic activities.

Each of the above land uses and activities impacts the preservation and visibility of the archaeological record within the Subject Area. The majority of the Subject Area has been subject to very limited modification and disturbance. The construction of fire trails throughout the Subject Area have been one form of surface disturbance that has taken place (see Plates 5 and 6).



Plate 5: Fire Trail located within the Subject Area.



Plate 6: Fire Trail 6, which extends through the southeast part of the Subject Area.

5.5 Summary

The Subject Area consists of rugged sandstone ridgelines and escarpments, with moderate to steep slopes and narrow incised valleys around the Avon and Cordeaux Rivers, that have had limited disturbance or modification due to the area being used as a water catchment. This landscape is most likely to contain sandstone overhangs that were used for shelter and for art. Those sandstone platforms located within the rivers, tributaries and adjacent to swamps are most likely to contain axe grinding grooves.

6 Regional character

The Subject Area is located on the traditional country of the Tharawal nation. Tindale (1974) has identified the Tharawal boundaries extend from the south side of Botany Bay to north of the Shoalhaven River to the south, running inland to the Campbelltown and Camden area (Attenbrow 2010: 34). Attenbrow (2010:35) points out that such boundary mapping, undertaken as it was in the nineteenth century is indicative at best; however there appears to be reasonably strong agreement between those who have mapped language boundaries that the area is Tharawal country. Tharawal people distinguished themselves as Fresh Water, Bitter Water or Salt Water depending on where in the wider language boundary their traditional lands were – the inland hills and valleys, the plateaus and swamps or the coastal plain respectively (DEC 2005b: 6).

One tribe/ sub-group of Tharawal-speakers was the Wodi Wodi. They inhabited the coastal plains and escarpment around Wollongong where the Dendrobium Pit Top and coal handling infrastructure is located. Other named groups of the Tharawal language group are thought to include the Gweagal, Norongerraga, Illawarra, Tagary, Wandeanega, Wodi Wodi and Ory-ang-ora (Tindale 1974).

The records and histories of the Tharawal and their country at the time of contact with Europeans are subject to bias and are generally fragmented, providing nothing like a complete picture of the way Aboriginal people were living prior to European contact. Nevertheless, we know the Tharawal regularly communicated, moved, traded and participated in ceremonies between their country and neighbouring areas. It is most likely family groups or clans would ‘intermingle and interact along both physical and social boundaries’ rather than be strictly confined to the ‘tribal’ borders that were to be artificially imposed by European anthropologists (Organ 1990: xlili).

The majority of reliably dated archaeological sites within the region are less than 5,000 years old, with previous excavations of rock shelters on the Woronora Plateau providing the oldest date of just over 2,000 years BP (Sefton 1998 a, 1998b). A combination of reasons has been suggested for this collection of relatively recent dates. There is an argument that an increase in population and ‘intensification’ of much of the continent took place around this time leading to a great deal more evidence being deposited than was deposited as a result of the sparser former occupation period. It is also the case that many archaeological sites along the former coastline may have been submerged as the seas rose to approximately their current level around 6,000 years ago. This would have had the effect of covering evidence of previous coastal occupation. In addition, it is also true that the acidic soils that predominate around the Sydney region are not conducive to the long-term survival of sites (Hiscock 2008: 106).

The arrival of the First Fleet in Sydney Cove in 1788 was followed the next year by a smallpox epidemic, which spread to the neighbouring regions and, although the exact effects are not known, killed over half the Aboriginal population of the areas effected (Organ 1990: 5).

Early in the nineteenth century, European graziers began taking land in the south of the Cumberland Plain and the coastal plains around Wollongong, with cedar getting in the narrower northern coastal plain and rainforest areas of the escarpment (DEC 2005b). Access to traditional and everyday resources (such as water) and clearing the land of trees would have had a major impact on the ways in which Aboriginal people would have been living, and also caused significant social disruption between Aboriginal groups, and pressure between Aboriginal people and the ever-increasing European population. This period was a time of drought, and the competition for resources between the Europeans and the Tharawal, who were adapting to the massive changes that were so quickly upon them, led to several years of conflict. Organ (1990) documents the various skirmishes, killings and reprisals between Europeans and the Tharawal during the 1814 – 1815 period in the Cowpastures, Camden and Appin districts. Eventually this sporadic bloodshed would lead to larger scale conflict, with Governor Macquarie implementing a sustained punitive action against the Aboriginal population in the district. This resulted in the Appin Massacre of 17 April 1816, in which Aboriginal people were shot and driven over the steep cliffs (probably near Broughtons Pass) to their death during a surprise attack by a detachment of the 46th Regiment, in the middle of the night.

Despite the massive changes that were so quickly brought to the Aboriginal people of the region, they maintained a sense of community, traditional customs and practices, cultural knowledge and continued to care for significant sites and the land in general. Today there are many thousands of Aboriginal people living in the Illawarra. They continue to be custodians of the land, whilst traditional owners maintain cultural knowledge.

Past Aboriginal land use of the Subject Area can be re-traced using various resources, including recorded archaeological resources, historical observations of early settlers and surveyors (though the inherent bias present in historical European observations must be recognised), and contemporary comments from Aboriginal people and consideration of art motifs represented within the Subject Area. These resources provide a glimpse into the past lives of Aboriginal occupants of the region and help to illustrate how resident communities utilised the various resources that were available in the surrounding landscape.

7 Predictions

This section summarises the landscape and archaeological context of the Subject Area to provide predictive statements about the likelihood and nature of archaeological evidence in the Subject Area.

The predictive model developed for the Subject Area included the consideration of previous archaeological surveys and assessments in the local area and wider surrounds, the distribution and patterning of known sites within the Subject Area and surrounds, the landform units and landscape context of the Subject Area and the previous known land uses in the area. Due to the rugged nature of the Hawkesbury Sandstone landscape, the majority of the sites suitable for Aboriginal occupation and transient use are sandstone overhangs.

A comparison of slope analysis and distribution based on slope gradient has been considered and has assisted with compiling the following predictive model.

A summary of the previously recorded Aboriginal heritage sites listed in the AHIMS database as well as the three newly identified sites is provided in Table 5.

The predictive model developed for the Subject Area is as follows:

- Grinding groove sites are a common site type within the area, making up approximately 41% of the AHIMS registered sites within the Subject Area:
 - Axe grinding groove sites will most likely occur on sandstone outcrops associated with drainage lines, swamps, creek lines and riverbeds.
 - The bulk of grinding groove sites will contain fewer than 50 grinding grooves.
 - Grooves will generally be between 25 cm and 50 cm in length, 5 cm to 8 cm in width and between 2 cm and 5 cm in depth and represent the sharpening or preparing of ground edge hatchets or fire hardened points.
- Axe grinding grooves are often located on large sandstone platforms within creek beds and swamp.
- Sandstone shelters or rock overhangs with archaeological deposits, art, midden and/or artefacts will be the most common site type identified within the Subject Area. This is due to the steep slopes and ridgelines present along the Avon and Cordeaux Rivers; as well as Donalds Castle Creek and their small unnamed tributaries. Of the 31 sites situated within the Subject Area, 55% are sandstone shelter sites.
- Stone artefact scatters and isolated stone artefacts will be a less common class of site type or feature within the Subject Area. Of the 31 sites situated within the Subject Area, 3% are isolated finds:
 - The identification of this type of site depends on ground surface visibility, as site extent and artefact numbers are only visible on the surface. Due to the vegetation cover of the Subject Area this type of site type is difficult to relocate. Areas of open ground surface will be assessed for such site types.
 - The majority of these types of site occur on level to gently inclined alluvial plains, floodplains, terraces, foot slopes and simple slopes.
 - The majority of sites will occur within 200 m of temporary or permanent water with the average distance between a site and water being 700 m.
 - The majority of sites will occur on alluvial and transferral soil landscapes, neither of which are present within the Subject Area.

- An isolated find has previously been identified within the Subject Area and has been identified as part of the AHIMS search undertaken for this study. Avon Dam IF1 (AHIMS # 52-2-3204) is a single white quartzite core with several negative flake scars. The site was registered recorded by Dominic Steele Consulting Archaeology on 6/12/2004. The core was located amongst exposed gravels from a location of underlying decomposing bedrock and was not considered to be *in situ*. An attempt was made by Niche in 2017 to relocate the site as part of the previous ACHA undertaken for Areas 5 and 6, however it could not be relocated.
- Culturally modified trees will be the least represented class of site type in the Subject Area. No culturally modified trees were identified within the Study Area:
 - Culturally modified trees are a site type that is formed from the removal of bark from a tree for use in the manufacture of canoes, shields, shelters and containers for sorting or carrying items.
 - Whilst the area has been protected from large scale timber felling operations, due to its use as a water catchment area, the area is frequently subject to intense bushfires that would significantly reduce this site type's survival.
- Burials, an uncommon site type, are present within soft alluvial sediments, caves or hollow trees. Such sites are more commonly located within the sand dunes of the coast region. It is highly unlikely that this site type will occur within the Subject Area.
- Stone arrangements, a rare site type, may be located within the Subject Area. This type of site can include mounds of rocks for burial, or markers, mythological sites or areas of spiritual connection. There are no stone arrangements previously identified within the Subject Area.
- The bulk of archaeological sites within the Subject Area will relate to the last 2,000 years of occupation and the late Holocene period.
- Older archaeological deposits may be present in rock shelters or buried archaeological deposits associated with the infill of drainage lines, swamps and in areas with multiple depositional layers.

8 Sampling strategy

8.1 Archaeological survey

A proposed methodology for the Project ACHA was developed by Niche. A copy of the proposed methodology is available in Appendix 3. The Proposed Methodology follows the:

- *Draft Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation* (DECb 2005);
- *Aboriginal Cultural Heritage Consultation Requirements for Proponents* (DECCW 2010a);
- *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW 2010b); and
- *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (OEH 2011).

As part of the development of the Proposed Methodology, a sampling strategy for an archaeological survey of the Subject Area was developed.

A targeted site survey was carried out (including representation by the RAPs) over eight (8) days to identify and attempt to relocate previously recorded Aboriginal cultural heritage sites within the Subject Area and along the proposed surface disturbance. Areas that were not previously surveyed were also targeted. A full list of previously identified and newly discovered sites are listed in Table 5.

A list of the survey participants who were involved in the present Field Survey is provided in Table 11.

The field assessment involved the relocation of previously recorded Aboriginal heritage sites situated within the Subject Area and the baseline recording of any newly identified sites. The assessment included:

- The recording of relevant information including landform type, vegetation, level of disturbance and relevant site features including the presence of a PAD;
- A detailed photographic record of each of the Aboriginal cultural heritage sites;
- Recording the location of artefacts and features using a hand non-differential GPS unit;
- Detailed scaled plans of each site including physical characteristics and features;
- Detailed information regarding the dimensions, composition and features of the site;
- A record of the survey tracks undertaken in order to determine survey coverage; and
- A discussion of site conditions with RAPs and a record made of all comments and recommendations for each site.

9 Field methods

The archaeological survey program was undertaken between 6 October 2021 and 2 November 2021.

The targeted site survey was carried out over eight days in order to identify and attempt to relocate recorded Aboriginal cultural heritage sites within the Subject Area and along the proposed surface disturbance. Areas that had not been previously surveyed were also be targeted.

The assessment of the sites included:

- Recording relevant information including landform type, existing environment, and level of disturbance.
- A detailed photographic record of each of the Aboriginal cultural heritage sites.
- Recording the location of artefacts and features using a hand non-differential GPS unit.
- Detailed scaled plans of each site including physical characteristics and features.
- Detailed information regarding the dimensions, composition, and features of the site.
- A discussion of site conditions with RAPs and a record made of all comments and recommendations for each site.

The list of fieldwork participants is provided in Table 11 below. A number of groups were invited to attend but were not present for the surveys. These groups have also been identified in the Table 11 for reference.

Table 11: List of fieldwork participants, affiliation, and dates.

Participant	Affiliation	Dates
Stella Quast	Niche	Present on all days
Rebecca Chalker	Niche	Present on all days, except 22/10/2021
Samuel Ward	Niche	22/10/2021
Renée Regal	Niche	
Steven Hickey	A1 Indigenous Services	6/10/2021- Invited but did not attend
	Butucarbin	7/10/2021- Invited but did not attend
Kirsty Lee Chalker	Cubbitch Barta Native Title Claimants	22/10/2021
Joleen Smith	Didge Ngunawal	6/10/2021
Richard Dutton	Gulaga	25/10/2021
Cory Currell	Kamilaroi Yankuntjatjaka Working Group	22/10/2021, 26/10/2021
Mark Pietruszewski	South Coast Native Title Claimants (through Woronora Plateau Gundangara)	6/10/2021
John Carriage	Thoorga Nura	7/10/2021, 1/11/2021, 2/11/2021
Tom Butler	Warra Bingi Nunda Gurri	7/10/2021
Chantelle Davis	Wodi Wodi Traditional Owners	22/10/2021, 25/10/2021, 26/10/2021
James Davis	Wodi Wodi Traditional Owners	1/11/2021, 2/11/2021
Marilyn Carroll-Johnson	Woka	7/10/2021
Daniel Kennedy	Woronora Plateau Gundangara Elders Council	22/10/2021, 25/10/2021, 26/10/2021
Kayla Williamson	Woronora Plateau Gundangara Elders Council	1/11/2021
Paul Cummins	Woronora Plateau Gundangara Elders Council	2/11/2021
Anonymous	Another organisation that doesn't wish to be identified	6/10/2021
Anonymous	Another organisation that doesn't wish to be identified	25/10/2021, 26/10/2021, 1/11/2021

10 Results

10.1 Survey coverage

Approximately 110.2 ha (5.5%) of the 1989.88 ha of the Subject Area was surveyed. This relatively low survey coverage number is attributed to the assessment focusing on ridge and creek lines that have archaeological potential based on the predictive model developed for the Subject Area (Section 7), and given the predominately underground nature of the Project, it is considered adequate for the purpose of this assessment. The Subject Area was also subject to an extensive survey undertaken by Niche in 2019. This included an additional 134.5 ha (6.76%) of the current Subject Area. Together, the effective survey coverage is 244.7 ha or 12.3% of the Subject Area.

The survey was conducted by a team of two archaeologists and between three and four representatives from the RAPs. The survey sampled a range of landforms including open depressions and gullies, slopes, ridges and crests. The survey predominately sampled slopes that were gently inclined (41.6%), moderately inclined (35%) and very gently inclined (10.7%). For additional information of the survey coverage, see Table 12.

A total of 8 days were spent to complete the field assessment. The survey conditions during all days of survey were clear to overcast. Field work was cancelled during days of predicted heavy rain due to WaterNSW catchment entry conditions. Cancelled days were rescheduled to the next available fine day, so that no survey days were lost to weather.

A summary of survey coverage by slope and landform categories across the Subject Area is provided in Table 12 and Figure 6. It should be noted that as per Requirement 10 of the DECCW (2010b) *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* this assessment has not included tables outlining the visibility due to the obtrusive, above surface evidence of the Aboriginal occupation of the Subject Area, as per the Navin Officer (2000) assessment.

Navin Officer Heritage Consultants (Navin Officer 2000: 49-50) discusses the considerations for visibility within the Illawarra Escarpment and Woronora Plateau that can be applied to the WaterNSW catchment areas. The obtrusive nature of sandstone shelter sites and rock platforms suitable for Aboriginal occupation and use is always high, even in areas as highly vegetated as WaterNSW catchment areas, so these sites are likely to be identified during survey efforts regardless of vegetation coverage. Further to this, the concept of archaeological visibility is also applicable to shelter sites that have artefact deposits and artefacts exposed within the shelter's dripline or on the shelter floor (Biosis Research 2009a: 48).

Survey conditions were excellent, with cool to hot and sunny conditions. Visibility was generally low (10%) due to vegetation cover, with areas of exposure present due to erosion, sheetwash and occasional localised areas of disturbance. Vegetation cover was relatively thick as is typical of the WaterNSW catchment areas. Obtrusiveness of shelters, overhangs and sandstone platforms was good throughout the Subject Area (Plate 7, Plate 8, Plate 9 and Plate 10). Drainage lines were surveyed and had frequent exposed stone suitable for grinding grooves.

As required by the *Code of Practice for Archaeological Investigation in NSW*, survey units, landforms and effective survey coverage are summarised in Table 12. Sample images of the landscape typically encountered during the survey are included in Plates 7 – 10.

Table 12: Survey coverage across Subject Area by slope and landform category

Slope Class	Slope degrees	Total Area Surveyed (ha)	Percentage Total of 278.53 ha surveyed
Flat	0°	1.75	1.59%
Very gently inclined	Up to 1.75°	11.86	10.76%
Gently inclined	1.75-5.75°	45.80	41.56%
Moderately inclined	5.75-18°	39.09	35.47%
Steep	18-30°	8.49	7.70%
Very steep	35-40°	2.06	1.87%
Precipitous	40-45°	1.11	1.01%
Cliff	>45°	0.05	0.05%
Total		110.21ha	100%



Plate 7: General photo of visibility and exposure on the ridge and slope



Plate 8: Vegetation cover typical of the low slopes near to waterways



Plate 9: General photo of exposed rock platform typically containing grinding grooves



Plate 10: General photo showing the obtrusiveness of rock shelters within the Subject Area

10.2 Newly recorded Aboriginal heritage sites

Three Aboriginal cultural heritage sites were identified during the Field Survey. These included:

- Two shelters with art and PAD
- One axe grinding groove site

Newly recorded Aboriginal cultural heritage sites are presented in Table 13 and are detailed below. A more detailed description of the sites can be found in Annex 2.

Table 13: Newly recorded Aboriginal heritage sites

Site Name	AHIMS ID	Site Type	Features
Dendrobium ACHA Shelter-3	Pending	shelter with art and PAD	Sandstone rock shelter with a sandy deposit and faded art (11 charcoal lines).
Dendrobium ACHA AGG-5	Pending	axe grinding groove	Three narrow Axe Grinding Grooves situated on a sandstone platform. The platform is situated in a creek bed.
Dendrobium ACHA Shelter-4	Pending	shelter with art and PAD	Sandstone rock shelter with a 15-40 cm deposit of yellow-brown loamy sand. Two panels of art are located on the back wall of the shelter. Panel 1 has 13 charcoal indeterminate motifs and Panel 2 has two charcoal indeterminate motifs.

11 Analysis and discussion

11.1 Site types and features within the Subject Area

As a result of the survey, a total of 31 Aboriginal cultural heritage sites were identified within the Subject Area. A summary of the site types is provided in Table 14.

Table 14: Summary of site types in Subject Area

Site features	Total	Percentage
Artefact	1	3.23%
Axe Grinding Groove	13	41.94%
Shelter with Art	8	25.81%
Shelter with Art and Deposit	1	3.23%
Shelter with Art and PAD	5	16.13%
Shelter with Deposit	2	6.45%
Shelter with PAD	1	3.23%
Total	31	100%

Site distribution within the Subject Area follows the same pattern that has previously been outlined by Biosis Research 2007a's predictive model for the archaeological and cultural heritage assessment of Dendrobium Area 3. Due to the rugged nature of the Hawkesbury Sandstone landscape, the majority of the sites suitable for Aboriginal occupation and transient use comprise of sandstone overhangs (a total of 16 shelters). Comparing slope analysis and distribution of sites per slope gradient, 19 of the 31 sites located within the Subject Area are located on moderately inclined slopes. A further 10 sites are located on steeply inclined slopes. In this case moderately inclined slopes are defined as slopes of between 5.75 and 18 degrees, steep is defined as between 18 and 30 degrees. As per Biosis 2007a's model the Aboriginal heritage sites located within the Subject Area are mostly located within the moderate to steep slope set, which are the slope classes where there is the formation of overhangs suitable for use for occupation.

11.1.1 Artefact Sites

The Subject Area contains only a single Isolated Artefact site. This can be attributed to the landforms within the Hawkesbury Sandstone formation and the vegetation coverage across the Dendrobium Area 5 investigation area having limited ground surface exposure. The location of the Dendrobium Pit Top carpark extension area, whilst having ground surface exposure, has been heavily disturbed due to the development of the core storage facility, the existing power easement and access road, giving the site low potential for further subsurface archaeological deposits and artefact scatter sites.

11.1.2 Axe Grinding Groove Sites

The Subject Area contains a relatively high number of grinding groove sites; accounting for 13 of the 31 Aboriginal sites identified within the Subject Area. This can be attributed to the landforms within the Hawkesbury sandstone formation comprising of large areas of sandstone plateau and large rivers and creeks with sandstone beds suitable for use for the making of stone tools. These sites hold significance to the local Aboriginal community as evidence of past occupation and use of the Subject Area as well as an educational tool for younger generations.

11.1.3 Sandstone Shelter Sites

Of the 31 Aboriginal cultural heritage sites, 17 comprise of sandstone shelter sites that have either one or a combination of deposit, PAD or art.

The Hawkesbury Sandstone landform of the Subject Area lends itself to this site type to be used by past Aboriginal peoples for artistic expression, occupation and transient use. Similar to axe grinding grooves, these site types are significant to the local Aboriginal community as they evidence the past occupation of the area and can be used as an educational tool for younger generations.

Whilst the Subject Area is not large enough to detect major trends in motif types, a number of the motif types have previously been observed during assessment within the adjoining Dendrobium mining lease areas. Sefton suggests (Sefton 1988) that in the area surrounding Lake Avon and Lake Cordeaux, human motifs are relatively more frequent than in the remainder of the region. Examples of human figures within the current Subject Area were assessed at Donald Castle Creek Site 6 (AHIMS ID# 52-2-1567, Donald Castle Creek Site 9 (AHIMS# 52-2-1570), Donald Castle Creek Site 30 (AHIMS# 52-2-1591), Upper Avon 49 (AHIMS# 52-2-1754), Upper Avon 46 (AHIMS ID# 52-2-1761), Upper Avon 45 (AHIMS# 52-2-1782), and M2D PAD2 (AHIMS ID #52-2-3955). As outlined in Annex 3, there are a number of other motif types represented including macropods, eels, snakes, gliders, goannas, kangaroos, anthropomorphs and hand stencils (both adult and children's).

As with previous assessments the most common type of expression is charcoal outline/infill. Red ochre is used for outline and solid motifs at Upper Avon 47 (AHIMS ID #52-2-1752). Red ochre was also used for a hand stencil at Upper Avon 53 (AHIMS# 52-2-1747). There are no examples of stencils of feet or material culture such as boomerangs or axes, as has been previously identified within the areas surrounding Tahmoor (Niche 2017b) and Helensburgh (Kayandel Archaeological Services 2008, Niche 2016b and Niche 2016c).

11.2 Summary

The Subject Area contains a range of archaeological and cultural sites which provide information about past Aboriginal land use and settlement of the area. The types and locations of sites can be interpreted to provide an insight into what events took place in the past, and how the landscape was used in the past.

The sites present represent a range of activities and events, such as living places, stone artefact manufacture, the grinding of stone axes, the use of flaked stone artefacts to prepare foods and utilitarian items, the grinding of plant foods to produce flour and the removal of bark and cambium from trees for utilitarian items such as shelters and coolamon style dishes.

The location of the sites in the Subject Area are dependant in many cases on the natural environment – axe grinding grooves only occur where there are suitable stone platform outcrops, and sandstone shelters only occur in areas where there are suitable rock formations, which generally occur on moderate and steeply inclined slopes. However, within this framework of the landscape Aboriginal people will have used the land in different ways, at different times and for different purposes – dictated by both utilitarian and non-utilitarian influences and objectives. Resource rich areas such as creeks, and rivers may have been a focus of occupation when resources were abundant or readily available, and hence we expect to find more archaeological sites in association with these landforms. On the other hand, the nature and timing of occupation will also have been dictated by non-utilitarian objectives such as ceremonies, rituals and gatherings.

In conclusion, the archaeological and cultural values work that has been undertaken for the Project provides an insight into past Aboriginal land use within the Subject Area and the wider region. Some of the largest archaeological sites identified are located in close proximity to the Cordeaux River, which would have provided abundant and reliable resources.

12 Scientific values and significance assessment

12.1 Assessment framework

The Burra Charter (Australia ICOMOS 2013) defines the basic principles and procedures to be observed in the conservation of important places. It provides the primary framework within which decisions about the management of heritage sites in Australia should be made. The Burra Charter defines cultural significance as being derived from the following values summarised in Table 15.

Table 15: Scientific values as outlined by the Burra Charter

Value type	Description
Aesthetic Value	Aesthetic value includes aspects of sensory perception for which criteria can and should be stated. Such criteria may include consideration of the form, scale, colour, texture and material of the fabric; the smells and sounds associated with the place and its use.
Historic Value	Historic value encompasses the history of aesthetics, science and society, and therefore to a large extent underlies all of the terms set out in this section. A place may have historic value because it has influenced, or has been influenced by, an historic figure, event, phase or activity. It may also have historic value as the site of an important event. For any given place the significance will be greater where evidence of the association or event survives in situ, or where the setting are substantially intact, than where it has been changed or evidence does not survive. However, some events or association may be so important that the place retains significance regardless of subsequent treatment.
Scientific Value	The scientific or research value of a place will depend upon the importance of the data involved, on its rarity, quality or representativeness (conservation value), and on the degree to which the place may contribute further substantial information.
Social Value	Social or cultural value refers to the spiritual, traditional, historical or contemporary associations and attachments the place or area has for Aboriginal people. Social or cultural value is how people express their connection with a place and the meaning that place has for them. Places of social or cultural value have associations with contemporary community identity. These places can have associations with tragic or warmly remembered experiences, periods or events. Communities and individuals can experience a sense of loss should a place of social or cultural value be damaged or destroyed.

12.2 Other approaches

The categorisation into aesthetic, historic, scientific and social values is one approach to understanding the concept of cultural significance. However, more precise categories may be developed as understanding of a particular place increase.

The NSW DECCW guidelines for the significance assessment of Aboriginal archaeological sites are contained within the Aboriginal Cultural Heritage Standards and Guidelines Kit (National Parks and Wildlife Service 1997). The Kit identifies with two main streams in the overall significance assessment process: the assessment of cultural/social significance to Aboriginal people and the assessment of scientific significance to archaeologists.

This approach encapsulates those aspects of the Burra Charter that are relevant to Aboriginal archaeological sites. The guidelines specify the following criteria for archaeological (scientific) significance, as paraphrased in Table 16.

Table 16: Criteria specified for archaeological (scientific) significance

Criteria	Description
Research potential	It is the potential to elucidate past behaviour which gives significance under this criterion rather than the potential to yield collections of artefacts. Matters considered under this criterion include – the intactness of a site, the potential for the site to build a chronology and the connectedness of the site to other sites in the archaeological landscape.
Representativeness	As a criterion, representativeness is only meaningful in relation to a conservation objective. Presumably all sites are representative of those in their class or they would not be in that class. What is at issue is the extent to which a class of sites is conserved and whether the particular site being assessed should be conserved in order to ensure that we retain a representative sample of the archaeological record as a whole. The conservation objective which underwrites the ‘representativeness’ criteria is that such a sample should be conserved.
Rarity	This criterion cannot easily be separated from that of representativeness. If a site is ‘distinctive’ then it will, by definition, be part of the variability which a representative sample would represent. The criteria might best be approached as one which exists within the criteria of representativeness, giving a particular weighting to certain classes of site. The main requirement for being able to assess rarity will be to know what is common and what is unusual in the site record but also the way that archaeology confers prestige on certain sites because of their ability to provide certain information. The criterion of rarity may be assessed at a range of levels: local, regional, state, national, and global.
Educational Potential	Heritage sites and areas should be conserved and managed in relation to their value to people. It is assumed that archaeologists have the ability to speak of the value of sites to members of their own profession. Where archaeologists or others carrying out assessments are speaking for the educational value of sites to the public, the onus is on them to go to the public for an assessment of this value, or to reputable studies which have canvassed public demand for education. The danger, otherwise, is that archaeologists would be projecting their values onto a public which is itself given no voice on the matter.
Aesthetics	Archaeologists are not expected to include an assessment of aesthetic significance along with their assessment of scientific significance. In relation to heritage places, aesthetic significance is generally taken to mean the visual beauty of the place. Aesthetic value is not inherent in a place but arises in the sensory response people have to it. Although the guidelines provide no expectation for archaeologists to consider aesthetic values it is often the case that a site’s or a landscape’s aesthetic is a significant contributory value to significance. Examples of archaeological sites that may have high aesthetic values would be rock art sites, or sites located in environments that evoke strong sensory responses. For this reason, we consider it appropriate to include aesthetic values as part of the significance assessments for the sites identified during this assessment.

Educational potential and aesthetic values are not considered to be criteria against which scientific values and significance can be assessed. Aesthetic values should be considered as a distinct category (rather than a criterion that contributes to scientific value) in accordance with the Burra Charter and the *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW* (OEH 2011). Educational potential is considered to be a criterion that contributes to social value, rather than scientific value, and hence this is considered below in the overall cultural significance assessment.

12.2.1 Grading scientific values

The following gradations, where a site or zone satisfies at least one criterion, have been applied to provide a measure of the values/significance for Aboriginal objects identified within the Subject Area, and to provide an overall assessment of the significance of each of the zones used that define the Subject Area.

A description of the criteria used to grade the scientific values of Aboriginal objects within the Subject Area is included in Table 17.

Table 17: Criteria for grading scientific values

Gradation	Description
Low	The site or object contains only a single or limited number of features and has no potential to meaningfully inform our understanding of the past beyond what it contributes through its current recording (i.e. no or low research potential). The site or object is a representative but unexceptional example of the most common class of sites or objects in the region. Many more similar examples can be confidently predicted to occur within the Subject Area, and in the region.
Moderate	The site or object derives value because it contains features, both archaeological and contextual, which through further investigation may contribute to our understanding of the local past. These features include but are not limited to the relationship with landscape features or other Aboriginal archaeological sites or areas of identified heritage importance; diagnostic archaeological or landscape features that inform a chronology; and a relatively large assemblage of stone artefacts. The presence of a diverse artefact and feature assemblage, and connectedness with landscape features and other notable sites provide relatively higher representative and rarity values than sites of low significance.
High	The site or object has value because it contains archaeological and/or contextual features which through further investigation may significantly contribute to our understanding of the past, both locally and on a regional scale. These features include, but are not limited to: Aboriginal ancestral remains; the site's relationship with landscape features or other Aboriginal archaeological sites or areas of identified heritage importance; diagnostic archaeological or landscape features that inform a chronology; and a very large assemblage of stone artefacts associated with other features such as oven remains or shell midden. Such sites will be relatively rare and will be representative of a limited number of similar sites that make up this class; hence they derive high representative and rarity values.

12.3 Assessment of scientific (archaeological) significance

An assessment of each of the criteria for scientific value and significance is presented in Table 18 and Table 19 for each registered Aboriginal heritage sites.

12.4 Statement of significance

A statement of significance, including an assessment of the social, aesthetic, cultural and historic values, has been provided in Section 6 and Appendix 2 of the ACHA.

Table 18: Assessment of Scientific (Archaeological) Significance – previously recorded sites

AHIMS ID	Site Name	Features	Significance Statement	Research Potential	Representativeness	Rarity	Scientific Significance Rating
52-2-4468	Dendrobium ACHA AGG-1	Axe Grinding Groove	Dendrobium ACHA AGG-1 is assessed to be of low scientific significance due to the site comprising of a single axe grinding groove only.	Low	Low	Low	Low
52-2-4467	Dendrobium ACHA AGG-2	Axe Grinding Groove	Dendrobium ACHA AGG-2 is assessed to be of low scientific significance due to the site comprising thirteen axe grinding grooves, each of the grooves are of a uniform length, as demonstrated at a number of sites within the Dendrobium Mine area.	Low	Low	Low	Low
52-2-4466	Dendrobium ACHA AGG-3	Axe Grinding Groove	Dendrobium ACHA AGG-3 is assessed to be of low scientific significance due to the site comprising a single axe grinding groove only.	Low	Low	Low	Low
52-2-4465	Dendrobium ACHA AGG-4	Axe Grinding Groove	Dendrobium ACHA AGG-4 is assessed to be of low scientific significance due to the site comprising six axe grinding grooves, each of the grooves are of a uniform length, as demonstrated at a number of sites within the Dendrobium Mine area.	Low	Low	Low	Low
52-2-1566	Donald Castle Creek Site 5	Axe Grinding Groove	Donald Castle Creek Site 5 comprises four axe grinding grooves, as a result it is given a low scientific significance rating due to the low number of uniform axe grinding grooves.	Low	Low	Low	Low
52-2-1568	Donald Castle Creek Site 7	Axe Grinding Groove	Donald Castle Creek Site 7 comprises 11 axe grinding grooves, as a result it is given a low scientific significance rating due to the low number of uniform axe grinding grooves.	Low	Low	Low	Low
52-2-1592	Donald Castle Creek Site 31	Axe Grinding Groove	Donald Castle Creek Site 31 comprises 12 axe grinding grooves, as a result it is given a low scientific significance rating due to the low number of uniform axe grinding grooves.	Low	Low	Low	Low
52-2-1729	Ricki Lee 1	Axe Grinding Groove	Ricki Lee 1 comprises two axe grinding grooves, neither of which are still visible, as a result it is given a low scientific significance rating due to the low number of uniform axe grinding grooves.	Low	Low	Low	Low
52-2-1730	Ricki Lee 2	Axe Grinding Groove	Ricki Lee 2 comprises 51 axe grinding grooves and a grinding stone, as a result it is given a moderate scientific significance rating due to the large number of uniform axe grinding grooves.	Moderate – due to large number of axe grinding grooves	Moderate – limited examples of platforms with this number of axe grinding grooves within the region	Moderate – limited examples of platforms with this number of axe grinding grooves within the region	Moderate
52-2-1779	Upper Avon 42	Axe Grinding Groove	Upper Avon 42 comprises seven axe grinding grooves, as a result it is given a low scientific significance rating due to the low number of uniform grinding grooves.	Low	Low	Low	Low
52-2-1781	Upper Avon 44	Axe Grinding Groove	Upper Avon 44 comprises three axe grinding grooves, as a result it is given a low scientific significance rating due to the axe grinding grooves no longer being visible.	Low	Low	Low	Low
52-2-1758	Upper Avon 54	Axe Grinding Groove	This site comprises two axe grinding grooves, on a sandstone platform within a creek bed. This shelter's location could not be confirmed during this assessment, so the following details are taken from the original AHIMS recording form.	Low	Low	Low	Low
52-2-3204	Avon Dam IF1	Isolated Find	Avon Dam IF 1 is assessed to be of low scientific significance due to the low-density nature of the isolated artefact, the moderate level of disturbance has removed the archaeological integrity of the deposit, and the common nature of the raw material.	Low	Low	Low	Low
52-2-1567	Donald Castle Creek Site 6	Shelter with Art	Donald Castle Creek Site 6 is a rock shelter with a single panel with three indeterminate charcoal drawings on the back wall. All of these motif types are common within the area. As a result, this site is given a low scientific significance rating.	Low	Low	Low	Low
52-2-1570	Donald Castle Creek Site 9	Shelter with Art	Donald Castle Creek Site 9 is a rock shelter with art. Only two of the three artworks that were identified in the original recording in 1990 are still visible. All of these motif types are common within the area. As a result, this site is given a low scientific significance rating.	Low	Low	Low	Low
52-2-1591	Donald Castle Creek Site 30	Shelter with Art	Donald Castle Creek Site 30 is a rock shelter with art. Of the 15 artworks that were identified in the original recording in 1990, only 10 could be relocated. All of these motif types are common within the area, as a result, this site is given a low scientific significance rating.	Low	Low	Low	Low
52-2-1780	Upper Avon 43	Shelter with Art	Upper Avon 43 comprises a sandstone shelter formed through cavernous weathering and block fall in antiquity. The art motifs are in the same condition as previously described by Sefton and comprise kangaroos, full frontal female and male figures, as well as a charcoal infill snake. One example of the full-frontal female figure has her hands raised above her head- a motif not before seen within the Southern Coalfields. As a result of this grouping of motifs and their rareness to the area, this site has been given a high scientific significance.	High- Intactness of art motifs, high density of motifs with potential to provide evidence of local chronology	High-Uncommon layering and grouping of motifs	High- uncommon grouping of motifs	High
52-2-1782	Upper Avon 45	Shelter with Art	The shelter is formed out of Hawkesbury Sandstone by cavernous weathering and block fall in antiquity. The art is located on the back wall of the shelter and is in poor condition as recorded by Sefton. Art motifs were drawn in charcoal and red ochre with motifs comprising male frontal figures as well as a number of indeterminates. The art surfaces have heavy microflora growth due to waterwash and the location of the shelter within the landscape. The site has been given a low scientific significance due to the poor condition of the art.	Low	Low	Low	Low

AHIMS ID	Site Name	Features	Significance Statement	Research Potential	Representativeness	Rarity	Scientific Significance Rating
52-2-1753	Upper Avon 48	Shelter with Art	Upper Avon 48 comprises a sandstone shelter that was formed through cavernous weathering and blockfall in antiquity. The art comprises an eel, a red ochre hand stencil and a charcoal indeterminate. All of these motif types are common within the area. As a result, this site is given a low scientific significance rating.	Low	Low	Low	Low
52-2-1755	Upper Avon 50	Shelter with Art	Upper Avon 50 comprises a sandstone shelter formed through cavernous weathering and blockfall in antiquity. The art comprises charcoal macropod and indeterminate lines. These motif types are common within the area and as a result this site is given a low scientific significance rating.	Low	Low	Low	Low
52-2-1756	Upper Avon 51	Shelter with Art	Upper Avon 51 comprises a sandstone shelter formed through cavernous weathering and blockfall in antiquity. The art comprises charcoal indeterminate lines. These motif types are common within the area and as a result this site is given a low scientific significance rating.	Low	Low	Low	Low
52-2-1761	Upper Avon 46	Shelter with Art and Deposit	Upper Avon 46 comprises a sandstone shelter formed through cavernous weathering and blockfall in antiquity. The art is in poor condition due to water wear and comprises charcoal indeterminates, two macropods and a partial male figure. These motifs are common within the region and as a result this site is given a low scientific significance.	Low	Low	Low	Low
52-2-1752	Upper Avon 47	Shelter with Art and PAD	Upper Avon 47 is a sandstone shelter formed through cavernous weathering and blockfall. Whilst the art has faded due to pigment loss and some surface flaking, the red ochre motifs are in good condition generally, some of these motifs have been infilled with charcoal. The motifs comprise of macropods, gliders, kangaroos, goannas and 'bush tucker' these motifs are frequently superimposed. Whilst the motifs singly are not rare within the area, they are not often depicted together frequently, the bicolour nature of some of the depictions is also rare within the area. There is one example of a previously registered site within the region that has a bicolour macropod depicted, this site is Flat Rock Creek 305 (AHIMS ID #52-2-3497). As a result of this rarity, the site is given a high scientific significance.	High- Intactness of art motifs, high density of motifs with potential to provide evidence of local chronology	High-Uncommon large amount of animal and 'bush tucker' motifs	High-Uncommon large amount of animal and 'bush tucker' motifs	High, Local
52-2-1747	Upper Avon 53	Shelter with Art and PAD	Upper Avon 53 is a sandstone shelter formed through cavernous weathering and blockfall. The art at the shelter comprises a single red ochre, child's left-hand stencil. Red ochre hand stencils are a frequent motif within the area as a result the site is given a low scientific significance rating.	Low	Low	Low	Low
52-2-1759	Upper Avon 55	Shelter with Art and PAD	Upper Avon 55 is a sandstone shelter formed through cavernous weathering and blockfall. The art is in poor condition due to the rapid nature of the natural weathering processes at this site. Large sandstone blocks have fallen onto the floor of the site, there is only a single charcoal indeterminate still visible on the outside of the shelter. As a result of this the site is given a low scientific significance.	Low	Low	Low	Low
52-2-1754	Upper Avon 49	Shelter with Deposit	Upper Avon 49 comprises a sandstone shelter formed through blockfall in antiquity. The art at this shelter is in excellent condition and comprises at least 30 motifs. A number of these motifs are scratched into the sandstone, a technique that is not common within the region, however this has been seen previously within the Dendrobium Area 3B mining area at DM 21 (AHIMS ID#52-2-3645) where a circle is scratched between two red ochre hand stencils. The motifs at this shelter are layered and the application techniques vary from charcoal infill, white ochre hand and fist stencil, scratching and red ochre line drawings. Such a broad range of techniques is rare within the region.	High- uncommon layering of varied application techniques and motif types	High- uncommon motif types (white ochre hand stencils in the Dendrobium Mine area), uncommon application- in the form of scratching	High- uncommon motifs and application techniques	High
52-2-1757	Upper Avon 52	Shelter with Deposit	Upper Avon 52 comprises a sandstone shelter with art and deposit. Shelters with deposit are a frequent site type within the region as a result the site is given a low scientific significance.	Low	Low	Low	Low
52-2-3955	M2D PAD 2	Shelter with PAD	M2D PAD 2 comprises a sandstone shelter with art and deposit. The art is very worn due to water wash. Shelters with deposit are a frequent site type within the region and the art is of a poor quality, as a result the site is given a low scientific significance.	Low	Low	Low	Low

Table 19: Assessment of Scientific (Archaeological) Significance – newly recorded sites

AHIMS ID#	Site Name	Site Type	Description	Research Potential	Representativeness	Rarity	Scientific significance rating
Pending	Dendrobium ACHA AGG-5	Axe Grinding Groove	Dendrobium ACHA AGG-5 comprises four axe grinding grooves, as a result it is given a low scientific significance rating due to the low number of uniform axe grinding grooves.	Low	Low	Low	Low
Pending	Dendrobium ACHA Shelter-3	Shelter with Art and PAD	Dendrobium ACHA Shelter-3 comprises a sandstone shelter formed through block fall and cavernous weathering. The art comprises a single panel with eleven (11) tally marks. A sandy deposit of unknown depth was identified.	Low	Low	Low	Low
Pending	Dendrobium ACHA Shelter-4	Shelter with Art and PAD	Dendrobium ACHA Shelter-4 comprises a sandstone shelter formed through block fall and cavernous weathering. Two panels of art with a total of 15 motifs were identified. A deposit of pale yellow-brown loamy sand extending to a maximum depth of 40cm was identified. Shelters with deposit are a frequent site type within the region and the art is of a poor quality. As a result, this site is given a low scientific significance rating.	Low	Low	Low	Low

13 Impact assessment

13.1 Potential for harm

The *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (OEH 2011) requires that both direct and indirect harm to Aboriginal objects and Aboriginal places be considered. Generally, direct harm refers to occasions where an activity physically impacts a site or objects and therefore affects the heritage values possessed by the site or objects. Indirect harm is usually taken to mean harm stemming from secondary consequences of the activity and may affect sites or objects as an indirect consequence of the activity. Examples of such indirect harm are increased visitors to a site, or increased erosion in an area as a result of an activity.

The proposed development has the potential to harm Aboriginal objects through surface disturbance and potentially via subsidence. Both surface and ancillary infrastructure planned as part of the mining extension have the potential to cause harm to sites and will be explored in detail. The potential impacts of the Project have been evaluated in consideration of comments received from the RAPs during the consultation process. These comments include those relating to the archaeological potential of landforms and the likelihood of occurrence and distribution of sites. All comments received from the RAPs are provided in Appendices B and C of the ACHA.

There are six Aboriginal heritage sites that have been identified directly above the proposed longwalls and 12 sites located outside the mining area and within the Subject Area based on the 35° angle of draw. There are also 13 additional sites identified within the Subject Area based on the 600 m boundary which could experience valley-related movements and could be sensitive to these effects and, therefore, have been included in the assessment.

13.2 Potential Impacts from Surface Disturbance

13.2.1 Surface Infrastructure

A detailed description of the surface infrastructure components of the Project is provided in Section 1.2 and in the main text of the EIS.

The main surface infrastructure components of the Project would be developed includes, but is not limited to, the development of the ventilation shaft site, ETL, an underground pumping system and pipeline to supply water from an existing borehole and proposed carpark extension at the Dendrobium Pit Top. Whilst detailed design of the surface infrastructure is not yet finalised, disturbance would only occur within the assessed footprint. For the purposes of this ACHA it is therefore conservatively assumed that the development of surface infrastructure for the Project would be wholly within the assessed footprint and would be of a nature that would cause direct harm to any Aboriginal objects or areas of cultural value located within the footprint.

The direct harm associated with surface disturbance activities is anticipated to cause either a total or partial loss of heritage value at effected sites and would have a cumulative or landscape impact of partial loss of values for the area as a whole. The activities that may cause harm to Aboriginal objects or areas of cultural value would include:

- vegetation clearance and topsoil stripping;
- disturbance of soil units or the ground surface with Aboriginal objects on the surface or within the soil profile;

- changes to a site or place's context that has secondary impacts to the site or place, resulting in the loss of cultural values; and
- excavation works and the removal and redistribution of soil by heavy machinery during site regrading or development of suitable surface conditions for various construction activities.

The surface infrastructure proposed by IMC would avoid all known Aboriginal heritage sites, including rock shelters, grinding grooves and natural landscape features. Therefore, there would be no potential direct surface disturbance impacts to any known Aboriginal cultural heritage sites for the Project.

13.2.2 Ancillary Infrastructure

In addition to the proposed surface disturbance works located within the surface investigation area, the Project also includes ancillary infrastructure. Ancillary infrastructure comprises minor surface infrastructure, although the location of such infrastructure cannot be determined at this stage in the Project. Ancillary infrastructure includes, for example, the following activities:

- Construction and/or maintenance of access tracks (e.g. for the installation and/or maintenance of surface infrastructure).
- Surface works associated with emergency and communication systems.
- Service boreholes (e.g., air, diesel and water supply) and related infrastructure. This would include one of three proposed options for supplying water to the vent shaft as outlined in Section 3.2.
- Subsidence monitoring and remediation works (where required).
- Surface rehabilitation works (where required).
- Other associated minor infrastructure, plant, equipment and activities.

The location and design of ancillary infrastructure would be flexible and would be located in areas to avoid Aboriginal heritage sites and areas of cultural sensitivity, as far as practicable. The location of the ancillary infrastructure would be determined as required over the life of the Project.

While the design and location of the ancillary infrastructure is somewhat flexible, some Aboriginal cultural heritage sites may not be able to be avoided completely. Where this occurs, appropriate management measures would be implemented including salvage activities where necessary.

13.3 Potential Impacts from Subsidence

Subsidence predictions for the Subject Area (including specific predictions for Aboriginal heritage sites) have been provided by Mine Subsidence Engineering Consultants (MSEC) (2022). The subsidence predictions are informed by subsidence modelling, previous experience of underground mining in the region as well as an understanding of the geological formations in the Subject Area.

Longwall Mining

Longwall mining involves removing rectangular sections of coal from between supported underground roadways by cutting a wide, continuously retreating panel of the coal (the longwall). The roof of the mine is held up by hydraulic jacks, which are moved behind the retreating face where coal is cut. Once moved the jacks no longer support the roof and the roof collapses into the void left behind. This process can result in the subsidence of the ground surface above the mine (NSW Minerals Council 2013).

Impacts of Subsidence on Aboriginal Heritage

The potential for mine subsidence induced ground movements to harm Aboriginal objects or areas of Aboriginal cultural value is dependent on many factors, including the nature of the Aboriginal objects or areas of cultural value themselves. MSEC (2014:33) describes how longwall mining can result in the cracking, heaving and stepping at the ground surface. The magnitude of these effects is largely dictated by factors such as the mine's geometry, the depth of cover (how deep the coal is below the ground surface), the extracted seam thickness, the geology above the mine, and the presence of geological features such as joints or faults, especially near the ground surface.

In the case of Aboriginal cultural heritage, the nature of the heritage sites and features is also a very important consideration in the potential effects of subsidence induced ground movements. Whether a site is an open site with stone artefacts, or a culturally significant area, or whether the site is a rock shelter or grinding groove platform are important considerations in determining the likely impact, if any.

In the case of open sites that occur in an area with a soil profile, subsidence induced ground movements will result in stresses and strains generally within the tolerance limits of the soil profile (therefore showing little to no impact on the surface), although isolated cracking of soils at the surface may occur. If this cracking is coincident with a surface Aboriginal heritage site or object, then it could be impacted. This is considered a low risk and the greater risk to sites in this instance may be from remediation measures, such as minor earthworks as described below. Other possible impacts may be from changes to surface or sub-surface drainage, which may alter local erosion and potentially expose, slump or bury sites. Such cases, especially in respect of isolated objects, would be very difficult to predict. MSEC (2014:33) note that whilst cracks can occur above the longwall as the subsidence trough develops, larger cracks that may require remediation generally only occur on the surface at an area coincident with the perimeters of the longwalls. In some cases, where steep slopes are present, large surface cracks can develop due to downslope mass movement triggered by subsidence related ground movements.

For sites which occur on bedrock platforms, or in areas where the landscape is comprised of rock formations (such as sandstone and rock outcrops) the risks of harm to the sites are greater than for open sites on soil landscapes. These sites are mostly grinding groove platforms. When observed as surface effects, bedrock or rock formations will behave differently than soil to the strains and pressures associated with subsidence induced ground movements. For rock platforms there is a risk that the rock will buckle and deform, and the types of changes that can occur in this case are cracking or delamination of the surface strata (MSEC 2014). For rock shelters the types of changes can include cracking, delamination of surface rock, exfoliation, block fall and in some cases overhang collapse (although adverse impacts have never been documented within the Dendrobium Mine area) or slumping of rock.

For rock shelters, the types of changes will be similar or identical to those that would be expected due to natural weathering processes, but exacerbated by subsidence. For example, a naturally weathering block which will have detached and fallen at some point in time may be detached and fall sooner due to differential movements of the rock strata induced by subsidence (Biosis Research 2007a).

Monitoring of the effects of subsidence induced ground movements to Aboriginal heritage sites (such as rock shelters and grinding groove platforms) has been conducted since the 1990s (see Sefton 2000, Biosis Research 2007a, Biosis Research 2009b, ERM 2010, Kayandel 2008, Niche 2013 to 2021). Previous experience shows that approximately 1 in 10 rock-based sites that have been subjected to subsidence induced ground movements show demonstrable changes that can be attributed to subsidence. These changes take the form of block fall, exfoliation, cracking, opening and/or closing of existing faults and fissures (Biosis Research 2009b).

Preventative management measures can be implemented in some circumstances, but for the most part the management of Aboriginal heritage sites relies on monitoring of the sites and implementing pre-arranged management responses should they be triggered by harm to the site. For most Aboriginal heritage sites there are often no suitable remediation measures as these can often be more intrusive and harmful to heritage value than the effects of the subsidence, which as described above is usually an extension or acceleration of pre-existing natural weathering processes. As an example, the process of accessing a site and cutting stress relief slots, which requires heavy drilling or sawing machinery, in close proximity to a grinding groove platform would be likely to be more damaging to the site and its cultural context than the subsidence induced cracking or shearing of surface strata.

For the Project, the consideration of potential harm to Aboriginal heritage sites from subsidence induced ground movements falls into three distinct categories:

- sites relatively more susceptible to harm from subsidence (e.g., grinding groove platforms, rock shelters);
- sites relatively less susceptible to harm from subsidence (e.g., open artefact sites); and
- other sites of cultural value where landscape changes (such as mass movement) may impact heritage values.

A total of six Aboriginal heritage sites have been identified directly above the proposed longwalls. An additional 12 sites have been identified that are located outside of the area directly above the proposed longwalls but are still within the 35° angle of draw (MSEC 2022). There are also an additional 13 sites which are identified within the Subject Area based on the 600 m buffer from the proposed longwalls which could experience valley-related subsidence.

An outline of the Aboriginal heritage sites which are at risk of subsidence-related movement are listed in Table 20.

Table 20: Summary of the Aboriginal Heritage Sites within the Subject Area which are at risk due to subsidence

Site Type	Number of sites located directly above the proposed longwalls	Number of sites located outside the area directly above the proposed longwalls and within the 35° angle of draw	Number of sites located outside the 35° angle of draw and within the 600m boundary
Isolated finds	0	0	1
Grinding groove sites	3	7	3
Rock shelters	3	5	9
Total	6	12	13

The following sections present the subsidence predictions for each of the Aboriginal heritage sites located within the Subject Area that would not otherwise be impacted by surface disturbance works associated with the surface and ancillary infrastructure.

13.3.1 Open Artefact Sites

There is one open site located within the Subject Area (which comprises of one stone artefact). Table 21 provides a summary of the subsidence predictions for Avon Dam IF 1 (AHIMS ID # 52-2-3204). Avon Dam IF 1 (AHIMS ID # 52-2-3204) is predicted to experience less than 20 mm vertical subsidence. Whilst the site may experience very low levels of vertical subsidence, it is not expected to experience measurable tilts, curvatures or strains (MSEC 2022). Avon Dam IF 1 (AHIMS ID # 52-2-3204) is located outside the 35° angle of draw of the proposed longwalls, and therefore, it is unlikely that cracking in the surface soils would occur in the location of the artefact, due to this distance. It is expected, therefore, that the isolated find would experience no adverse impacts due to the proposed mining (MSEC 2022).

Table 21: Subsidence Predictions for Isolated Finds within the Subject Area

AHIMS ID	Site Name	Scientific Significance	Maximum Predicted Total Subsidence (mm)	Maximum Predicted Total Tilt (mm/m)	Maximum Predicted Hogging Curvature (km ⁻¹)	Maximum Predicted Sagging Curvature (km ⁻¹)
52-2-3204	Avon Dam IF1	Low	<20	<0.5	<0.01	<0.01

mm/m = millimetres per metre

km⁻¹ = per kilometre

13.3.2 Rock Shelter Sites

There are 17 sandstone rock shelter sites identified within the Subject Area including two previously unrecorded sandstone rock shelter sites. Three of the rock shelters are located directly above the proposed longwalls, Upper Avon 53 [AHIMS ID # 52-2-1747], Upper Avon 45 [AHIMS ID # 52-2-1782] and M2D PAD [AHIMS ID # 52-2-3955]. The maximum conventional subsidence effects these sites are predicted to experience (i.e., at Upper Avon 53 [AHIMS ID # 52-2-1747]) includes up to 1750 mm vertical subsidence, 12 mm/m tilt, 0.13 km⁻¹ hogging curvature and 0.18 km⁻¹ sagging curvature (MSEC 2022). MSEC (2022) predicted that the proposed longwalls are likely to result in fracturing of the exposed bedrock along ridgelines and that this may result in rockfalls or instabilities in areas where the rock is marginally stable. This would in turn adversely impact the three rock shelters directly above the proposed longwalls. They suggested that the likelihood of a rock fall or instability is difficult to fully quantify, but is affected by factors that include jointing, inclusions, weaknesses within the rock mass, groundwater pressure and seepage flow behind the rockface. As part of their report, they assessed that:

‘..between approximately 7 % and 10 % of the total length, or between 3% and 5% of the total face area of the cliffs located directly or partially above the proposed longwalls would be impacted by the mining of these longwalls.’ (MSEC 2022).

They concluded that the potential for mining-induced fracturing to cause adverse impacts on the three rock shelters directly above the proposed longwalls was unlikely (less than 10 % probability) for each of the sites. Five additional rock shelters are located outside of the proposed longwalls and within the 35° angle of draw. These are Upper Avon 51 [AHIMS ID # 52-2-1756], Upper Avon 52 [AHIMS ID # 52-2-1757], Upper Avon 55 [AHIMS ID # 52-2-1759], Upper Avon 43 [AHIMS ID # 52-2-1780] and Dendrobium ACHA Shelter-4 [AHIMS ID # Pending]. These sites are predicted to experience vertical subsidence of less than 20 mm, apart from Upper Avon 55 [AHIMS ID # 52-2-1759] which is predicted to experience vertical subsidence of 30 mm.

Though these sites are expected to experience some vertical subsidence, they are not expected to experience measurable conventional tilts, curvatures, strains or valley- related subsidence or compressive strains (MSEC 2022).

The remaining nine rock shelters are located outside of the 35° angle of draw but within the 600 m buffer from the proposed longwalls. These include Donald Castle Creek Site 6 [AHIMS ID # 52-2-1567], Donald Castle Creek Site 9 [AHIMS ID # 52-2-1570], Donald Castle Creek Site 30 [AHIMS ID # 52-2-1591], Upper Avon 47 [AHIMS ID # 52-2-1752], Upper Avon 48 [AHIMS ID # 52-2-1753], Upper Avon 49 [AHIMS ID # 52-2-1754], Upper Avon 50 [AHIMS ID # 52-2-1755], Upper Avon 46 [AHIMS ID # 52-2-1761] and Dendrobium ACHA Shelter-3 [AHIMS ID # Pending]. These sites range in distances from 230 m and 470 m from the mining area and are not predicted to experience measurable conventional subsidence or valley-related effects (MSEC 2022).

Table 22 provides the subsidence predictions for the rock shelter sites within the Subject Area.

Table 22: Subsidence Predictions for the Rock Shelters within the Subject Area

AHIMS ID	Site Name	Scientific Significance	Maximum predicted total vertical subsidence (mm)	Maximum predicted total tilt (mm/m)	Maximum predicted total hogging curvature (km ⁻¹)	Maximum predicted total sagging curvature (km ⁻¹)
52-2-1567	Donald Castle Creek Site 6	Low	<20	<0.5	<0.01	<0.01
52-2-1570	Donald Castle Creek Site 9	Low	<20	<0.5	<0.01	<0.01
52-2-1591	Donald Castle Creek Site 30	Low	<20	<0.5	<0.01	<0.01
52-2-1747	Upper Avon 53	Low	1750	12	0.13	0.18
52-2-1752	Upper Avon 47	High	<20	<0.5	<0.01	<0.01
52-2-1753	Upper Avon 48	Low	<20	<0.5	<0.01	<0.01
52-2-1754	Upper Avon 49	High	<20	<0.5	<0.01	<0.01
52-2-1755	Upper Avon 50	Low	<20	<0.5	<0.01	<0.01
52-2-1756	Upper Avon 51	Low	<20	<0.5	<0.01	<0.01
52-2-1757	Upper Avon 52	Low	<20	<0.5	<0.01	<0.01
52-2-1759	Upper Avon 55	Low	30	1.5	0.06	<0.01
52-2-1761	Upper Avon 46	Low	<20	<0.5	<0.01	<0.01
52-2-1780	Upper Avon 43	High	<20	<0.5	<0.01	<0.01
52-2-1782	Upper Avon 45	Low	875	15	0.25	0.30
52-2-3955	M2D PAD 2	Low	1600	8	0.1	0.17
AHIMS Pending	Dendrobium ACHA Shelter-3	Low	<20	<0.5	<0.01	<0.01
AHIMS Pending	Dendrobium ACHA Shelter-4	Low	<20	<0.5	<0.01	<0.01

13.3.3 Axe Grinding Grooves

There is a total of 13 grinding groove sites identified within the Subject Area, including one previously unrecorded grinding groove site. Three of these axe grinding groove sites (Donald Castle Creek Site 5 [AHIMS ID # 52-2-1566], Donald Castle Creek 31 [AHIMS ID # 52-2-1592] and Upper Avon 54 [AHIMS ID#52-2-1758]) are located above the proposed longwalls. MSEC (2022) has predicted that these sites are likely to experience “up to 1550 mm vertical subsidence, 11 mm/m tilt, 0.25 km⁻¹ hogging curvature and 0.17 km⁻¹ sagging curvature”.

The extraction of the proposed longwalls is likely to result in the fracturing of exposed bedrock along waterways. The fracturing is “expected to occur predominately above the proposed longwalls and, to lesser extents, outside the longwalls and within the 35° angle of draw. Minor and isolated fracturing could occur up to approximately 400 m from the proposed longwalls” (MSEC 2022). The potential for mining- induced fracturing causing adverse impacts to these three grinding groove sites (Donald Castle Creek Site 5 [AHIMS ID # 52-2-1566], Donald Castle Creek 31 [AHIMS ID # 52-2-1592] and Upper Avon 54 [AHIMS ID#52-2-1758]) directly above the longwalls has been assessed as unlikely (less than 10%) (MSEC 2022).

A further seven grinding groove sites are located outside the proposed longwalls and within the 35° angle of draw. These sites are Donald Castle Creek Site 7 [AHIMS ID # 52-2-1568], Ricki Lee 1 [AHIMS ID # 52-2-1729], Ricki Lee 2 [AHIMS ID # 52-2-1730], Upper Avon 42 [AHIMS ID # 52-2-1779], Upper Avon 44 [AHIMS ID # 52-2-1781], Dendrobium ACHA AGG-4 [AHIMS ID # 52-2-4465] and Dendrobium ACHA AGG-1 [AHIMS ID # 52-2-4468].

These sites are located between 30 m and 230 m outside of the mining area and are predicted to experience vertical subsidence of less than 20 mm, apart from Donald Castle Creek Site 7 [AHIMS ID # 52-2-1568] which is predicted to experience vertical subsidence of 40 mm (MSEC 2022). They are not expected to experience measurable conventional tilts, curvatures or strains, but may experience compressive strains due to valley closure effects in the order of 2 mm/m. The potential for mining-induced fracturing to cause adverse impacts on these six grinding sites has been assessed as rare (less than 5%) (MSEC 2022).

The remaining three sites are located outside of the 35° angle of draw. These include Dendrobium ACHA AGG-3 [AHIMS ID # 52-2-4466], ACHA AGG-2 [AHIMS ID # 52-2-4467] and Dendrobium ACHA AGG-5 [AHIMS ID # Pending]. At distances of between 270 m and 510 m outside of the mining area, they are not predicted to experience measurable conventional subsidence effects but may experience compressive strains due to valley closure effects in the order of 0.5 mm/m. The potential for mining-induced fracturing to cause adverse impacts on these three grinding groove sites has been assessed as very rare (less than 1%) (MSEC 2022).

Table 23 provides the subsidence predictions for axe grinding groove sites within the Subject Area.

Table 23: Subsidence Predictions for Grinding Groove Sites within the Subject Area

AHIMS ID	Site Name	Scientific Significance	Maximum Predicted Total Vertical Subsidence (mm)	Maximum Predicted Total Tilt (mm/m)	Maximum Predicted Hogging Curvature (km ⁻¹)	Maximum Predicted Sagging Curvature (km ⁻¹)
52-2-1566	Donald Castle Creek Site 5	Low	475	11.0	0.25	0.09
52-2-1568	Donald Castle Creek Site 7	Low	40	0.5	0.02	<0.01
52-2-1592	Donald Castle Creek Site 31	Low	1550	8.0	0.09	0.17
52-2-1729	Ricki Lee 1	Low	<20	<0.5	<0.01	<0.01

AHIMS ID	Site Name	Scientific Significance	Maximum Predicted Total Vertical Subsidence (mm)	Maximum Predicted Total Tilt (mm/m)	Maximum Predicted Hogging Curvature (km ⁻¹)	Maximum Predicted Sagging Curvature (km ⁻¹)
52-2-1730	Ricki Lee 2	Moderate	<20	<0.5	<0.01	<0.01
52-2-1758	Upper Avon 54	Low	875	3.5	0.14	0.05
52-2-1779	Upper Avon 42	Low	<20	<0.5	<0.01	<0.01
52-2-1781	Upper Avon 44	Low	<20	<0.5	<0.01	<0.01
52-2-4465	Dendrobium ACHA AGG-4	Low	<20	<0.5	<0.01	<0.01
52-2-4466	Dendrobium ACHA AGG-3	Low	<20	<0.5	<0.01	<0.01
52-2-4467	Dendrobium ACHA AGG-2	Low	<20	<0.5	<0.01	<0.01
52-2-4468	Dendrobium ACHA AGG-1	Low	<20	<0.5	<0.01	<0.01
AHIMS Pending	Dendrobium ACHA AGG-5	Low	<20	<0.5	<0.01	<0.01

13.4 Summary of Potential Impacts

For the purposes of this ACHA, some Aboriginal heritage sites located within the underground investigation areas have the potential to be impacted by subsidence. Table 24 provides a summary of the potential impacts of the Project on Aboriginal heritage sites within the Subject Area, including the potential type of impact on each site (i.e., surface impacts, subsidence impacts or no impacts).

Table 24: Summary of Potential Impacts of the Project on Aboriginal Heritage Sites and Summary of Potential Harm

AHIMS ID	Site Name	Site Type	Scientific Significance	Impact Type	Likelihood of Impact	Type of Harm (Direct/Indirect/None) ¹	Degree of Harm (Total/Partial/None)	Consequences of Harm (Total Loss of Value/Partial Loss of Value/No Loss of Value) ²
52-2-4468	Dendrobium ACHA AGG-1	Axe Grinding Groove	Low	Potential subsidence	Rare (less than 5%)	Indirect	Partial	Partial Loss of Value (aesthetic/visual)
52-2-4467	Dendrobium ACHA AGG-2	Axe Grinding Groove	Low	Potential subsidence	Very rare (less than 1%)	Indirect	Partial	Partial Loss of Value (aesthetic/visual)
52-2-4466	Dendrobium ACHA AGG-3	Axe Grinding Groove	Low	Potential subsidence	Very rare (less than 1%)	Indirect	Partial	Partial Loss of Value (aesthetic/visual)
52-2-4465	Dendrobium ACHA AGG-4	Axe Grinding Groove	Low	Potential subsidence	Rare (less than 5%)	Indirect	Partial	Partial Loss of Value (aesthetic/visual)
Pending	Dendrobium ACHA AGG-5	Axe Grinding Groove	Low	Potential subsidence	Very rare (less than 1%)	Indirect	Partial	Partial Loss of Value (aesthetic/visual)
52-2-1566	Donald Castle Creek Site 5	Axe Grinding Groove	Low	Potential subsidence	Unlikely (less than 10%)	Direct	Partial	Partial Loss of Value (aesthetic/visual)
52-2-1568	Donald Castle Creek Site 7	Axe Grinding Groove	Low	Potential subsidence	Rare (less than 5%)	Indirect	Partial	Partial Loss of Value (aesthetic/visual)
52-2-1592	Donald Castle Creek Site 31	Axe Grinding Groove	Low	Potential subsidence	Unlikely (less than 10%)	Direct	Partial	Partial Loss of Value (aesthetic/visual)
52-2-1729	Ricki Lee 1	Axe Grinding Groove	Low	Potential subsidence	Rare (less than 5%)	Indirect	Partial	Partial Loss of Value (aesthetic/visual)
52-2-1730	Ricki Lee 2	Axe Grinding Groove	Moderate	Potential subsidence	Rare (less than 5%)	Indirect	Partial	Partial Loss of Value (aesthetic/visual)
52-2-1779	Upper Avon 42	Axe Grinding Groove	Low	Potential subsidence	Rare (less than 5%)	Indirect	Partial	Partial Loss of Value (aesthetic/visual)
52-2-1781	Upper Avon 44	Axe Grinding Groove	Low	Potential subsidence	Rare (less than 5%)	Indirect	Partial	Partial Loss of Value (aesthetic/visual)
52-2-1758	Upper Avon 54	Axe Grinding Groove	Low	Potential subsidence	Unlikely (less than 10%)	Direct	Partial	Partial Loss of Value (aesthetic/visual)

AHIMS ID	Site Name	Site Type	Scientific Significance	Impact Type	Likelihood of Impact	Type of Harm (Direct/Indirect/None) ¹	Degree of Harm (Total/Partial/None)	Consequences of Harm (Total Loss of Value/Partial Loss of Value/No Loss of Value) ²
52-2-3204	Avon Dam IF1	Isolated Find	Low	Potential subsidence	Very rare (less than 1%)	Indirect	Partial	Partial Loss of Value (aesthetic/visual)
52-2-1567	Donald Castle Creek Site 6	Shelter with Art	Low	Potential subsidence	Very rare (less than 1%)	Indirect	Partial	Partial Loss of Value (aesthetic/visual)
52-2-1570	Donald Castle Creek Site 9	Shelter with Art	Low	Potential subsidence	Very rare (less than 1%)	Indirect	Partial	Partial Loss of Value (aesthetic/visual)
52-2-1591	Donald Castle Creek Site 30	Shelter with Art	Low	Potential subsidence	Very rare (less than 1%)	Indirect	Partial	Partial Loss of Value (aesthetic/visual)
52-2-1780	Upper Avon 43	Shelter with Art	High	Potential subsidence	Rare (less than 5%)	Indirect	Partial	Partial Loss of Value (aesthetic/visual)
52-2-1782	Upper Avon 45	Shelter with Art	Low	Potential subsidence	Unlikely (less than 10%)	Direct	Partial	Partial Loss of Value (aesthetic/visual)
52-2-1753	Upper Avon 48	Shelter with Art	Low	Potential subsidence	Very rare (less than 1%)	Indirect	Partial	Partial Loss of Value (aesthetic/visual)
52-2-1755	Upper Avon 50	Shelter with Art	Low	Potential subsidence	Very rare (less than 1%)	Indirect	Partial	Partial Loss of Value (aesthetic/visual)
52-2-1756	Upper Avon 51	Shelter with Art	Low	Potential subsidence	Rare (less than 5%)	Indirect	Partial	Partial Loss of Value (aesthetic/visual)
52-2-1761	Upper Avon 46	Shelter with Art and Deposit	Low	Potential subsidence	Very rare (less than 1%)	Indirect	Partial	Partial Loss of Value (aesthetic/visual)
52-2-1752	Upper Avon 47	Shelter with Art and PAD	High	Potential subsidence	Very rare (less than 1%)	Indirect	Partial	Partial Loss of Value (aesthetic/visual)
52-2-1747	Upper Avon 53	Shelter with Art and PAD	Low	Potential subsidence	Unlikely (less than 10%)	Direct	Partial	Partial Loss of Value (aesthetic/visual)
52-2-1759	Upper Avon 55	Shelter with Art and PAD	Low	Potential subsidence	Rare (less than 5%)	Indirect	Partial	Partial Loss of Value (aesthetic/visual)
Pending	Dendrobium ACHA Shelter-3	Shelter with Art and PAD	Low	Potential subsidence	Very rare (less than 1%)	Indirect	Partial	Partial Loss of Value (aesthetic/visual)

AHIMS ID	Site Name	Site Type	Scientific Significance	Impact Type	Likelihood of Impact	Type of Harm (Direct/Indirect/None) ¹	Degree of Harm (Total/Partial/None)	Consequences of Harm (Total Loss of Value/Partial Loss of Value/No Loss of Value) ²
Pending	Dendrobium ACHA Shelter-4	Shelter with Art and PAD	Low	Potential subsidence	Rare (less than 5%)	Indirect	Partial	Partial Loss of Value (aesthetic/visual)
52-2-1754	Upper Avon 49	Shelter with Deposit	High	Potential subsidence	Very rare (less than 1%)	Indirect	Partial	Partial Loss of Value (aesthetic/visual)
52-2-1757	Upper Avon 52	Shelter with Deposit	Low	Potential subsidence	Rare (less than 5%)	Indirect	Partial	Partial Loss of Value (aesthetic/visual)
52-2-3955	M2D PAD 2	Shelter with PAD	Low	Potential subsidence	Unlikely (less than 10%)	Direct	Partial	Partial Loss of Value (aesthetic/visual)

¹ Sites located outside the predicted 20mm subsidence contour, with the exception of those located near or within valley bases for example axe grinding grooves are unlikely to experience direct or indirect impacts. Sites located near valley bases could potentially be affected by valley closure effects. Minor and isolated fracturing have been observed up to 400 m away from mining within the Southern Coalfield. The likelihood of the fracture to be coincidence with the sites located outside the Subject Area is considered to be very low. As a result, indirect harm is attributed in this case as it is an impact to the surrounding landscape as opposed to the actual Aboriginal cultural heritage site.

² The code does not provide definitions for these categories; however, they are taken to mean:
 Type of harm: Direct- the object will or may be subject to direct physical disturbance. Indirect- there may be secondary consequences from the activity, resulting in harm. None- neither the object nor its context will be altered.
 Degree of harm: Total: the object(s) will be directly harmed in their entirety. Partial- some objects will be directly or indirectly harmed; however, a portion of a site may remain unaffected. None- there will be no harm.
 Consequence of harm: Total loss of value- no heritage values will remain subsequent to the harm. Partial loss of value- some heritage values will remain subsequent to the harm. No loss of value- there will be no harm, and no loss of value.

13.4.1 Potential Harm

The *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW* (OEH 2011) requires that both direct and indirect harm be considered. Generally, direct harm refers to occasions where an activity physically impacts a site or objects and therefore affects the heritage values possessed by the site or objects. Indirect harm is usually taken to mean harm stemming from secondary consequences of the activity and may affect sites or objects as a consequence of the activity. Examples of such indirect harm are increased visitors to a site, or increased erosion in an area.

The Project has the potential to harm Aboriginal objects and Aboriginal cultural values during both the development phase and the operational phase. During the development phase potential harm and impacts may result from the development of surface infrastructure (e.g., land clearing and ground disturbance for the establishment of transport corridors and facilities), although no known Aboriginal heritage sites were identified within the proposed surface disturbance areas for the Project. During the operational phase of the Project potential harm and impacts may be derived from subsidence induced ground movements and may also be derived from any works associated with subsidence remediation or ancillary infrastructure such as goaf gas drainage or environmental monitoring locations.

As required by the Code of Practice (DECCW 2010b), the likely impacts (and partial loss of value) to Aboriginal heritage sites as a result of the Project is presented in Table 24.

13.5 Potential Cumulative Impacts

The Project would cause a minor increase to the cumulative development impact on the Aboriginal cultural heritage of the region and local area. The Aboriginal heritage of the area has had limited impacts to it due to the area being used as a water catchment for the past 100 years. Sites that have been impacted within the catchment area have, for the large majority, been impacted by subsidence that is a result of longwall mining or by environmental processes. During the consultation process for this project in regards to potential cumulative impact, a representative of the Illawarra Local Aboriginal Land Council noted that:

Connection between sites is an important aspect of the cultural significance that needs to be considered in the Aboriginal Cultural Heritage Assessment, for example the link between the waterways that provided the resources and the shelter sites that were used by Aboriginal people for occupation.

Within the Southern Coalfield, Sefton (2000) conducted a long-term monitoring program that reviewed the effects of longwall mining to sandstone shelter sites over a ten-year period. During the assessment Sefton monitored 52 Aboriginal sites; prior to, during and after longwall mining had been completed (Sefton 2000:15). The results of this study were:

- Five of the 52 sites monitored during the assessment (Sefton 2000) had evidence of impacts that related to longwall extraction methods.
- Impacts associated with longwall mining can be grouped into four distinct categories:
 - cracking;
 - movement along existing joints and/or bedding planes;
 - changes to the water seepage patterns through the sandstone; and
 - blockfalls.
- Elements of shelters that were associated with the highest risk of impact were:
 - Size of the overhang, including the length of the ridgeline.

- Wetness of the overhang.
 - Location in regard to the valley base.
 - Location of the shelter, in regard to the goaf.
 - Shelters formed through blockfall.
- During Sefton’s monitoring program, there were no collapsed shelters identified.
 - No shelters with an area of less than 50 cubic metres (m³) had been impacted due to subsidence.
 - Not all shelters that were identified as being larger than 50 m³ had been impacted.
 - Any impacts caused by subsidence were not observed until at least three months after the completion of extraction.
 - ‘The over-riding factor which appears to be significant is overhang size, where large overhangs are at greater risk’ (Sefton 2000:38).

The *Impacts of Underground Coal Mining on Natural Features in the Southern Coal Field: Strategic Review* (NSW Department of Planning 2008) considered past and potential impacts of mine related subsidence on significant natural features within the Southern Coalfield. The objectives of the inquiry were to:

- Undertake a review of the impacts of longwall extraction within the Southern Coalfields significant natural features (rivers, significant streams, swamps and cliff lines), concentrating on risks to water flow, quality and ecosystems.
- Provide advice on best practise in regard to subsidence impacts, avoidance and/or minimising impacts on significant natural features; as well as the management, monitoring and remediation of any adverse effects.
- Report on the social and economic significance of the coal resources within the region.

In relation to Aboriginal heritage the summary of the report states that ‘Aboriginal heritage sites are most at risk of subsidence impacts where they are located in cliff lines and/or rock overhangs. The Panel was not made aware of any significant impacts having occurred on Aboriginal heritage features in the Southern Coalfields since the 1980s’ (NSW Department of Planning 2008: 2).

Impacts on natural features such as cliff lines, watercourses and valleys were described during the inquiry as having been associated with ‘non-conventional’ subsidence (NSW Department of Planning 2008: 82). The measures for predicting valley closure and upsidence were judged to be the most valuable when determining impacts on these landforms.

The *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW* (OEH 2011) defines ecologically sustainable development and inter-generational equity as follows, ‘the principle of inter-generational equity holds that the present generation should make every effort to ensure the health, diversity and productivity of the environment – which includes cultural heritage – is available for the benefit of future generations. When considered against the principles of inter-generational equity and ecologically sustainable development, the potential impacts of the Project can be considered relatively minor because they directly harm only a relatively small number of sites, one of moderate scientific value, one of high significance and the remaining being of low scientific value. There is no significant detrimental effect to quality or benefit that the Aboriginal history and archaeology of the Subject Area may provide to future generations. There is reciprocal cumulative growth of the understanding of the Subject Area’s history and prehistory which provides some amelioration of any adverse impacts, and which provides knowledge and information for future generations.

13.5.1 Potential Cumulative Impacts - Within the Southern Coalfield

Since the monitoring work completed by Sefton between 1990 and 2000, archaeological monitoring programs have continued in the Southern Coalfield at the majority of underground mines. Monitoring programs have been undertaken at the Dendrobium Mine and at Tower, Appin, West Cliff, Elouera, Cordeaux, Tahmoor and Metropolitan Collieries. The following discussion outlines the results of these monitoring programs in comparison to Sefton’s original conclusions.

Aboriginal cultural heritage site monitoring programs have been developed and implemented across the Southern Coalfield in the past 22 years (Biosis Research 2008, 2009a, 2009b, 2009c, 2011, 2013, 2015, EMM 2020, Gun and Kayandel Archaeological Services 2007, Kayandel Archaeological Services 2012, Niche 2011, 2012, 2013a, 2013b, 2013c, 2014a, 2014b, 2014c, 2015a, 2015b, 2015c, 2016a, 2016b, 2016c, 2017a and 2017b and Sefton 2000, 2002a, 2002b, 2002c). The methodology of these programs is very similar to that outlined in Sefton (2000). Initial baseline recording is completed on those sites that are identified by subsidence consultants as having potential to be affected by subsidence. Site types that are subject to baseline recording in the Southern Coalfield include sandstone shelter sites with art and/or PAD, stone artefacts, deposits, engravings and sandstone platforms that include engravings (often of animals, humans, anthropomorphic figures and ancestral beings) and/or axe grinding grooves. Sandstone platform sites can be located within creek and riverbeds on large plateaus, often within or at the edge of swamps on platforms that make up shelter roofs. Stone artefact scatters, isolated artefacts and scarred trees are often not monitored routinely as they are highly unlikely to be affected by subsidence, and hence the risk attributed to these site types is negligible.

At the completion of baseline recording, Aboriginal cultural heritage sites are often monitored a second time in line with the individual project’s monitoring requirements, generally within 6 months of the completion of a longwall extraction. Monitoring programs are generally continued in this fashion until the Aboriginal cultural heritage site is no longer subject to subsidence movements.

Within the Southern Coalfield a total of 244 Aboriginal cultural heritage sites have been monitored since 1990. The site types that have been monitored are outlined in Table 25 below.

Table 25: Aboriginal cultural heritage site types monitored within the Southern Coalfield

Site type	Number of type	Percentage
Sandstone Shelter with Art	116	48%
Sandstone Shelter with Deposit	38	16%
Sandstone Shelter with Art and Deposit	34	14%
Single Axe Grinding Groove	4	2%
Axe Grinding Grooves	17	7%
Engraving	1	0.4%
Scarred Tree	1	0.4%
Sandstone Shelter with Art, Deposit and Axe Grinding Groove	3	1%
Shelter with Art and PAD	4	2%
Sandstone Shelter with PAD	23	9%
Sandstone Shelter with Art, PAD and Deposit	1	0.4%
Shelter with Art, Axe Grinding Grooves and PAD	1	0.4%
Sandstone Shelter with Deposit and PAD	1	0.4%
Totals	244	100%

Of the 244 Aboriginal cultural heritage sites monitored, 25 sites were identified as having impacts or changes that may be attributable to subsidence, environmental factors or a combination of both (Table 26). This number equates to approximately 10.2 % of all the Aboriginal cultural heritage sites monitored.

Table 26: Aboriginal sites within the Southern Coalfields observed to have subsidence related changes, during monitoring programs

AHIMS number	Site name	Site type	Observed changes/ impacts	Is the art panel or heritage value affected	Reference
52-2-0094	Flat Rock Creek 4	Sandstone shelter with art	Opening of existing bedding planes, along the roof/ rear wall and minor roof fall.	No	Kayandel Archaeological Services 2008
52-2-0106	Flat Rock Creek 10	Sandstone shelter with art	Cracks in rear wall, potential for altered seepage to impact art- mitigated with an artificial dripline.	No	Kayandel Archaeological Services 2008
52-2-0089	Flat Rock Creek 11	Sandstone shelter with art	Exfoliation and block fall at rear wall.	No	Kayandel Archaeological Services 2008
52-2-0154	Flat Rock Creek 49	Sandstone shelter with art	Minor block fall from rear wall and ceiling.	No	Kayandel Archaeological Services 2008
52-2-0258	Flat Rock Creek 57	Sandstone platform with engraving and axe grinding grooves	Crack in sandstone platform.	No	Kayandel Archaeological Services 2008
52-2-0176	Flat Rock Creek 152	Sandstone shelter with art	Cracking and minor block fall at rear wall.	No	Sefton 2000 and Kayandel Archaeological Services 2008
52-2-1638	Browns Road Site 24	Sandstone shelter with art	Minor block fall at rear wall.	No	Sefton 2000
52-2-1625	Browns Road Site 10	Sandstone shelter with art	Cracking and minor blockfall at rear wall.	No	Sefton 2000
AHIMS number could not be confirmed	Wedderburn Road 1	Sandstone shelter with art	Cracking in floor and rear wall.	No	Sefton 2000

AHIMS number	Site name	Site type	Observed changes/ impacts	Is the art panel or heritage value affected	Reference
52-2-1300	Wedderburn Road 2	Sandstone Shelter with art	Opening of crack in back wall.	No	Sefton 2000
52-2-1162	Stokes Creek Site 67	Sandstone shelter with art	Opening of the bedding plane above the art and increased water seepage as a result.	No	Sefton 2000
52-2-2252	Dendrobium 4	Sandstone shelter with art	Opening of crack along the back wall.	No	Comur 2009
52-2-0195	Flat Rock Creek 34	Sandstone shelter with art	Horizontal cracking visible on the ceiling of the shelter. Cracking occurred over the most southern hand stencil on the back panel. Crack across hand stencil 40cm long. Crack along the roof of the shelter 1-2.5 m off ground, and 5 m long.	Yes ¹	Niche 2017b
52-2-3083	Flat Rock Creek 281	Sandstone shelter with art	Thin cracking adjacent to the hand stencil at the northern end of the shelter.	Yes ¹	Kayandel Archaeological Services 2012
52-2-3086	Flat Rock Creek 284	Sandstone shelter with art	Fractured a corner of a buttress-like formation on the rear wall.	No	Kayandel Archaeological Services 2012
52-2-2243	Georges River No. 2	Sandstone shelter with art	Thin vertical cracking in the shelter ceiling, adjacent to the art panel.	No	Niche 2013a
52-2-0396	Flat Rock Creek 15	Sandstone shelter with art	The large vertical fissure in the central back wall had increased in width (opened) and shifted laterally.	No	Niche 2013b
52-2-2244	Georges River No.3	Sandstone shelter with art and axe grinding grooves	Opening of the horizontal bedding plane. Cracking and exfoliation along the back wall.	No	Niche 2014
AHIMS number could not be confirmed	MET 1	Sandstone shelter with art	Vertical cracking and cracks along the roof.	No	Niche 2015a
52-2-0826	Flat Rock Creek 176	Sandstone shelter with art	Vertical cracking at the northern and southern ends of the shelter.	No	Niche 2015b
52-2-3077	Flat Rock Creek 275	Sandstone shelter with art	The horizontal bedding plane joins along the back of the shelter have been noted as opening, three hairline cracks have formed, running vertical from the bedding plane.	No	Niche 2016a

AHIMS number	Site name	Site type	Observed changes/ impacts	Is the art panel or heritage value affected	Reference
52-2-3486	Flat Rock Creek 301	Sandstone platform with axe grinding groove	A large crack was observed running east to west along the entire rock platform. Crack is approximately 3.08 m to the north of the grinding groove and is approximately 25 m long and continues past the rock platform.	No	Niche 2017a
52-2-3645	DM 21	Sandstone Shelter with Art	The landscape surrounding the shelter site has experienced a range of subsidence impacts from the extraction of Longwall 15 such as localised rockfalls to the upper ridgelines (South 32 2020). The northern exterior of the shelter has experienced fracturing as result of subsidence from the extraction of Longwall 15. Four main instances of vertical and diagonal cracking were observed. The largest crack at the base of the ridgeline measures 3.7 cm in width. The interior cavern of the shelter did not have any direct impacts from subsidence.	No	Niche 2019 and Niche 2020
52-2-2068	Stonequarry Creek 1, SC-1	Sandstone platform with axe grinding grooves	Fracturing to the rock bar which has lead to rock shearing off the platform	No	EMM 2021

¹The sites highlighted have experienced adverse consequences as a result of mining that are highlighted in their individual projects TARP. This means that the art panels at these sites have experienced cracking.

Twenty-one of the Aboriginal heritage sites in Table 26 sustained structural effects¹ to either the sandstone shelter or the sandstone platform, with eight of these sites having also sustained environmental effects such as, root jacking from trees growing on top of the shelter, water seepage as a result of this root jacking and natural wind and bush fire exposure and micro and macro fauna growth within shelters. The effects at two sites could not be attributed decisively as either subsidence or environmental.

Of the 25 sites identified as having impacts attributable to subsidence (Table 26), two are noted as having adverse consequences to the physical fabric which supports the sites heritage values as a result of underground mining. These adverse consequences were cracking that occurred across or adjacent to the art panels. The cracks adjacent to art panels have caused changes to water seepage above the panel, causing water flow to redirect over the art. The percentage of sites with impacts to art panels in this instance is approximately 1% of the 144 sites with art, assessed across the southern coalfield considerably less than the 10% originally predicted by Sefton in 2000. The remaining twenty-three sites have experienced subsidence related impacts to their structure (either the sandstone shelter or rock platform), which equates to approximately 10% of all Aboriginal sites monitored within the Southern Coalfield.

The smaller observed number of adverse consequences on heritage values compared to the predictions of Sefton (2000) could be an indicator of a number of things not originally considered in the study. Sefton's initial sample size was much less than the total number of Aboriginal heritage sites currently being monitored within the Southern Coalfield, as sandstone shelter sites with PAD and/or deposit as well as sandstone platforms with engravings and/or axe grinding grooves were not originally considered for monitoring due to the lack of predicted impacts to these site types.

Potential cumulative impacts to Aboriginal cultural heritage values as a result of the Project should consider the aforementioned monitoring programs in conjunction with the data provided for the Subject Area by MSEC (2022) (Section 13.3). There are 31 Aboriginal cultural heritage sites located within the Subject Area, six of which (three rock shelter sites and three axe grinding groove sites) are located directly over proposed longwalls. As 31 Aboriginal cultural heritage sites identified are within the 600 m buffer of the proposed longwalls for the Subject Area, it is recommended that these sites would be added to future monitoring programs bringing the total number of sites monitored in the Southern Coalfield to 237.

¹ In the case of Aboriginal Heritage Trigger Action Responses, for the purposes of End of Panel assessments within the Southern Coalfields structural effects are not constituted as harm, as it does not effect the art panel.

13.5.2 Potential Cumulative Impacts - Within the Dendrobium Mine Area

As demonstrated in Table 26, there have been three Aboriginal cultural heritage sites (Dendrobium 4 [AHIMS ID #52-2-2252], Browns Road Site 11 [AHIMS ID#52-2-1626] and DM 21 [AHIMS ID#52-2-3645]) impacted as a result of subsidence movements at Dendrobium Mine. Dendrobium 4 (AHIMS ID #52-2-2252) has had impacts recorded along the back wall and horizontal bedding planes of the sandstone shelter (Comur 2009). Browns Road Site 11 (AHIMS ID#52-2-1626) experienced cracking at the southern end of the shelter, as well as some minor block fall (as outlined in Table 26). DM 21 (AHIMS ID#52-2-3645) has had cracking occur on the northern exterior of the shelter, the interior of the cavern did not have any direct impacts from subsidence. This movement did not affect the art located within each of these shelters. Adding the 31 sites identified within the Subject Area for this ACHA, there would be a total of 85 sites monitored for the Mine.

14 Management and mitigation measures

14.1 Conservation Principles and Management Framework

The two founding principles behind the *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW* (OEH 2011:12) are ecologically sustainable development and intergenerational equity. These principles hold that “the present generation should make every effort to ensure the health, diversity and productivity of the environment – which includes cultural heritage – is available for the benefit of future generations”.

The strong emphasis, as in the Burra Charter, is to quantify and understand the heritage values of a place, a site, or an object and exhaust avenues of avoiding harm to those values. If harm cannot be avoided, then there must be consideration and implementation of strategies to minimise harm (OEH 2011:13).

It follows that the hierarchy for consideration in regard to management strategies available for surface stone artefacts and subsurface stone artefacts and areas of archaeological potential, fall into four general categories, in order of preference from a conservation perspective:

- avoidance and *in-situ* conservation.
- partial avoidance and partial *in-situ* conservation (includes partial harm);
- harm caused with mitigating circumstances such as collection or salvage; and
- unmitigated harm.

The four general categories (described above) have been considered in the following subsections with regard to both direct impacts (e.g., surface disturbance) and indirect impacts (e.g., monitoring activities).

The management and mitigation measures have been prepared in consideration of comments received from the RAPs during the consultation process. These comments include those related to cultural considerations surrounding salvage works and the handling of artefactual materials, as well as the cultural significance of all sites. All comments received from the RAPs are considered in Section **3 of the ACHA**.

Where possible, harm to sites will be avoided and sites will be retained *in situ*.

14.1.1 Detailed Design to Avoid Harm

The surface infrastructure proposed by IMC would avoid all known Aboriginal heritage sites, including rock shelters, grinding grooves and natural landscape features. During detailed design of proposed ventilation shaft site and the location of any other surface and ancillary infrastructure, it is recommended IMC give consideration to the known Aboriginal heritage sites identified by this study. This process should include a consideration of whether or not surface infrastructure can be designed in a way that avoids harm, and if harm cannot be avoided that harm be caused to as few sites as possible, within existing design and operational constraints. Depending on the site type (e.g., artefact scatter or grinding groove) and scientific significance rating, further management measures such as archival recording and fencing may be undertaken prior to harm, in consultation with a suitably qualified archaeologist and representatives of the RAPs.

Avoidance of key surface features associated with Aboriginal heritage values has been incorporated into the design of the Project. The surface infrastructure proposed by IMC would avoid all previously identified Aboriginal heritage sites, including rock shelters, grinding grooves and natural significant landscape features. IMC has proposed a Project design that would:

- not longwall mine beneath 3rd, 4th and 5th order (or above) streams;
- not longwall mine beneath previously identified high archaeological (scientific) significance Aboriginal heritage sites;
- set longwall mining at a distance of at least 400 m from named watercourses (i.e. the Avon River, Cordeaux River, Donalds Castle Creek and Wongawilli Creek);
- avoid longwall mining beneath identified key stream features;
- avoid longwall mining beneath “Area 4” swamp cluster; and
- use existing infrastructure (namely the Dendrobium Pit Top, Kemira Valley Coal Loading Facility, Kemira Valley Rail Line, Dendrobium CPP, Shaft Sites Nos 1, 2 and 3 and the West Cliff Stage 3 Coal Wash Emplacement) which would reduce the requirement for additional surface disturbance.

This approach is consistent with the Heritage NSW requirements of ecologically sustainable development and intergenerational equity.

14.1.2 Subsidence Monitoring

Subsidence monitoring prior to and after longwall mining should be implemented for Aboriginal heritage sites within the Subject Area that may be subject to impacts from mining induced subsidence. The subsidence monitoring program should be in accordance with the relevant approved Extraction Plan and Aboriginal Heritage Management Plan (AHMP). Monitoring should be undertaken by a suitably qualified archaeologist and representatives of the RAPs.

15 Recommendations

Based on the scientific significance of the Aboriginal heritage sites presented in Section 6 of the ACHA, the impact assessment presented in Section 7 of the ACHA and the suggested management and mitigation measures outlined in Section 8 of the ACHA, the following draft recommendations are made regarding the Aboriginal heritage sites within the Subject Area. Finalised recommendations will be presented after the consultation with the RAPs in regard to the report and assessment is completed.

Table 27: Recommendations

Recommendations	
1.	Protocols for the involvement of the RAPs in cultural heritage works conducted under the AHMP. This protocol should focus on members of the RAPS identified during this ACHA's consultation process.
2.	A communications protocol that describes clear methods of communication, including expectations of suitable notification and response time, between the proponent and the RAPs.
3.	A protocol to allow for reasonable access to identified significant Aboriginal heritage sites (noting that access is also subject to the requirements of WaterNSW).
4.	Procedures to establish, maintain and update a current GIS database of Aboriginal heritage sites identified within the Subject Area (i.e., the Project Sites Database).
5.	A protocol for the determination of the final location of ancillary infrastructure, including systematic survey of the relevant area(s) (in consultation with the RAPs) if the area has not already been surveyed.
6.	A subsidence monitoring program to be implemented progressively over the life of the Project. The subsidence monitoring program should include monitoring of all Aboriginal sandstone shelter sites and grinding groove sites located within the angle of draw of the Project. The program should include (but not be limited to) the following: <ul style="list-style-type: none"> • A schedule for undertaking the subsidence monitoring at the nominated sites. • Appropriately detailed baseline and archival site recordings, including high resolution digital photographs. • An impact TARP specific to each of the sites being monitored.
7.	A protocol for the discovery and management of human remains, including stop work provisions and notification protocols.
8.	Procedures for the management and reporting of previously unknown Aboriginal heritage sites that may be identified during the life of the Project.
9.	Protocols for heritage awareness training to be incorporated into the mine site inductions for both employees and sub-contractors who may be conducting works that have the potential to impact on any Aboriginal heritage sites. Consideration should be given to involving the RAPs in the development and presentation of the cultural awareness training.
10.	A regular review process for the AHMP.
11.	AHIMS Site cards to be submitted for newly recorded sites.
12.	Copies of the final report should be made available to each RAP, the DP&E and the Heritage NSW.
13.	If the Project is approved, it is recommended IMC continue to undertake further engagement with any Aboriginal stakeholders that may hold knowledge regarding cultural values in the Project area, including undertaking further interviews, conversations and 'on Country' engagement to further explore cultural values.

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Annex 1- Aboriginal Heritage Site Information

Not included in this version.

Annex 2 Supporting Figures

Not included in this version.

Annex 3 AHIMS Results

Not included in this version.

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Development and activity approvals
Rehabilitation
Stakeholder consultation and facilitation
Project management

Environmental offsetting

Offset strategy and assessment (NSW, QLD, Commonwealth)
Accredited BAM assessors (NSW)
Biodiversity Stewardship Site Agreements (NSW)
Offset site establishment and management
Offset brokerage
Advanced Offset establishment (QLD)

Appendix B: Aboriginal Community Consultation Log

Not included in this version.

Appendix C: Aboriginal Community Consultation Record

Not included in this version.

Appendix D: Project Methodology 2018 and 2021

Not included in this version.

Appendix E: Reconciliation of the Secretary’s Environmental Assessment Requirements for the Project

Relevant Secretary’s Environmental Assessment Requirements	Section/Appendix
<p>General Requirements In particular, the EIS must include:</p> <ul style="list-style-type: none"> • an assessment of the likely impacts of the development on the environment focusing on the specific issues identified below, including: <ul style="list-style-type: none"> – a description of the existing environment likely to be affected by the development, using sufficient baseline data; 	Sections 2, 3, 4 and 5 and Appendices A, B, C and D
<ul style="list-style-type: none"> – an assessment of the likely impacts of all stages of the development, including appropriate worst-case scenarios, consideration of any cumulative impacts, taking into consideration any relevant legislation, environmental planning instruments, guidelines, policies, plans and industry codes of practice and with consideration to advice provided by agencies in Attachment 2; 	Sections 6 and 7
<ul style="list-style-type: none"> – a description of the measures that would be implemented to avoid, mitigate and/or offset the likely impacts of the development, and an assessment of: <ul style="list-style-type: none"> ○ whether these measures are consistent with industry best practice, and represent the full range of reasonable and feasible mitigation measures that could be implemented; ○ the likely effectiveness of these measures, including performance measures where relevant; ○ whether contingency plans would be necessary to manage any residual risks; and ○ a description of the measures that would be implemented to monitor and report on the environmental performance of the development if it is approved; 	Sections 7, 8 and 9 and Appendix A
<p>5. Heritage – including:</p> <ul style="list-style-type: none"> – an assessment of the likely impacts of the development on Aboriginal cultural heritage values having regard to the advice of Heritage NSW (see Attachment 2), including consultation with Aboriginal stakeholders in accordance with <i>Aboriginal Cultural Heritage Consultation Requirements for Proponents</i> (OEH, 2010); 	Sections 2, 3, 5, 6 and 7 and Appendices A, B, C and D
<p>Attachment 1: list of relevant Environmental Planning Instruments, Policies, Guidelines & Plans:</p> <ul style="list-style-type: none"> – The Burra Charter (The Australia ICOMOS charter for places of cultural significance) – Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010 (DECCW 2010) – Code of Practice for Archaeological Investigations of Objects in NSW (DECCW 2010) – Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW (OEH 2011) – NSW Heritage Manual (OEH) – Statements of Heritage Impact (OEH) 	Section 1

Relevant Secretary's Environmental Assessment Requirements	Section/Appendix
<p>Heritage NSW – Aboriginal Cultural Heritage - SEARs</p> <p>1. The EIS must identify and describe the Aboriginal cultural heritage values that exist across the whole area that will be affected by the development and document these in an Aboriginal Cultural Heritage Assessment Report (ACHAR). This may include the need for surface survey and test excavation. The identification of cultural heritage values must be conducted in accordance with <i>the Code of Practice for Archaeological Investigation in NSW</i> (DECCW 2010), and be guided by <i>the Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in New South Wales</i> (OEH 2011).</p>	<p>Sections 2, 3, 4 and 5 and Appendix A</p>
<p>2. Consultation with Aboriginal people must be undertaken and documented in accordance with the <i>Aboriginal Cultural Heritage Consultation Requirements for Proponents</i> (DECCW 2010). The significance of cultural heritage values for Aboriginal people who have a cultural association with the land must be documented in the ACHAR.</p>	<p>Sections 3 and 4 and Appendices B, C and D</p>
<p>3. Impacts on Aboriginal cultural heritage values are to be assessed and documented in the ACHAR. The ACHAR must demonstrate attempts to avoid impact upon cultural heritage values and identify any conservation outcomes. Where impacts are unavoidable, the EIS must outline measures proposed to mitigate impacts. Any objects recorded as part of the assessment must be documented and notified to Heritage NSW.</p>	<p>Sections 6, 7 and 8 and Appendix A</p>
<p>4. The assessment of Aboriginal cultural heritage values must include a surface survey undertaken by a qualified archaeologist. The result of the surface survey is to inform the need for targeted test excavation to better assess the integrity, extent, distribution, nature and overall significance of the archaeological record. The results of surface surveys and test excavations are to be documented in the ACHAR.</p>	<p>Sections 6 and 7 and Appendix A</p>
<p>5. The ACHAR must outline procedures to be followed if Aboriginal objects are found at any stage of the life of the project to formulate appropriate measures to manage unforeseen impacts.</p>	<p>Sections 7, 8 and 9 and Appendix A</p>
<p>6. The ACHAR must outline procedures to be followed in the event Aboriginal burials or skeletal material is uncovered during construction to formulate appropriate measures to manage the impacts to this material.</p>	<p>Section 9 and Appendix A</p>

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