APPENDIX G

Historical Heritage Assessment
with Statement of Heritage Impact

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Dendrobium Mine Extension Project
Historical Heritage Assessment with Statement of Heritage Impact

Prepared for Illawarra Metallurgical Coal
Prepared by Niche Environment and Heritage Pty Ltd | 03 March 2022

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Document control

Project number	Client	Project manager	LGA
6627	Illawarra Metallurgical Coal	Samuel Ward	Wollongong, Wingecarribee and Wollondilly

Version	Author	Review	Status	Date
D1	Samuel Ward	Wendy Thorp and Renée Regal	Draft	02 August 2021
D2	Samuel Ward	Renée Regal	Draft	23 September 2021
REV0	Samuel Ward	Resource Strategies	Final	30 November 2021
REV1	Samuel Ward	Ben Slack/Resource Strategies	Final	28 January 2022
REV2	Samuel Ward	Resource Strategies	Final	03 March 2022

Cover photograph: Dendrobium Pit Top c.1950s (source: Wollongong City Libraries Collection)

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Executive summary

Niche Environment and Heritage Pty Ltd was commissioned by Illawarra Coal Holdings Pty Ltd (Illawarra Metallurgical Coal (IMC)), a wholly owned subsidiary of South32 Limited (South32), to complete a Historical Heritage Assessment (HHA) for the Dendrobium Mine Extension Project (the Project).

This HHA includes the results of heritage register searches, a summary of historical background, the results of a field survey, significance and impact assessment, conclusions and the provision of management recommendations. This HHA includes a Statement of Heritage Impact (SoHI) and assessment of heritage significance. This assessment has been prepared in accordance with best practice in historical heritage management as guided by the *NSW* (New South Wales) *Heritage Manual* (Department of Urban Affairs and Planning 1996) and the *Australia ICOMOS Charter for Places of Cultural Significance, The Burra Charter* (Australia ICOMOS 2013) with reference to the provisions of the *NSW Heritage Act 1977* and the *Wollondilly Local Environmental Plan 2011*, *Wollongong Local Environmental Plan 2009* and *Wingecarribee Local Environmental Plan 2010*.

The Project seeks to extend underground mining operations into a future mining area known as Area 5, would involve the development of supporting infrastructure and the use and augmentation of existing surface facilities at the Dendrobium Mine.

Proposed Area 5

Only two state heritage items were identified that overlap with the Project areas considered as part of the HHA. These items are the Cordeaux and Avon Dams, which are listed on the NSW State Heritage Register (SHR) (SHR ID: 01358 & 1360). The proposed underground mining at Area 5 would result in a negligible impact on the heritage significance of both the Cordeaux and Avon Dams and their associated infrastructure, as the Subsidence Assessment (Mine Subsidence Engineering Consultants [MSEC], 2021) concluded it was unlikely that the Cordeaux and Avon Dam walls would experience adverse impacts due to the proposed longwalls, based on their distances from mining and the very low-levels of predicted movement.

Strategies to mitigate the potential visual impact of above-ground infrastructure on the views and vistas from these items have also been recommended, including the colour choice for materials used for the Project surface infrastructure. The report also concludes that there is a low likelihood for historical archaeological deposits to exist within Area 5. As such, no further assessment of historical heritage is required prior to commencement of the Project.

Dendrobium Pit Top

The Dendrobium Pit Top is located within two locally listed heritage items including '*Nebo Colliery*' (Wollongong Local Environmental Plan (LEP) 2009 Item – Archaeological #7104), the '*Site of the Pioneer Kerosene Works*' (Wollongong LEP 2009 Item #6411) and one locally listed conservation area namely the '*Kembla Heights Mining Village -Harry Graham Drive and Soldiers Road*' (Wollongong LEP 2009 Heritage Conservation Area). The Project would include upgrades to the existing infrastructure at the Dendrobium Pit Top with the indicative locations of proposed infrastructure assessed as part of this HHA. The Project would involve a continuation of the existing use which is wholly consistent with the nature of the item, as an operational colliery. Prior to the commencement of works, a Conservation Management Plan (CMP) should be developed by a suitably qualified heritage consultant. The CMP would provide guidance for the management and conservation of heritage items during the detailed design, construction and operational phases of the Project.

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1 Introduction

1.1 Project Background and Aims

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 (see Figure 1). The Dendrobium Mine was approved in 2001 and has operated since that time under approvals from both the NSW Government (under the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act)) and the Commonwealth Government under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The Dendrobium Mine is owned and operated by Illawarra Coal Holdings Pty Ltd (Illawarra Metallurgical Coal (IMC)), a wholly owned subsidiary of South32 Limited (South32). The existing mining operations are undertaken in accordance with Development Consent DA 60-03-2001 (as modified), as well as the Approvals EPBC 2001/214 and EPBC 2010/5350 under the EPBC Act. Construction for the Dendrobium Mine commenced in January 2002, with longwall mining commencing in April 2005.

IMC is seeking approval to:

- extend the current mining operations into a potential future mining area within Consolidated Coal Lease (CCL) 768 which is known as 'Area 5'. Area 5 will be serviced by associated surface infrastructure such as a ventilation shaft, electricity transmission line (ETL), temporary water pipeline, water pumping station and a construction carpark; and
- use the existing Dendrobium Pit Top with minor upgrades and extensions, including an extension for a carpark.

The proposed works are known as the Dendrobium Mine Extension Project (herein referred to as 'the Project').

Approval for the Project will be sought under the Part 5 of the EP&A Act. Niche Environment and Heritage (Niche) was commissioned to prepare a Historical Heritage Assessment (HHA) in support an approval application for the Project.

1.2 Location of the Project and Subject Area

The Dendrobium Mine is located in the Southern Coalfield of NSW, approximately 8 km west of Wollongong with the Dendrobium Pit Top located within Kembla Heights. The Subject Area for this report consists of several existing and one new works locations which will be utilised by the Project. These locations which make up the Subject Area are located within the Local Government Areas (LGAs) of Wollongong City Council, Wingecarribee Shire Council and Wollondilly Shire Council and are shown on Figure 1. The Dendrobium Pit Top is located along Cordeaux Road approximately 400 metres (m) east of the intersection of Cordeaux Road and Harry Graham Drive, Kembla Heights (see Figure 2 and Figure 3).

The proposed underground mining at Area 5 and the additional surface infrastructure (i.e. the ventilation shaft site, ETL and water pipeline) are located in the catchments of the Avon and Cordeaux Rivers, which are situated within the Metropolitan Special Area declared under the *Water NSW Act 2014*. Area 5 is located to the east of the Avon River within the suburb of Avon.

1.3 Project Description

IMC is seeking approval for the Project, which would support the extraction of approximately 30 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 2041[1].

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 million tonnes per annum (Mtpa) of ROM coal,
- 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) at the Dendrobium CPP to 2041;
- delivery of product coal from the Dendrobium CPP to the Port Kembla Steelworks for domestic use or to the Port Kembla Coal Terminal for transport to Liberty Primary Steel Whyalla Steelworks or export,
- 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 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,
- controlled release of excess water in accordance with the conditions of Environmental Protection Licence (EPL) 3241 and/or beneficial use, and
- monitoring, rehabilitation and remediation of subsidence and other mining effects; and other associated infrastructure, plant, equipment and activities.

[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).

The upgrades at the Dendrobium Pit Top would include construction of additional carpark facilities, south of Cordeaux Road. Other minor upgrades and augmentations are anticipated to occur within the existing footprint of the surface facilities which are in keeping with the ongoing continuous use of this location for active mining. Some elements and existing infrastructure at the Dendrobium Pit Top that are no longer required and is assessed to be of limited heritage value may also be decommissioned and removed. However, specific impacts and plans are not clearly defined in this Project (see Section 6.4)

In addition, the Project underground mining layout has been designed with the following mine design features:

- no longwall mining beneath existing Avon and Cordeaux reservoirs,
- longwall mining at least 300 m from the full supply levels of Sydney's water supply reservoirs,
- longwall mining at least 1,000 m from dam walls,
- longwall mining at least 400 m from the Avon River, Cordeaux River and Donalds Castle Creek,
- avoidance of the Area 4 "swamp cluster",
- no longwall mining beneath identified key stream features,
- no longwall mining beneath 3rd, 4th and 5th orders (or above) streams, and
- no longwall mining beneath identified high archaeological (scientific) significance Aboriginal heritage sites.

1.4 Aims of this Report

This HHA (including a Statement of Heritage Significance) aims to inform and provide evidence for the application for the Project, with regards to historic period heritage constraints within the established Subject Area. The Aboriginal heritage assessment is discussed in a separate report. The aims of this report are:

- To identify and outline the historic period heritage items and places within proximity to the Subject Area,
- To outline the relevant heritage constraints acting on the project,
- To provide an overview of the historical context of heritage items,
- To assess the archaeological potential of the Subject Area,
- To provide an assessment of significance for heritage items,
- To assess potential impacts to historical heritage value which could arise from the Project,
- To provide recommendations and mitigative measures to manage any places of heritage significance and impacts resulting from potential impacts of the Project.

1.5 Methodology

This HHA (including a Statement of Heritage Significance) has been prepared in accordance with the principles and methodology contained in *The Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance* (the Burra Charter) (Australia International Council on Monuments and Sites (Australia ICOMOS) 2013), and in accordance with the best practice standards set out by Heritage NSW. The relevant NSW best practice guidelines include:

- *Statement of Heritage Impact* (Heritage Council of NSW 2002).
- *NSW Heritage Manual* (Department of Urban Affairs and Planning 1996).
- *Assessing Heritage Significance* (NSW Heritage Office 2001).
- *Assessing Significance for Historical Archaeological Sites and 'Relics'* (Heritage Council of NSW 2009).

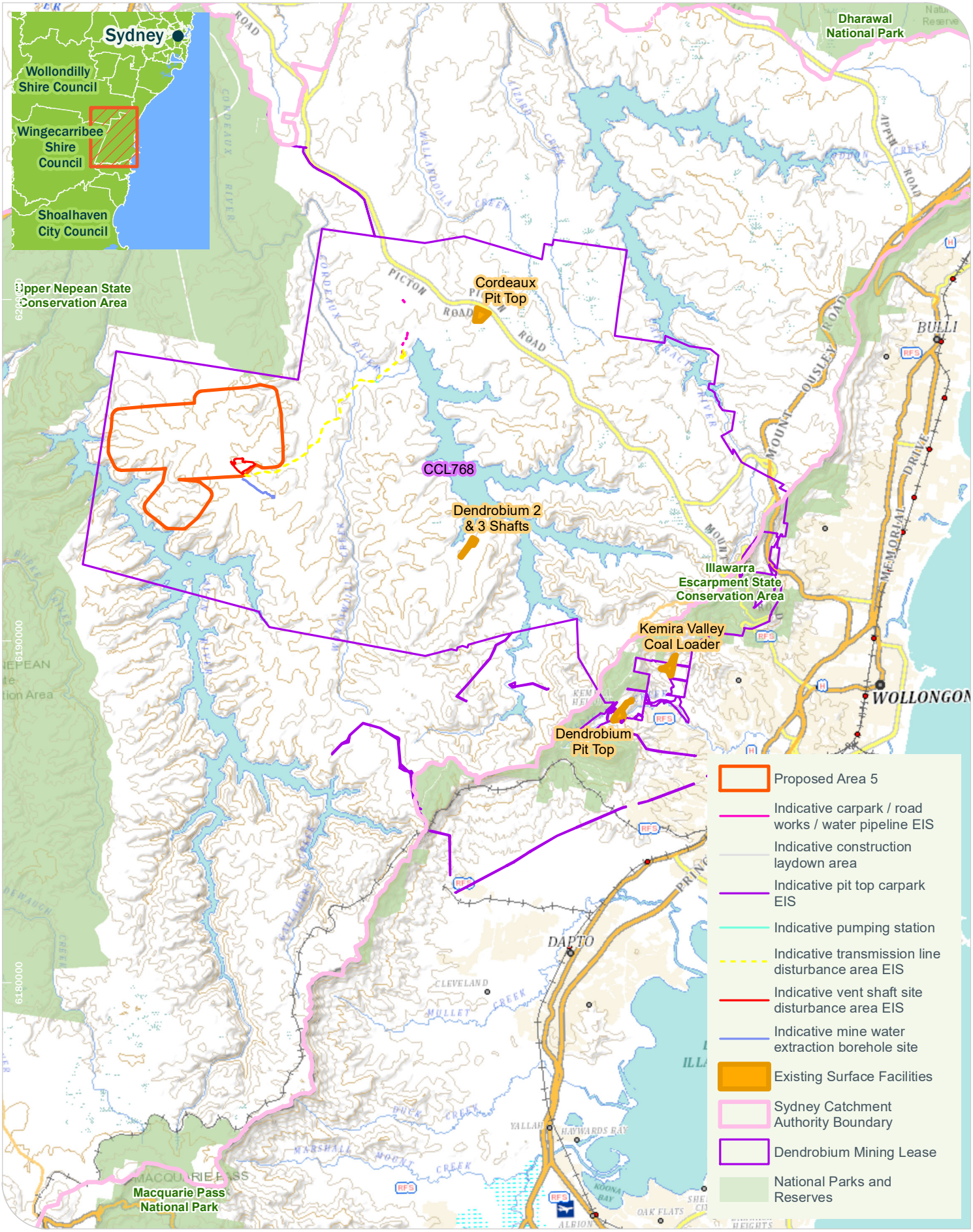
This report is an update of the HHA and HHA with addendum (Niche 2018 and Niche 2019) submitted in support of the previous application for the Dendrobium Mine. This report has used the completed assessment and historical analysis from previous assessments. This information has been supplemented and updated for this report and supporting information included where necessary. This update has identified differences in scope between the previous application and the Project. Table 1 provides the assessment methodology for this HHA.

Table 1: Assessment Methodology

Task	Description
Review of Heritage Listings	The results of searches of statutory Commonwealth, National and State heritage registers and local planning instrument schedules to identify any known items of heritage significance within the Subject Area, are presented in Section 2 Preceded by a summary of relevant legislation.
Historical Research and Background Review	A historical context for the assessment, used to assist in identifying potential historical heritage items and values within the Subject Area, is presented in Section 3.
Physical Inspection of the Subject Area	The methodology and results of the visual inspection undertaken for the Project are documented in Section 4.
Significance Assessment	Significance assessments of identified heritage items are presented in Section 5.
Impact Assessment and Statement of Heritage Significance	Assessment of the potential impacts of the Project on historical heritage items is discussed in Section 6. This section provides a Statement of Heritage Significance which is informed by the preceding sections.
Recommendations and Conclusions	Recommendations to manage, minimise or avoid potential impacts on items of historical heritage are presented in Section 7.

1.6 Authorship and acknowledgements

This HHA has been compiled by Samuel Ward (Historical Heritage Consultant, Niche), with document review completed by Wendy Thorp (Principal, Cultural Resources Management) and by Renée Regal (Discipline Leader, NSW Heritage, Niche) and Ben Slack (Senior Consultant, Niche). Technical assistance was provided by Greg Tobin (Senior GIS Consultant, Niche). Unless otherwise attributed, images used in this report are produced by Niche. This report has incorporated the outcomes and content of the previous assessment reports prepared by Niche.



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Location of Dendrobium Mine Sites

Dendrobium Mine Extension Project – Historical Heritage Assessment

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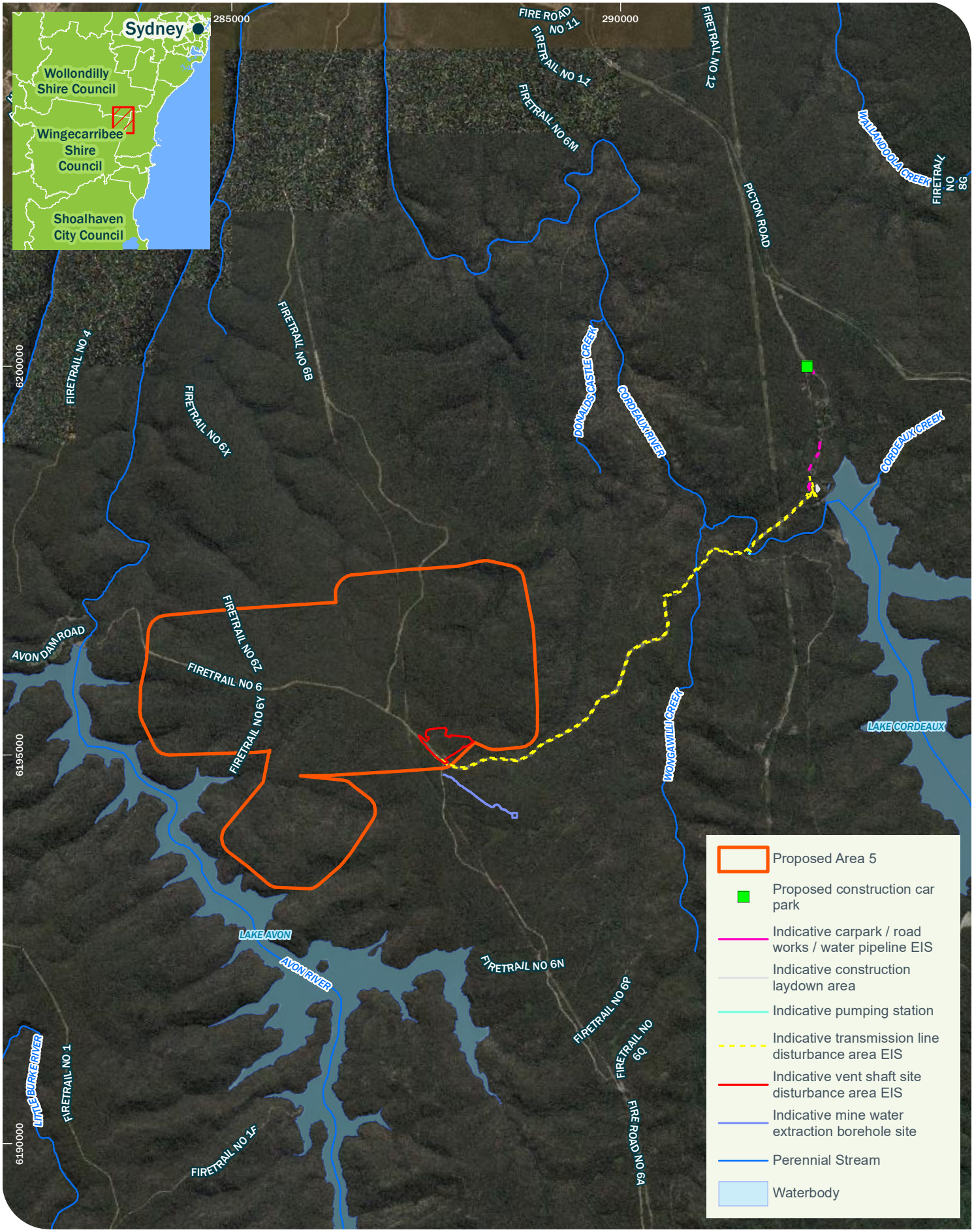
Figure 1



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Location of the Subject Area: Mining Area 5

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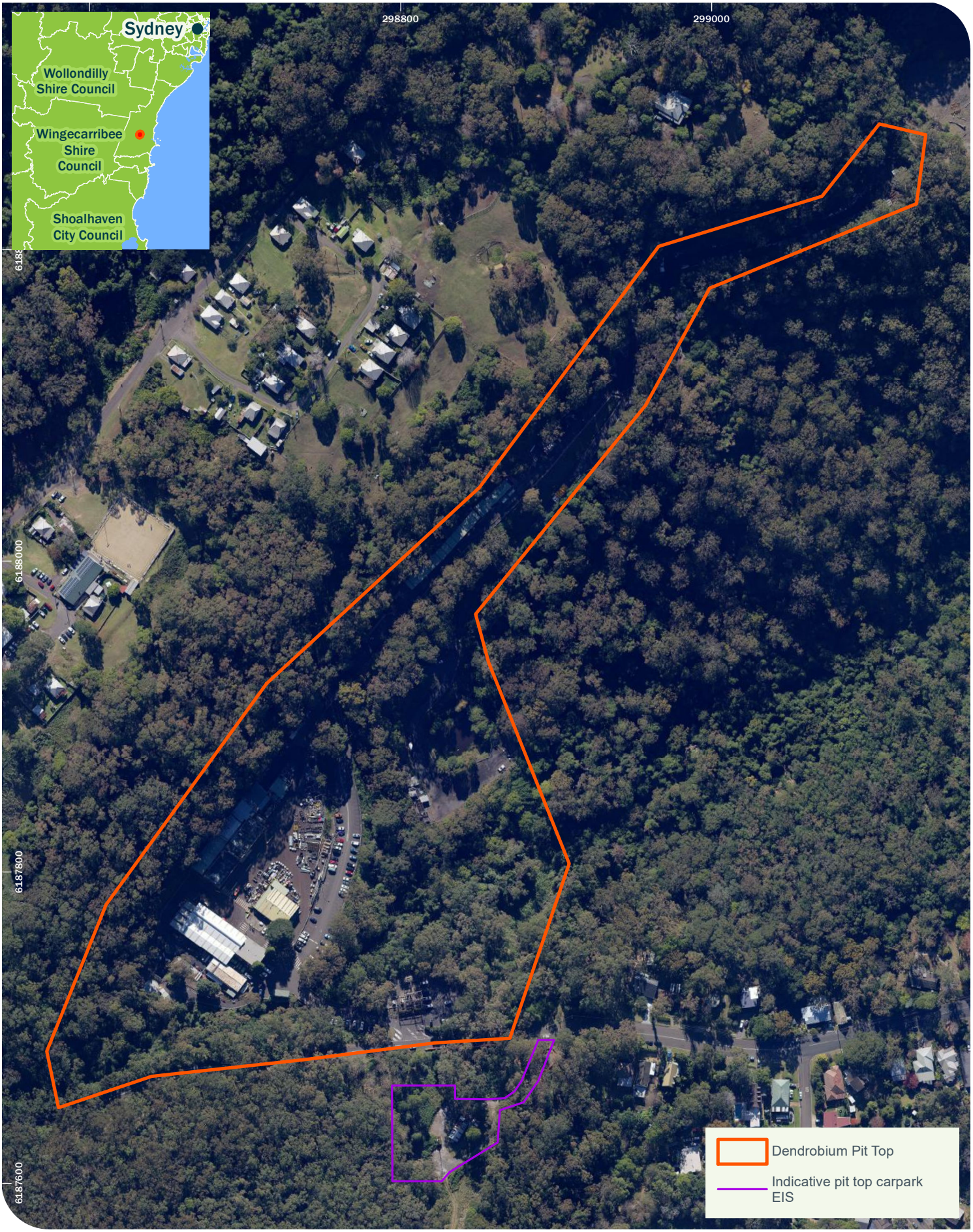
Figure 2



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Location of the Subject Area at Dendrobium Pit Top

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Figure 3

2 Regulatory and Assessment Framework

This section provides a summary of legislation and associated planning instruments designed to protect and conserve significant heritage items and their values.

2.1 The Burra Charter: The Australia ICOMOS Charter for Places of Cultural Significance (2013)

This HHA has been prepared in accordance with the principles and methodology contained in *The Burra Charter* (Australia ICOMOS 2013).

The Burra Charter outlines a series of best practice principles and measures for heritage investigation and conservation. *The Burra Charter* is supported by a series of Practice Notes that provide practical advice in the application of *The Burra Charter*. *The Burra Charter* was first adopted in 1979 and has been subject to numerous updates with the most recent iteration adopted in October 2013. The policies and legislative guidelines developed by the Heritage Council of NSW are guided by the Burra Charter.

2.2 Environmental Planning and Assessment Act 1979

The Environmental Planning and Assessment Act 1979 (EP&A Act) establishes the framework for cultural heritage values to be formally assessed in the land use planning process in NSW. The EP&A Act also requires local governments to prepare planning instruments, such as Local Environmental Plans (LEPs) which regulate the management of local heritage items within a Local Government Area (LGA). The standard heritage legislation and statutory constraints may be set aside depending on the development approvals pathway chosen under the EP&A Act.

2.2.1 Dendrobium Mine Extension Project Approval Pathway

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. The EP&A Act and EP&A Regulation generally set the framework for planning and environmental assessment in NSW.

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 therefore 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. Section 5.23(1) of the EP&A Act describes the authorisations that are not required for an SSI (which is distinct from a State Significant Development (SSD)) approved under Part 5, including those authorisations that would normally be obtained pursuant to the *Heritage Act 1977*, as described below.

2.2.2 Secretary's Environmental Assessment Requirements (Project Specific)

Secretary's Environmental Assessment Requirements (SEARs) have been issued for the Project under clause 3, Schedule 2 of the *Environmental Planning and Assessment Regulation 2000*. The SEARs outline the requirements for the Environmental Impact Statement (EIS) for the Project.

Specific to heritage values, the SEARs state that the EIS must include an assessment of the likely Aboriginal and historic heritage (cultural and archaeological) impacts of the development, having regards to the requirements of Heritage NSW. Table 2 provides a reconciliation of the SEARs relevant to heritage values and the corresponding section in the HHA where the assessment requirement has been addressed.

Table 2: Reconciliation of Secretary's Environmental Assessment Requirements relevant to Heritage Values

Secretary's Environmental Assessment Requirements	Response/Corresponding Section
***5. Heritage – including**:* – *an assessment of the likely impacts of the development on the historic heritage significance of the site and adjacent areas, including a Statement of Heritage Impact (SOHI) prepared by a suitably qualified heritage consultant in accordance with the guidelines in the NSW Heritage Manual.*	This HHA includes a Statement of Heritage Impact (SoHI – See Section 6) and has been prepared by suitably qualified heritage consultants. This report has been prepared in accordance with the NSW Heritage Manual. This condition is relevant to the whole report but particularly: Section 4, Section 5, Section 6.
Attachment 1: list of relevant Environmental Planning Instruments, Policies, Guidelines & Plans: – *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)*	This report has been prepared with reference to these documents. Please see Section 1.
Attachment 2 – Agency Advice on SEARs: Heritage Council of NSW Response: *It is recommended that the following SEARS are included:* *Heritage and archaeology* *a) A Statement of Heritage Impact (SOHI) prepared by a suitably qualified heritage consultant in accordance with the guidelines in the NSW Heritage Manual. The SOHI is to address the impacts of the proposal on the heritage significance of the site and adjacent areas and is to identify the following:*	This HHA contains a Statement of Heritage Impact (SoHI) which has been prepared in accordance with this recommendation. See Section 4, Section 5 and Section 6.

Secretary's Environmental Assessment Requirements	Response/Corresponding Section
• *all heritage items (state and local) within the vicinity of the site including built heritage, landscapes and archaeology, detailed mapping of these items [including mapping showing the project area in relation to the heritage items], and assessment of why the items and site(s) are of heritage significance;*	This HHA has addressed this recommendation: See Section 2, Section 3 and Section 4.
• *compliance with the relevant Conservation Management Plan;*	This HHA complies with the Nepean Dams CMPs, which is the relevant CMP.
• *the impacts of the proposal on heritage item(s) including visual impacts, required BCA and DDA works, new fixtures, fittings and finishes, any modified services, potential subsidence and vibration impacts;*	This HHA has assessed these impacts – see Section 6.
• *the attempts to avoid and/or mitigate the impact on the heritage significance or cultural heritage values of the site and the surrounding heritage items; and*	This HHA has suggested mitigative measures – See Section 6 and Section 7.
• *justification for any changes to the heritage fabric or landscape elements including any options analysis.*	This HHA has met this recommendation in Section 6.
b) *If the SOHI identifies impact on potential historical and/or maritime archaeology, an historical and/or maritime archaeological assessment should be prepared by a suitably qualified archaeologist in accordance with the guidelines Archaeological Assessment (1996) and Assessing Significance for Historical Archaeological Sites and Relics (2009). This assessment should identify what relics, if any, are likely to be present, assess their significance and consider the impacts from the proposal on this potential archaeological resource. Where harm is likely to occur, it is recommended that the significance of the relics be considered in determining an appropriate mitigation strategy. If harm cannot be avoided in whole or part, an appropriate Research Design and Excavation Methodology should also be prepared to guide any proposed excavations or salvage programme.*	This HHA has been prepared by suitably qualified historical heritage professional, and no maritime archaeology is present. The HHA has been prepared with these guidelines and manuals in conjunction with this recommendation. See Section 1 in particular.
As the site contains a local heritage item, and other local items are in the vicinity, advice should be sought from the relevant local council.	The three local councils have been contacted and their advice reviewed as part of the SEARs and approval process.

This HHA is intended to fulfil the historic (non-Aboriginal) heritage requirements as listed in Table 2, where relevant.

2.3 General Heritage legislation and Statutory Listing Searches

2.3.1 Commonwealth Heritage Legislation

Environment Protection and Biodiversity Conservation Act 1999

The Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) is the Australian Government's central piece of environmental legislation. It provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places. Under the EPBC Act, protected heritage items of significance are listed on the National Heritage List (NHL) or the Commonwealth Heritage List (CHL). The NHL provides protection to places of cultural significance to the nation of Australia, while the CHL comprises natural, Aboriginal and historic heritage places owned and controlled by the Commonwealth.

No items on the CHL or NHL were identified within the Subject Area.

The Dendrobium Mine operates in accordance with the EPBC Approvals EPBC 2001/214 and EPBC 2010/5350 under the EPBC Act.

The Project was determined to be a 'controlled action' under the EPBC Act and will be assessed under the NSW Assessment Bilateral Agreement.

2.3.2 NSW State Heritage Legislation

Heritage Act 1977

The *Heritage Act 1977* affords statutory protection to those items identified as having heritage significance and which form part of the NSW heritage record. The *Heritage Act 1977* defines a heritage item as "a place, building, work, relic, moveable object or precinct". Items that are assessed as having State heritage significance are listed on the NSW State Heritage Register (SHR). Proposals to alter, damage, move or destroy heritage items listed on the SHR (or protected by an Interim Heritage Order [IHO]), require an approval under section 60 of the *Heritage Act 1977.*

There are two SHR listed items (Listing #01358 and #01360) located within the Subject Area or near to proposed works that are being assessed in this report (See Table 3 and Figure 4 for details).

Archaeological features and deposits are afforded statutory protection by the 'relics provisions' of the *Heritage Act 1977*. A 'relic' is defined as "*any deposit, artefact, object or material evidence that relates to the settlement of the area that comprises New South Wales, not being Aboriginal settlement, and is of State or local heritage significance*" (*Heritage Act 1977*). Land disturbance or excavation that will or is likely to result in a relic being discovered, exposed, moved, damaged or destroyed is prohibited under the provisions of the *Heritage Act 1977*, unless carried out in accordance with a permit issued under section 140 for Local heritage sites and section 60 for State heritage sites of the *Heritage Act 1977*.

State Heritage and Conservation (s.170) registers

Under section 170 (s.170) of the *Heritage Act* 1977, NSW government agencies are required to maintain a register of heritage assets under their control or ownership. Each government agency is responsible for ensuring that the items entered on its register under section 170 are maintained with due diligence in accordance with State Owned Heritage Management Principles. Items listed on section 170 Heritage and Conservation Registers are listed on the State Heritage Inventory (SHI), and some are also listed on the SHR.

The two SHR items are also listed on the section 170 listings for the Water NSW s. 170 register (listing #125180 and #125220).

2.3.3 Local Heritage Legislation: regulated by the EP&A Act 1979

Local Environmental Plans (LEPs)

The Subject Area is located in the LGAs of Wollongong (*Wollongong Local Environmental Plan 2009*), Wollondilly (*Wollondilly Local Environmental Plan 2011*) and Wingecarribee (*Wingecarribee Local Environmental Plan 2010*). Heritage items within the three LGAs connected with the Subject Area are listed in Schedule 5 of their relevant LEPs. These LEPs' schedules were searched for heritage items listed within the Subject area:

There are seven listings on the LEP for the items within the Subject Area that are being assessed. (See Table 3 for details)

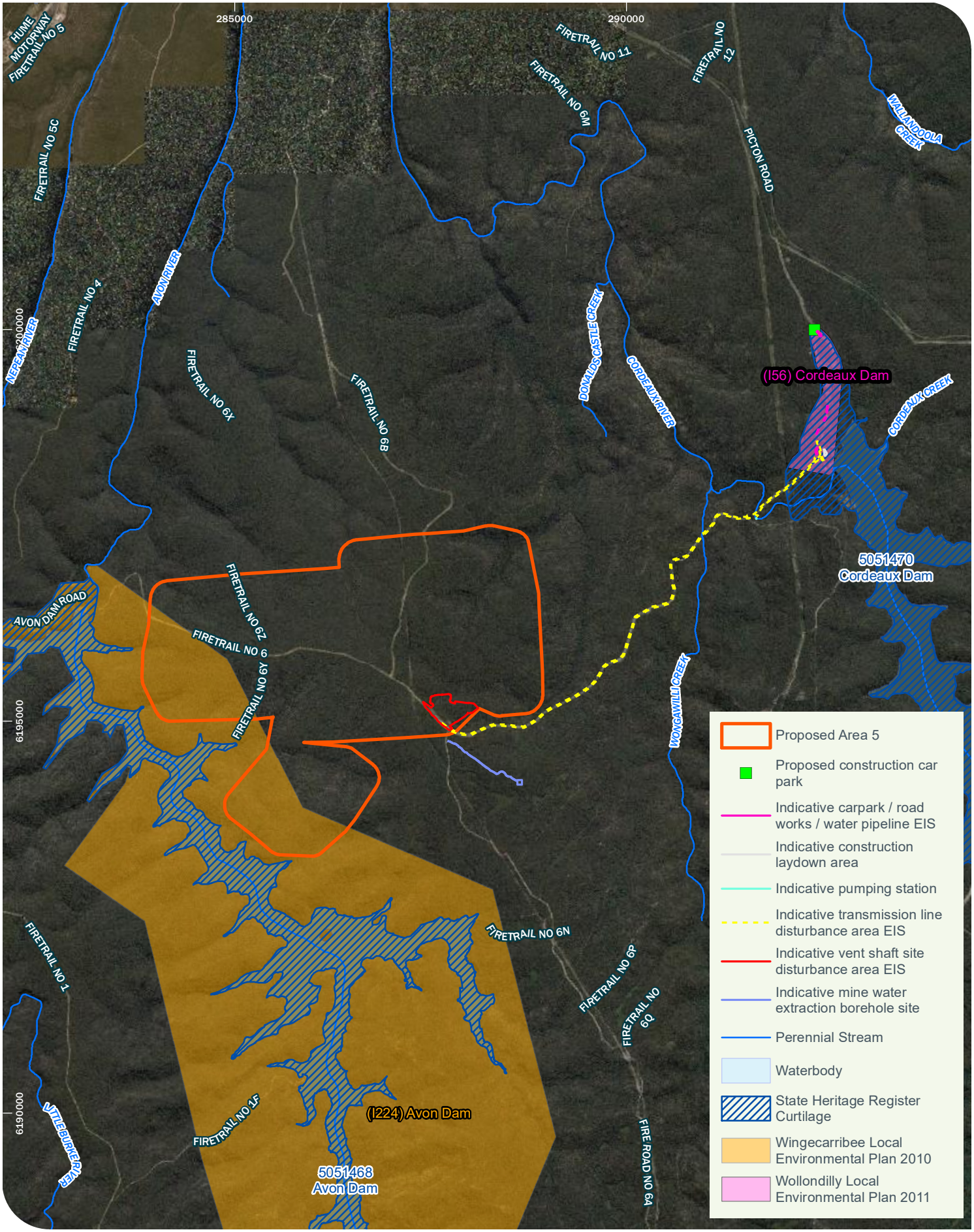
2.3.4 Summary of Listed Heritage Items

Table 3 provides the heritage places, sites or relics in proximity to the Subject Area that are identified in statutory registers or schedules and are shown on Figure 4 and Figure 5.

Table 3: Heritage Items inside or within proximity to the Subject Area

Item Name (Item number)	Listing Instrument	Item Type	Item Address	Approximate Distance from Project Area
Avon Dam (ID# 01358)	State Heritage Register	State Heritage Item	Plan #3045	Area 5 is located within proximity, but outside of, the SHR curtilage of this item.
Avon Dam (I224)	Wingecarribee LEP 2010	Item General	Avon Dam Road, Avon Dam, NSW	Area 5 is partially located within the curtilage of this item.
Avon Dam (ID# 125180)	s.170 NSW State agency heritage register	Water NSW heritage item	As per SHR listing curtilage	Area 5 is within 2km of the Avon Dam wall.
Cordeaux Dam (ID# 01360)	(SHR ID: 01360) and Avon Dam (SHR ID: 01358	State Heritage Item	Plan #3053	Surface Infrastructure is located within the SHR curtilage of this item.

Item Name (Item number)	Listing Instrument	Item Type	Item Address	Approximate Distance from Project Area
Cordeaux Dam (I56)	Wollondilly LEP 2011	Item General	Cordeaux River, Cordeaux, NSW	Surface Infrastructure is located within the curtilage of this item.
Cordeaux Dam (ID# 125220)	s.170 NSW State agency heritage register	Water NSW heritage item	As per SHR listing curtilage	Area 5 is located more than 2km from the Cordeaux Dam wall. Surface infrastructure is located within the curtilage of the SHR item, but removed from the Cordeaux Dam wall.
Nebo Colliery (7104)	Wollongong LEP 2009	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)	Wollongong LEP 2009	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)	Wollongong LEP 2009	Item General	Lot 1, DP 230082 356 Cordeaux Road	Approximately 150m east of the Dendrobium Pit Top.
Former post office (5946)	Wollongong LEP 2009	Item General	Part Lot 160, DP 751278 Harry Graham Drive	Approximately 100m west of the Dendrobium Pit Top.
Mine manager's residence (5947)	Wollongong LEP 2009	Item General	Part Lot 74, DP 751278	Approximately 100m north of the Dendrobium Pit Top.
Kembla Heights Mining Village – Harry Graham Drive and Soldiers Road	Wollongong LEP 2009	Heritage Conservation Area – General	–	Dendrobium Pit Top is partially located within the Heritage Conservation Area.
Illawarra Escarpment Landscape Area	Wollongong LEP 2009	Heritage Conservation Area – Landscape	–	Approximately 300m north-west of the Dendrobium Pit Top.



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Heritage Items Near New Mining Area 5

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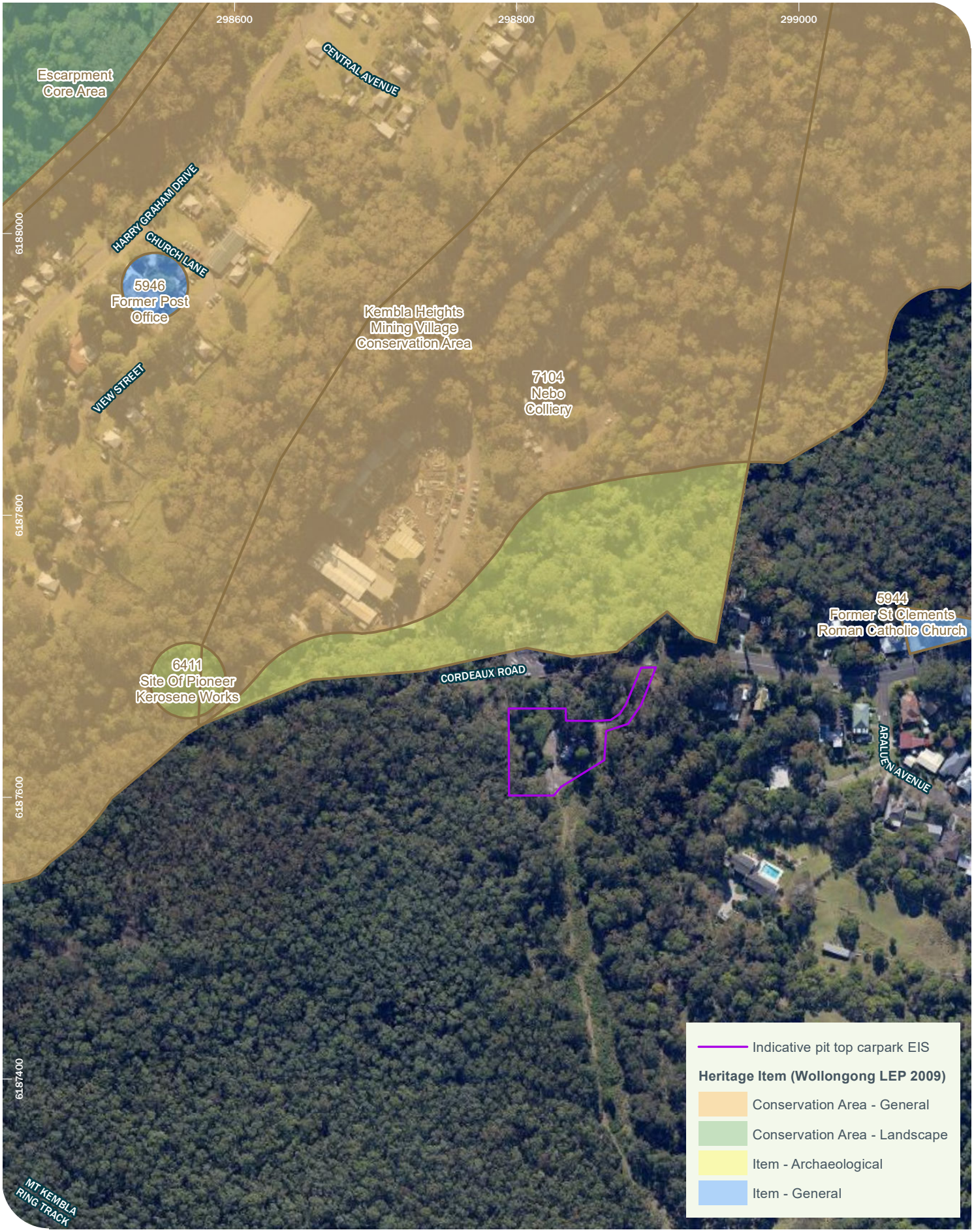
Figure 4



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Heritage Items Near Dendrobium Pit Top

Dendrobium Mine Extension Project – Historical Heritage Assessment

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Figure 5

3 Historical Context

This section discusses the history of the locale surrounding the Subject Area and provides an overview of its historical context. This context provides the evidence required to understand the place of the Subject Area within the region and, therefore its importance to the community. It also provides information to address the heritage values of the built environment and the potential for archaeological evidence.

3.1 Regional Historical Context

3.1.1 Early Historical Context

European exploration of this region of NSW commenced in the late eighteenth century, with Bass and Flinders noting the Port Kembla and Lake Illawarra area during their navigational voyages along the coast. Overland exploration into the region began in the early 1810s when cedar-getters began clearing timber in the area, exhausting supplies by the early 1840s (OHM Consultants 2006).

3.1.2 The Development of Wollongong (including Kembla Grange)/Mining History of Illawarra

In 1815, Dr. Charles Throsby herded his cattle from his property in Liverpool to Wollongong and erected a cattle stockyard at what is now the corner of Harbour and Smith Streets, Wollongong (Kass 2010). Due to poor overland access, the first official settlement in the area commenced a couple of years later in 1817 with the first land grants made along Lake Illawarra. Settlement in the Illawarra region continued to be hampered by the poor overland access routes with the small harbour the primary transport route in and out of the fledgling Wollongong settlement. In 1826, a military garrison was established at Wollongong with the barracks completed in 1830. By 1832 the garrison had moved and the barracks were used by the mounted police (Jervis 1942).

In 1834, the town was gazetted and included the formalisation of a harbour at Belmore Basin (OHM Consultants 2006). During the 1830s, the town and surrounding areas continued to grow at a slow but steady rate and boasted a number of hotels, a courthouse and a post office. An impetus for the growth of the region was the construction of what is now Bulli Pass by a large convict labour force between 1835 and 1836 (Kass 2010) which opened the overland access to Sydney and Campbelltown. However, the depression of the 1840s hit the Wollongong region hard with many inhabitants leaving the area. The 1841 census listed a total of 659 houses in Illawarra with the population of 2,999 across Northern Illawarra, Wollongong and those areas around Dapto and Lake Illawarra (K&T Henderson 1983).

During the 1840s, dairying became the most prominent industry in the region (Jervis 1942). As the number of small dairy farms in the Illawarra and surrounding regions increased the South Coast and West Camden Co-operative society was formed in 1881. The society was set up to market dairy products in the South Coast without the need for commercial agents (Kass 2010). The dairy industry continued to grow in the region with the support of numerous co-operatives including the butter co-operatives at Kiama, Unanderra and Dapto which would eventually amalgamate in 1898 under the banner the Illawarra Central Dairy Factory based out of Albion Park. In 1900 the Dairy Farmers Co-operative Milk Company was formed by the dairy farmers in and around Wollongong and Kiama (Hagan and Wells 1997). Dairying continued to be an important industry for the region well into the Twentieth Century however, after World War One the number of dairy farms decreased as dairies began to amalgamate (Kass 2010).

The town continued to grow and by the mid to late nineteenth century, Wollongong boasted a new courthouse, a School of Arts, the National School, numerous commercial banks and in 1862 a telegraph line was connected to Sydney (Jervis 1942). By 1865, the first gas supply in Wollongong was provided from the gas plant situated at what is now Corrimal Street. This would facilitate the introduction of gas streetlights in 1883. The growth of the new mining industry facilitated faster growth and the harbour was expanded in the late 1860s. As the mining industry grew so did the Illawarra region with other heavy industries moving to Wollongong due to the availability of coal (Kass 2010).

By 1886, the government rail line reached the Illawarra with a continuous single line between Wollongong and Sydney finished in 1888 (OHM Consultants 2006). The rail line made access to the region from Sydney easier and facilitated in further opening up of the Wollongong and Illawarra regions to regional markets. Further, the government line was utilised by various mines transporting coal from private lines on to the government line and on to the Harbour at Belmore Basin and by 1900 out of Port Kembla.

3.1.3 Mining History of the Illawarra

The coal seams located throughout the escarpment were first recorded in 1797 however, it wasn't until 1839 that the seams were examined by geologist Reverend W.B Clark. During the early to mid-nineteenth century the Australian Agricultural Company had a monopoly on mining coal in the colony which ended in 1848. This inhibited the mining of coal across the escarpment until 1849, when James Shoobert opened a small mine at Mount Keira in 1849 (Kass 2010; OHM Consultants 2006). Between 1849 and 1900, twelve mines had opened along the Illawarra escarpment employing some 2,300 men and boys with annual production reaching up to 1.26 million tonnes per year. One of the mines opened in this time was the Mount Kembla Colliery opened in 1883.

3.1.4 Mount Kembla Colliery

The Mount Kembla Colliery was the first mine opened in the Bulli Coal Seam south of Mount Keira (OHM Consultants 2006). The Mount Kembla mine was, for some time, one of the largest and most significant along the South Coast. Mount Kembla was one of the first mines in the Illawarra to longwall mine and have its own electric power generating plant (OHM Consultants 2006).

The lack of government infrastructure in the region meant that early mines were responsible for transporting mined coal from the colliery to the wider markets. In response, many mines constructed lines from mine shafts to company jetties along the Illawarra coastline. The Mount Kembla mine was one of the first colliery's to construct one of the earliest rail lines which ran to the company's jetty at what is now Port Kembla (Kass 2010; OHM Consultants 2006).

The growth of mines along the Illawarra escarpment saw an increasing need to house workers and their families close to the mine shafts. As a result, a number of purpose built mining villages sprang up around mine shafts including the Kembla Heights village (OHM Consultants 2006). The components of the Project are located within the Mount Kembla Mining Village Heritage Conservation Area. The Mount Kembla Colliery and the Kembla Heights village are associated with the worst mining tragedy in Australia's history which killed 96 boys and men on 31 July 1902 (OHM Consultants 2006; Kass 2010).

The Mount Kembla mine closed in 1970 however, Kembla Heights continues to be associated with the mining facilities at Dendrobium Mine. As a mining village mining has played a significant role in the history of Kembla Heights which is evidenced by the annual mining festivals and memorials held throughout the village by the Mount Kembla Mining Heritage Inc. (OHM Consultants 2006).

3.1.5 Pioneer Kerosene Works

In 1865, small quantities of kerosene shale were being produced from a shale bed identified at the American Creek Coal Seam. In 1872, the kerosene shale plant was established adjacent to the Dendrobium Pit Top. The plant was eventually closed in 1878 as it was unable to compete against the low cost of kerosene produced in other areas of the State (OHM Consultants 2006).

3.2 Development of Cordeaux and Avon / Nearby Towns

By the 1840s settlement spread with the growth of dairying in the vicinity of the Cordeaux and Avon Rivers (Plate 1). However, it wasn't until 1852, that Government surveyor Peter Carr, was sent to the Cordeaux River to begin surveying formal allotments in the region. Carr noted several families had already settled in the area and had already begun clearing and improving small parcels of land (McNamara 2000). The Fishlock and Moran families had reportedly taken up residence and cleared land along the banks of the river by 1857 (McNamara 2000). From the 1860s until the early twentieth century, the area around the Cordeaux River was gradually sold off in large allotments, with land use predominantly comprising of orchards, grazing and small-scale timber industries (McNamara 2000). Coal mining became a major industry in the region, with a State Coal Mine Reserve being proclaimed through the area in January 1926 (National Library of Australia 1938).

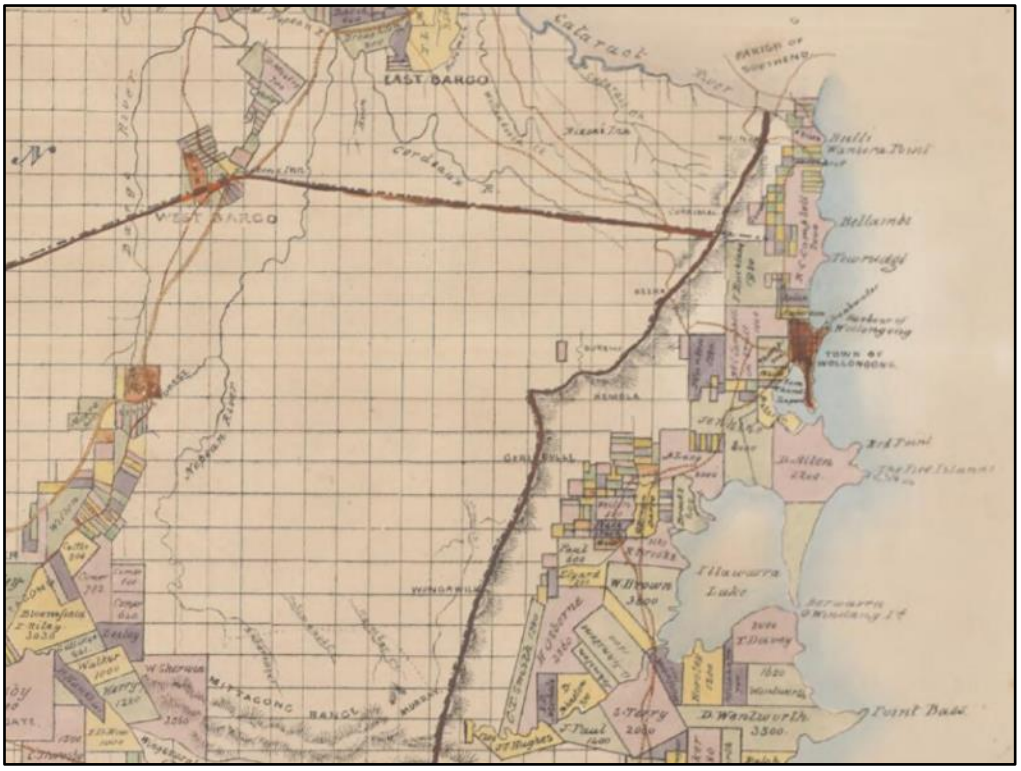


Plate 1: County of Camden in 1843 (Source: National Library of Australia 1943).

3.2.1 Upper Nepean Scheme

The Upper Nepean Water Supply System was built in 1880-1888 after more than a decade of investigation into schemes to provide Sydney with a fourth source of water supply (JRC Planning Services 1993:98). The system consists of an extensive system of dams, tunnels, weirs, aqueducts, canals, reservoirs and pipelines, delivering water from the catchment of the Nepean River (JRC Planning Services 1993:98). The Upper Canal forms part of the Upper Nepean Scheme and enables water diverted through the Nepean Tunnel to flow a distance of 64 km to the major distribution reservoir at Prospect, supplying water to a number of localities en route (Higginbotham 2002). The Upper Nepean Scheme continues to supply 20 to 40 per cent of Sydney's water (WaterNSW 2016).

According to Higginbotham (2002:11), one of the most outstanding features of the Upper Nepean Scheme as originally envisaged and constructed, was its potential for progressive development and improvement. Immediately after its completion in 1888, drought and population growth necessitated its further expansion, implemented over a period of nearly 50 years with the construction of four major storage dams on the Cataract, Cordeaux, Avon and Nepean Rivers (Higginbotham 2002:11):

- Cataract Dam – completed 1907. First large cyclopean masonry dam in Australia with a height of 55.7 m and total operating storage (TOS) of 94,300 megalitres (ML).
- Cordeaux Dam – completed in 1926. Curved concrete faced cyclopean sandstone dam with a height of 58.2 m and TOS of 50,600 ML.
- Avon Dam – completed in 1927. Curved, concrete faced, cyclopean sandstone dam with a height of 72.2 m and TOS of 146,700 ML.
- Nepean Dam – completed in 1935. Curved, concrete faced cyclopean sandstone dam with a height of 81.1 m and TOS of 52,000 ML.

As a result of the Upper Nepean Scheme, special protections were afforded to the catchment areas surrounding the new dams and complete exclusion or restricted access was mandated by the Water Board. At the time of gazettal, much of the land which now makes up the Upper Nepean catchment area was unalienated Crown land where little development had occurred. In combination, this has meant a high degree of preservation of the remnant historical archaeological remains within the Subject Area. In order to realise its potential for improvement the Water Board constructed public picnic grounds at scenic points within the popular catchment lands in the footprint of the dam construction infrastructure. Following World War One and the proliferation of access to motor vehicles, more and more visitors made visits to these picnic areas (NSW OEH 2017a; 2017b).

Some parts of the Special Areas have been protected from significant further development for over 100 years. The Subject Area for the Project is located within a restricted Special Area (WaterNSW 2017), namely the Metropolitan Special Area. This limits the potential for non-Aboriginal archaeological remains outside of the areas in the vicinity of the dams and picnic areas.

Detailed information about each of these four dams can be found within the Conservation Management Plan (CMP) for the Sydney Catchment Authority (SCA) Metropolitan Dams prepared by Graham Brooks and Associates Pty Ltd (2003).

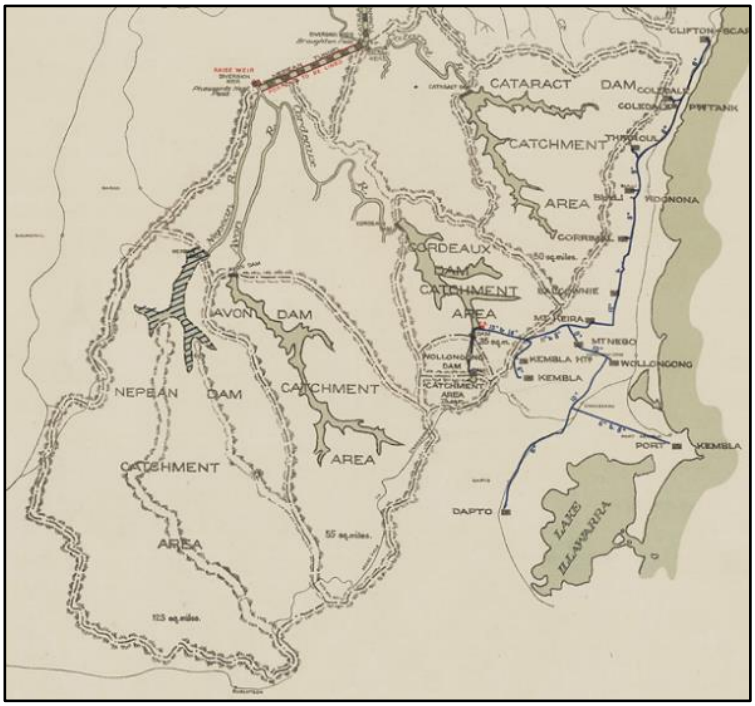


Plate 2: Map showing the Metropolitan catchment area, dams and reservoirs 1929-1940 (Source: State Library of NSW 1947).

3.2.2 Nebo Colliery

The Nebo Colliery was opened by BHP in 1946 to work the Wongawilli Coal Seam and was the first mine to be opened fully mechanised (Rogers 2001; OHM Consultants 2006). The Nebo Colliery employed 'track mounted mechanical coal loaders and coal cutters, 10-tonne capacity mine cars and battery and diesel powered locomotives' (Nebo Colliery Listing Sheet).

The Nebo Colliery originally comprised a headquarters for non-miner staff, as well as larger and more diverse steel-framed buildings for handling equipment, maintenance and storage (Irving 2001). The Nebo Colliery Pit Top was designed to be visually pleasing as well as a functional work place (Plate 3).

Plate 3: Nebo Colliery circa 1958 (Source: National Archives of Australia).

During the earliest times of the mining operations, workers would emerge from the coalface and head straight home. "The colliery bath house indicates one effect of twentieth century legislation aimed to improve miners' working conditions…Here at Nebo the bath house is one of a suite of brick surface structures conceived as an architectural whole" (Irving 2001 pp 85).

In 1951, mining operations were halted as large volumes of methane gas had to be released from the strata immediately above the coal seam. By 1952, the Nebo Colliery became 'semi trackless' using caterpillar mounted Anderson Boyes (UK) cutters and Joy Manufacturing loaders. Coal would then be loaded into track mounted mine cars which continued to the face. In 1954, caterpillar mounted continuous miners were introduced, and in 1959 conveyor belts replaced the mine cars with coal being cut and loaded into shuttle cars at the face (Irving 2001).

At the time of opening, the Nebo Colliery and surface facilities were of the most modern design with the administration building at the centre of the Nebo Colliery Pit Top which also included workshop and bathhouse buildings and a training school for mine workers (Irving, 2001).

A coal handling plant, erected in the north of the main portals, could rotary dump ten-tonne capacity rail-mounted mine cars which had been loaded at the coal face. Coal was then loaded on top of the conveyor belt and in turn into rail loading storage bins. The rail track was linked to the original Mt Kembla colliery rail line and transported to the Port Kembla Steelworks on the Company's private rail line (Nebo Colliery Listing Sheet).

In 1993, Nebo Colliery ceased operations as a mine, with certain underground workings and leases, portal entries and services used to create the Elourea mine. Since 2001, the remaining surface facilities at Nebo Colliery remained to support the development of the Dendrobium Mine and have been altered and/or reworked to suit the needs of this new mine. (OHM Consultants 2006).

4 Physical Analysis

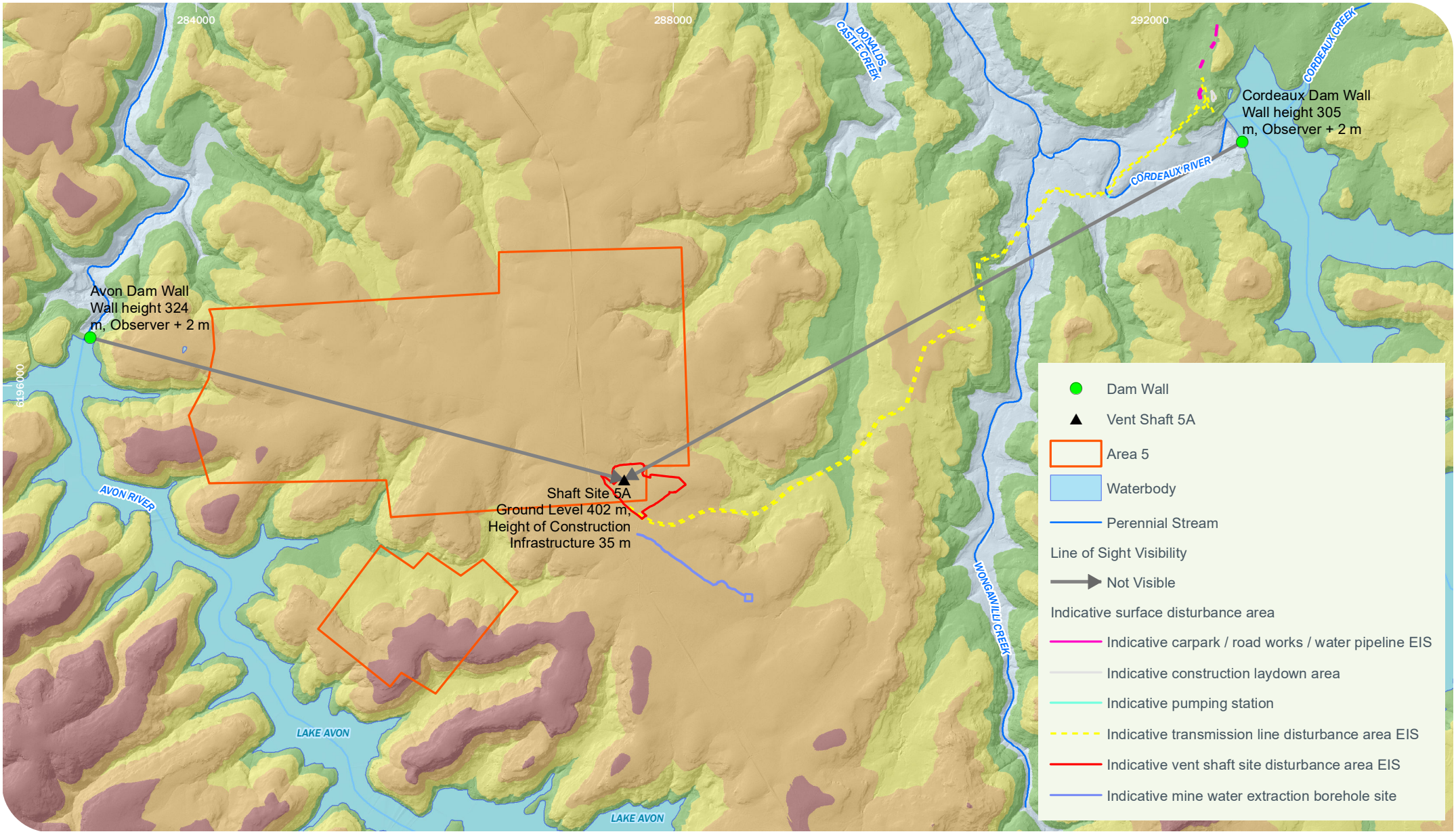
The following section details the physical description of the Subject Area as well as outlining any areas of potential archaeological sites. This section will also provide evidence of the conditions of known extant heritage items and describe the history of land use of the Subject Area.

A visual inspection focusing on the heritage items located within, or in proximity to Area 5 was undertaken on 16 June 2017 by Niche. A site inspection of Dendrobium Pit Top was also undertaken on 17 September 2021 by Niche.

4.1 Methodology

4.1.1 Proposed Area 5

The visual inspection component was intended to locate and characterise any heritage items within the Subject Area. The Cordeaux and Avon Dams and their associated views and vistas were assessed as being within proximity to the proposed works, as shown on Figure 5, and the various heritage curtilages are specified within Table 3. These heritage items are listed on the SHR, the Water NSW s.170 heritage asset register and are also locally listed. The curtilage of Avon Dam's local listing is within the proposed Area 5, while the SHR curtilage is not. The proposed surface infrastructure is within the local and SHR listings for Cordeaux Dam. These Dam's locations were photographed, and visually assessed, focusing on proposed sites of surface infrastructure associated with the Project. Sites where surface infrastructure is proposed have the potential to impact on the heritage values of the two heritage listed dams were inspected and assessed for their archaeological potential. The location of the proposed work is shown on Figure 3 and Figure 4. The assessment of views to the Ventilation Shaft Site 5A relative to the Cordeaux and Avon Dam walls are shown on Figure 6.



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Niche PM: Samuel Ward
Niche Proj. #: 6627
Client: Illawarra Metallurgical Coal

Projected Visual Impacts: Mining Area 5

Dendrobium Mine Extension Project – Historical Heritage Assessment

Figure 6

4.1.2 Cordeaux Dam

Cordeaux Dam is a popular tourist attraction and is entered via public road, the end section of which is lined with an avenue of mature Monterey Pines and stands of Cypress Pine (*Callitris sp.*) (Plate 4).

Plate 4: The Monterey Pine (*Pinus radiata*) avenue leading into the upper picnic area (Niche 2017)

Upper Picnic Area

The upper picnic area includes picnic grounds, landscaped gardens, shelters and pathways as well as remnant landscaping from c. late 1920s – early 1930s. The picnic grounds are located on the site of the original construction township and retain a road formation, culverts and drainage lines (Plate 5) from that era.

Plate 5: An original broad stone flagged drain which is still in use (Niche 2017)

The easternmost section of the picnic area adjacent to the dam viewing point is encircled by the old roadway and contains a tract of Eucalyptus which were planted by Board members of the former Water Board in 1928 (Plate 6) and retain particular memorial associations with past identities of the Board. There were numerous tree plantings undertaken for the opening of the dam in 1927 which are still extant today, including palms, pines, and at least one Magenta Lilly Pilly (*Szygium paniculatum*). Collectively the diversity of trees present an accurate record of past horticultural practices.

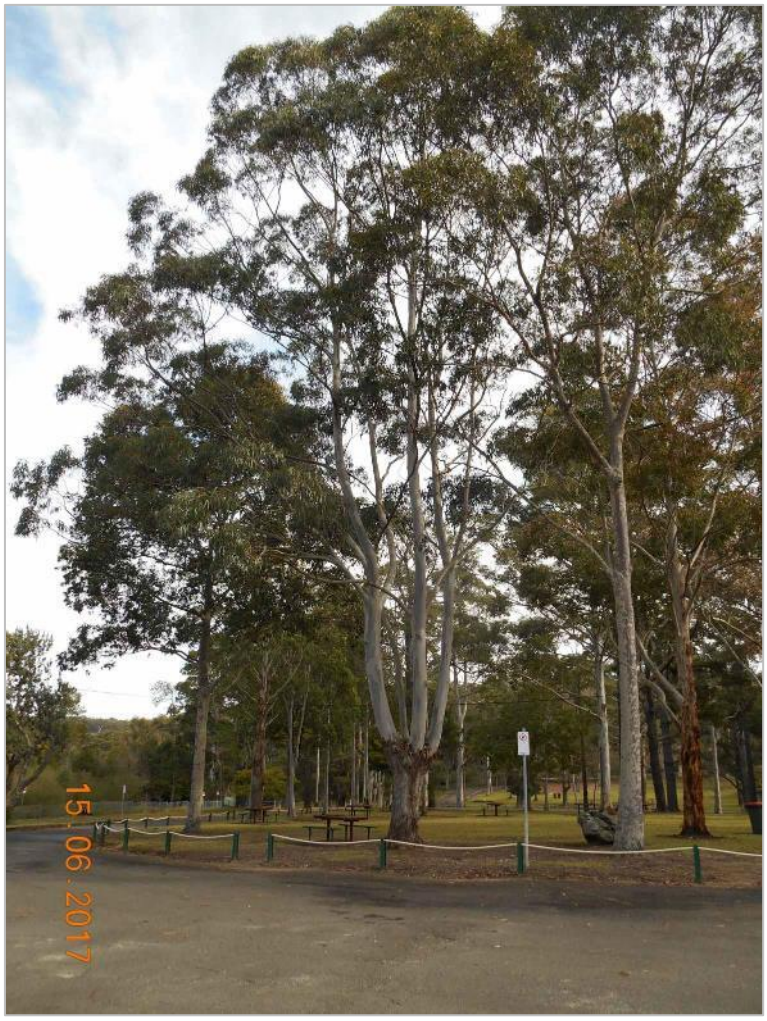

Plate 6: Tract of Eucalyptus planted by Water Board members, part of the original road alignment is in the foreground (Niche 2017)

The most immediately visible of the remnant landscaping features is a large grotto and garden present within the grounds. Filled with palms, ferns and water features, this landscape hints at the Egyptian Revival styling present across the rest of the dam landscape (Plate 7). Its overflow is currently managed by the drain described above.

Plate 7: The 'Egyptian Revival' grotto within the upper picnic area of Cordeaux Dam (Niche 2017)

The dam wall itself is not visible from the upper picnic area, but there are picturesque views of the reservoir created upstream from the dam, bordered by the crests of the valley sides (Plate 8). These can be viewed from select vantage points within the picnic area. This public vista faces away from the Project, including associated surface infrastructure.

Plate 8: The view of Cordeaux Dam from the upper picnic area (Niche 2017)

The past land use of the picnic site as the dam's construction township is not specifically signposted, but various plaques and small displays honour the dam's construction and engineering significance (Plate 9).

Plate 9: An old rail cart which has been placed on display as part of an information panel about Cordeaux Dam (Niche 2017)

This reuse and rehabilitation of land cleared and/or modified in the construction processes of Cordeaux Dam is representative of similar practices undertaken at other dams throughout NSW. Key features of this practice at the Cordeaux Dam site include utilising the former township as a picnic area, utilising former terraced construction areas as picnic areas and lookouts, and utilising the former construction roads and tramways for vehicular access to the Cordeaux Dam wall.

Views and vistas across the reservoir towards the Cordeaux Dam wall

Although not currently accessible to the public due to its location within the restricted Metropolitan Special Area, the survey included the view from the eastern side of the reservoir looking back towards the dam wall (Plate 10). As this view faces away from the existing Cordeaux Colliery, it is currently unaffected by any mining infrastructure, and provides a full length vista of the upstream face of the Cordeaux Dam wall, its entry pylons and crest houses, and the natural bushland setting beyond.

Plate 10: A front on view of Cordeaux Dam from across the reservoir looking south-west (Niche 2017)

Lower Picnic Area

The road to the lower picnic area passes a small quarry site which has been planted out and beautified as a small park (Plate 11) before winding down to the dam face along the old tramway track line.

Plate 11: A disused quarry face which has been converted into a small park (Niche 2017)

The visible remnants of sandstone quarrying for the construction of the dam are extensive, with a large quarry pit located next to what is now part of the carpark for the dam wall. The platforms and terraces adjoining the dam mark out the past location of plant and equipment used in the dam construction (Plate 12, Plate 13 and Plate 14).

Plate 12: A disused quarry pit next to the lower carpark (Niche 2017).

Plate 13: Past quarrying scars (Niche 2017).

Plate 14: The view of Cordeaux Dam wall from the lower carpark (Niche 2017)

Plate 15: Further Egyptian Revival plantings in the small park near the Cordeaux Dam wall (Niche 2017)

The lower picnic area includes a series of grassed terraces with stone retaining walls and a narrow crazy-paved stone path, where the Egyptian themed planting continues with a series of large palms (Plate 15). Close to the Cordeaux Dam wall entrance is an example of the cyclopean masonry blocks have been used in the construction of Cordeaux Dam (Plate 16), which helps to illustrate the monumental scale of construction to the general public.

Plate 16: An example block of cyclopean masonry located next to Cordeaux Dam wall (Niche 2017)

Cordeaux Dam Wall

The entrance to the Cordeaux Dam wall is immense, and the design and finishes of the crest houses, entry pylons and lower valve houses in Egyptian Revival style echo a romanticised view of Ancient Egypt at a time when many Australians had gained experience of the area through military service and archaeological finds reported in the popular press (SHR ID: 01360; Database No. 5051470) (Plate 17 and Plate 18).

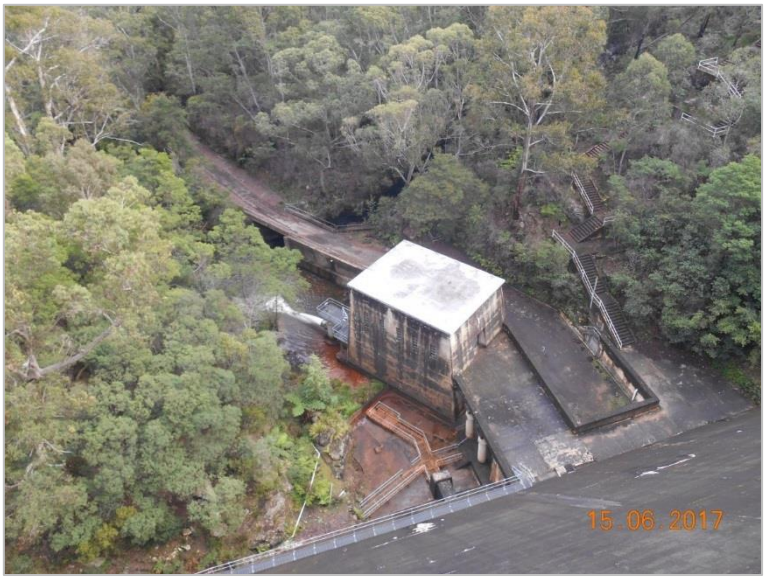

Plate 17: One of the lower valve houses, also in an Egyptian Revival style (Niche 2017)

Plate 18: The monumental entry pylons of Cordeaux Dam with its fluted lotus columns (Niche 2017)

Cordeaux Dam is a cyclopean gravity dam, a masonry construction technique which is unique to the Metropolitan Dams in Australia. The Cordeaux Dam wall is in good condition with no visible cracks or degradation (Plate 19) and incorporates viewing galleries for the public, retaining a high level of integrity. It is also one of only two extant dams in NSW which incorporate pedestrian and vehicular entry pavilions to the crest wall.

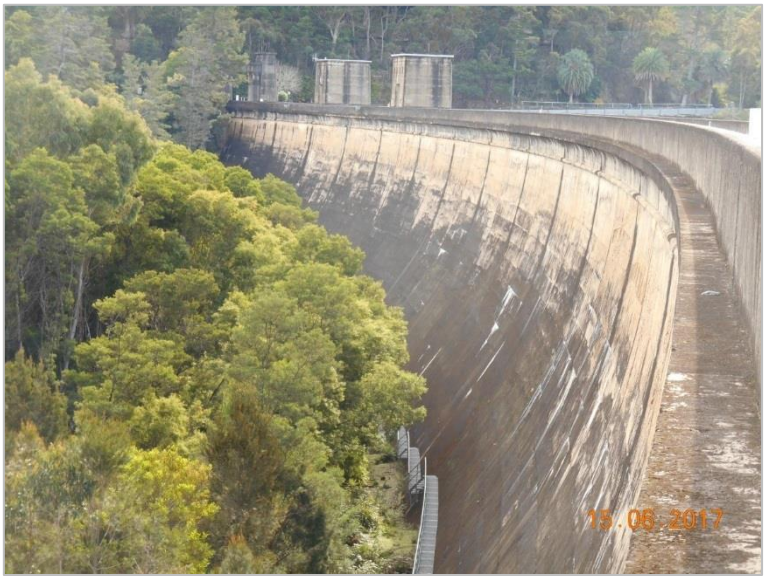

Plate 19: The downstream face of Cordeaux Dam wall (Niche 2017)

Cordeaux Dam includes a by-wash spillway which is an extension of the gravity wall. This spillway can be viewed both from the end of the dam wall, and through a separate viewing gallery within the end pylon of the dam wall (Plate 20).

Plate 20: The view of the spillway at the end of the dam through one of the designed public viewpoints (Niche 2017)

When looking northeast from the Cordeaux Dam wall, across the reservoir, it is possible to see the previous ventilation shafts of Cordeaux Colliery on a rise in the distance (Plate 21).

Plate 21: A view from Cordeaux Dam wall with the existing Cordeaux Colliery ventilation shafts on the right (Niche 2017)

Given the current vegetation and past rehabilitation works, ground surface visibility was low. Despite this, no evidence of further historical archaeological relics was noted during the inspection.

4.1.3 Avon Dam

Avon Dam Wall

Avon Dam continues the architectural character and strong Egyptian style of Cordeaux Dam (Plate 22), which complements the monumental nature of the structure and its natural surroundings.

Plate 22: The entry pylons of Avon Dam - unlike Cordeaux Dam the lotus columns are not fluted (Niche 2017)

The dam is in good condition, though the downstream face is now covered by an embankment of quarried sandstone blocks and compacted sandstone fill (Plate 23). This was added as part of upgrades completed in 1971 (along with a spill weir redesign) to relieve uplift pressure on, and leakage through, the foundations of the Avon Dam wall and to ensure the dam met modern safety requirements (SHR ID: 01358). These same requirements were not needed at Cordeaux Dam, likely due to the fact that Avon Dam is a much taller dam and therefore required greater reinforcement.

Plate 23: The downstream face of Avon Dam wall with its 1970s modifications (Niche 2017)

The Avon Dam wall itself maintains a high level of integrity, despite the sandstone embankment now present. There are, however, some maintenance issues with the entry pylons at the western end of the wall, with broken windows noted in the viewing galleries.

The Avon Dam sits within a gully with crests and low rises surrounding the dam and the upstream reservoir. Given the orientation of the Avon Dam face and the areas of current public access, there is little to no potential for proposed Project surface infrastructure to be visible.

Lower Picnic Ground

The lower picnic ground is also an interwar landscape design and is largely intact. The grounds include ornamental ponds with plantings of palms, grotto-like picnic shelters within the cliff faces, several gardens which function as individual picnic areas and a larger park area along the edge of the Avon Dam, which all incorporate various Egyptian Revival features, continuing the general themes of both construction design and landscaping at Cordeaux Dam. The SHR lists the immediate Avon Dam area as *'of distinction as a scenic landscape'* (SHR ID: 01360).

The picnic shelters (Plate 24) are stone with cement-rendered seating, some cement faux rockwork walling, wisteria, palms, *Cordyline sp.*, tree ferns (*Cyathea sp.*) and various other ferns.

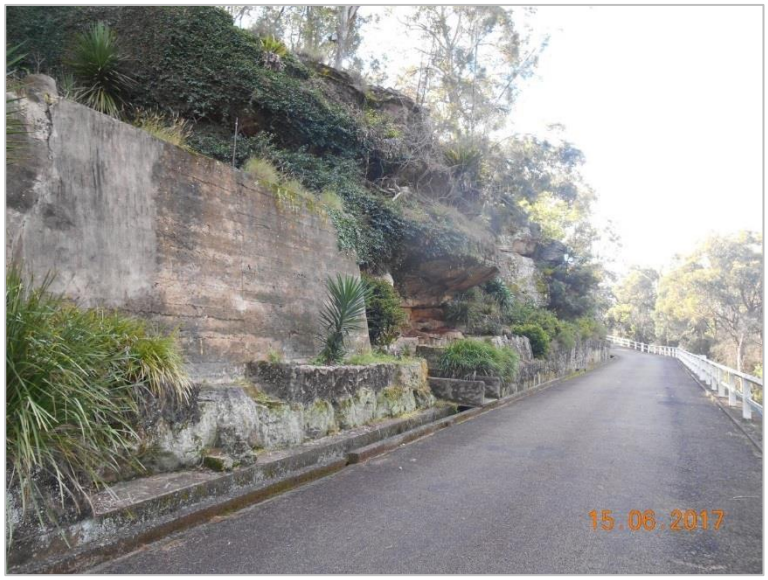

Plate 24: One of the 'grotto-like' picnic shelters within the terraced cliff faces (Niche 2017)

The ornamental pond garden contains four large circular ponds with smaller intermediate ponds between them and is made from rendered cement with planters attached to their sides (Plate 25). They are surrounded by an array of palms and Cordyline plantings, again following the Egyptian Revival theme to present the appearance of an oasis.

Plate 25: The four main pools of the pond garden (Niche 2017)

The stone columns at the entrance to the picnic area have the words 'AVON DAM' embedded in them with quartz pebbles (Plate 26), and the central path between them continues through to the end of the picnic ground.

Plate 26: The entrance to the Avon Dam picnic area which extends along the dam edge (Niche 2017)

There are a number of park benches throughout the area along with public amenities. There is also a propagating structure remaining from the post-construction regeneration process (Plate 27). As with Cordeaux Dam there is strong evidence of the rehabilitation process post-construction with the former terraced construction platforms used as picnic areas and lookouts, and the former construction roads converted for vehicle access to the Avon Dam site. The presence of an on-site propagation building shows the dedication to rehabilitation and beautification of the surrounds, and the picnic grounds include plantings of Swamp Cypress (*Taxodium disticum*), Hoop Pine (*Araucaria cunninghamii*), Magenta Lilly Pilly (*Szygium*), Conifer (*Podocarpus*), Japanese Maple (*Acer*), Camellia and Liquidambar.

Plate 27: The frame of the propagation structure with landscaped gardens in the foreground (Niche 2017)

Landscaping of lower picnic grounds exhibit a high level of design awareness through its planning, development, and association with the Botanic Gardens on the original layout and selection of species.

As previously mentioned, the central pathway continues through the length of the picnic area, along the terrace which was originally the railway terrace from the spillway excavations to the Avon Dam wall (Plate 28).

Plate 28: The old railway terrace, now converted into parkland (Niche 2017)

The terrace provides a series of viewpoints of the upstream dam through the trees (Plate 29). Given the topography of the ridge crest these views are primarily orientated south to south-east, and while they face the direction of Ventilation Shaft Site No. 5A, the topography and intervening crests mask any potential views.

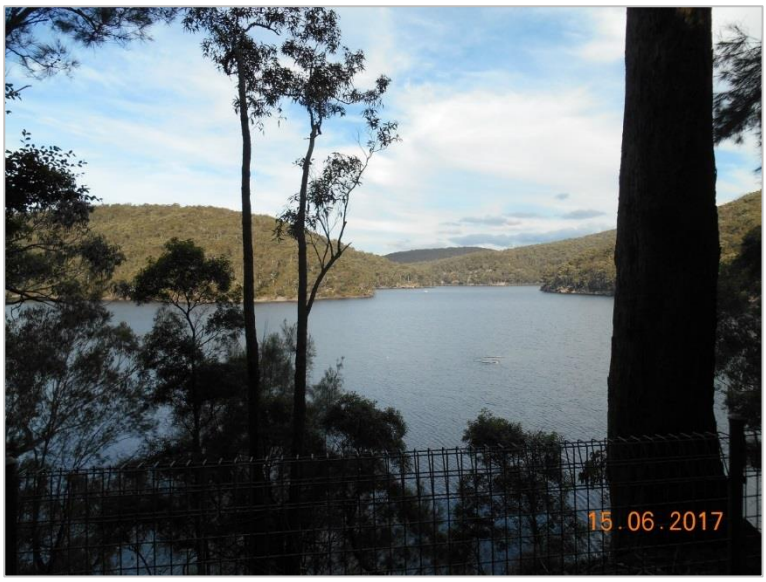

Plate 29: View from the parkland south-east across the reservoir (Niche 2017)

The stone for the construction of the Avon Dam wall came from the excavation of the spillway channel which is a deep open cut through the saddle of the hillside designed to discharge into a nearby creek and then beyond into the Avon River nearly 1 km below the dam – a design which is the earliest and largest example of its type in NSW. The spillway was originally a 1.2 m high mass concrete weir, but as part of the previously mentioned 1971 safety upgrades it was redesigned to a sawtooth or labyrinth design (Plate 30), which allows for a greater sill length and therefore discharge volume – in accordance with modern flood estimates (SHR ID: 01358).

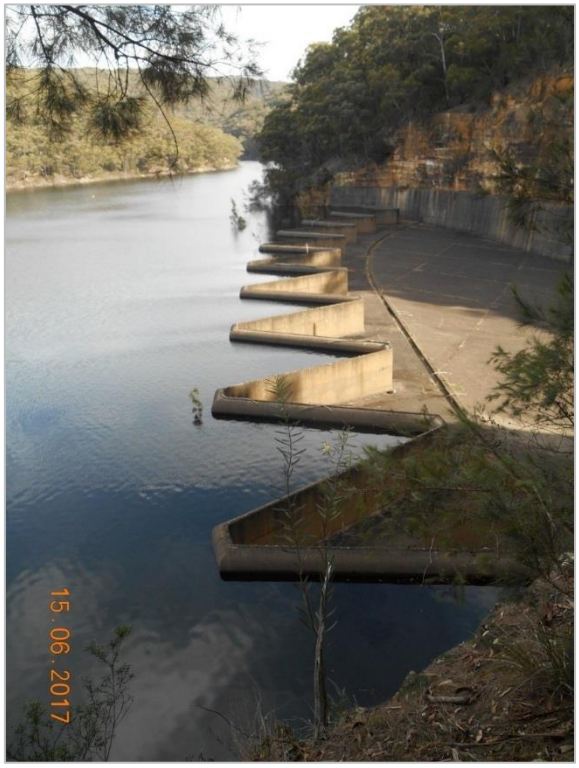

Plate 30: The redesigned sawtooth/labyrinth spillway weir (Niche 2017)

The SHR listing described several interwar cottages located above the Avon Dam wall, but these were not surveyed due to an access restriction (SHR ID: 01358). There are other indicators to their location throughout the picnic grounds, with several sets of stone and/or concrete steps leading above the terraced platform of the old railway (Plate 31).

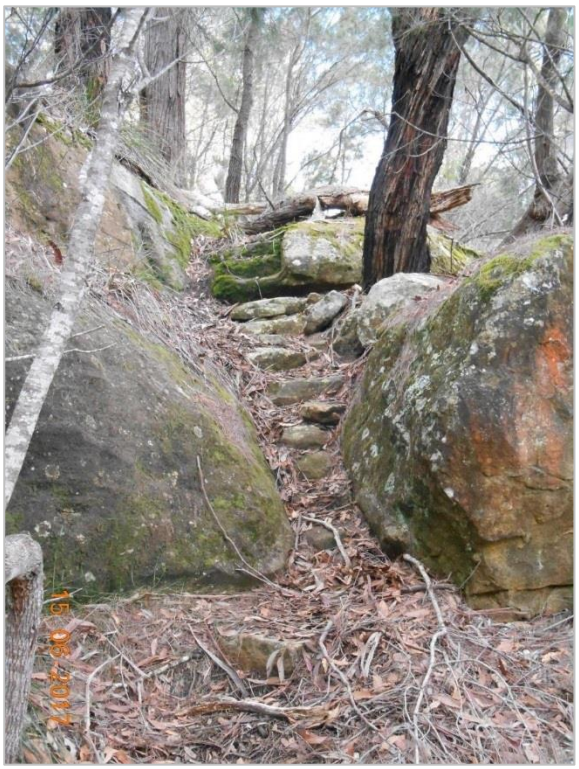

Plate 31: Stone steps leading from the railway terrace up to the cottage locations (Niche 2017)

Upper Picnic Area & Bridge

The roadway which leads away from the Avon Dam wall (and continued all the way to the railway station at Bargo) was constructed in 1918-1921 prior to construction of the Avon Dam and provided all the transportation needs for Avon Dam, unlike the other Metropolitan Dams which used a combination of road, tram and ropeway for moving men and material. This road continues to be used for the main access to both the Avon Dam wall and picnic grounds today. It includes a bridge across the deep excavated spillway to the upper picnic area (Plate 32) – originally the site of the construction township.

Plate 32: The bridge across the spillway channel (Niche 2017)

The picnic area features landscaped gardens within retaining walls (Plate 33 and Plate 34), large areas of lawn and modern amenities and shelters. One remaining element from the construction township is a large, riveted steel or cast-iron elevated water tank which is carried on riveted plate-web girders and cast steel or iron posts (Plate 35).

Plate 33: Terraced lawn and landscaping (Niche 2017)

Plate 34: Gardens within retaining walls (Niche 2017)

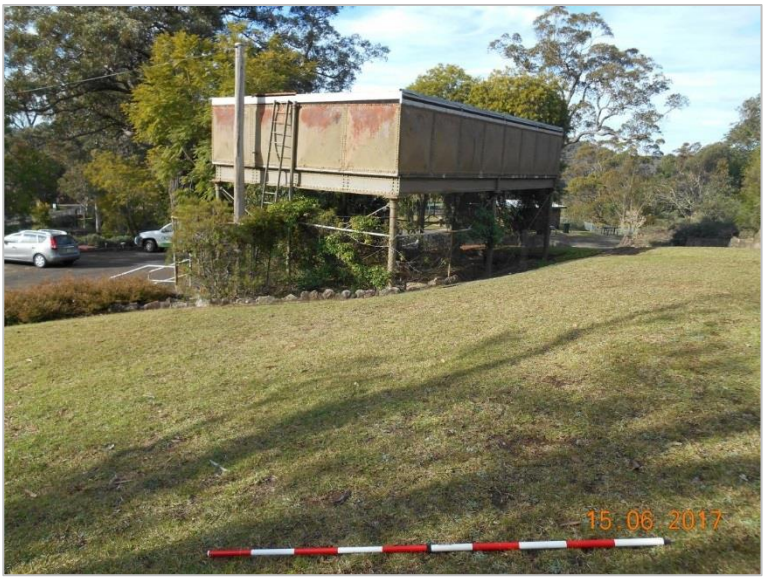

Plate 35: The elevated water tank (Niche 2017)

The elevated terraces of the upper picnic ground afford the public multiple scenic views over the upstream reservoir, with a dedicated lookout platform on the fence line overlooking the spillway channel (Plate 36). The views from this point include a vista back towards the lower picnic area (although the Avon Dam wall is not in view), but the ridgelines surrounding the reservoir are high enough that there would be no visibility beyond the Avon Dam to the proposed ventilation shaft site.

Plate 36: The view from the lookout, looking south-east (Niche 2017)

Given the current vegetation and past rehabilitation works, ground surface visibility was low. Despite this, no evidence of further historical archaeological relics was noted during the inspection and the potential for such relics was considered low.

4.1.4 Ventilation Shaft Site 5A

The Project includes the development of supporting infrastructure at a proposed ventilation shaft site (Shaft Nos 5A). The ventilation shaft site is located more than 1 km from both the Avon and Cordeaux Dams and the associated curtilages and is located nearby to currently maintained fire trails (adjacent Fire Trail 6) in densely vegetated bushland (Plate 37). The ventilation shaft site and associated surface disturbance is not within the curtilage of any listed historic heritage items.

Plate 37: Proposed location of Ventilation Shaft Site No 5A (Niche 2017)

In order to confirm whether infrastructure at the ventilation shaft site would be visible, an analysis model was produced and is shown in Figure 6. The analysis used surface topography and elevations to determine the viewshed of a person standing at the both the Avon and Cordeaux Dam walls , and measured whether the 35 m tall drill rig (during the construction phase), or 15 m tall, enclosed flare stacks and 8 m fans (the tallest structures during operation) at the ventilation shaft site would be visible to the public.

Infrastructure at the proposed new ventilation shaft site would be hidden from view from both Avon Dam and Cordeaux Dam due to the surrounding topography and dense intervening topography.

During operations a condensation plume may potentially be visible temporarily during periods of low temperature above the ventilation shaft site.

Following the completion of underground mining operations for the Project, the ventilation shaft and other supporting infrastructure would be decommissioned and removed, and the site rehabilitated.

4.1.5 Dendrobium Pit Top Area

The physical inspection of Dendrobium Pit Top was undertaken in September 2021 to confirm the locations and condition of infrastructure on-site.

Proposed Carpark Extension

The proposed carpark extension site for the Dendrobium Pit Top is located south of Cordeaux Road directly south-east of the Dendrobium Pit Top (on the opposite side of Cordeaux Road from the Dendrobium Pit Top site, and outside the heritage curtilage). The site has been subject to landform alteration with a primarily gravelled surface. A modern corrugated iron building is located in the centre of the site and would be demolished to accommodate the proposed carpark. The entrance to the proposed carpark extension is heavily vegetated and has been subject to erosion and disturbances (Plate 38 and Plate 39).

Plate 38: View of the proposed carpark entrance and ramp (Niche 2019)

Plate 39: View north overlooking the proposed carpark (Niche 2019)

Dendrobium Pit Top – Western Administration Buildings and Workshops

The complex of office stores/storage/garage facility structures located to the western side of the Dendrobium Pit Top is a combination of corrugated sheet metal buildings on concrete pads which are workshops, and a brick administration building. These buildings are located directly north and north-west of the entrance bridge, and the administration building served as the primary Nebo Colliery office building. The workshop/stores buildings are also connected with the former Nebo Colliery and are directly west of the original brick administration structure, and south of the 1946 bathhouse structure. A large tree has been removed from the location now occupied by the current security gate infrastructure, and two other trees are currently damaging the Administration building with their root systems (these trees were assessed in 2018).Plate 40 to Plate 45 provide the current state of the facilities in this location of the Dendrobium Pit Top.

Plate 40: View of the Administration Building, showing the current main entrance and two adjacent trees. The Bulk Warehouse is located to left of frame (Niche 2021).

Plate 41: View of the Main Entrance infrastructure, with turnstiles to the right of frame. The 1946 Bathhouse is visible in the background (Niche 2021).

Plate 42: View of the Bulk Warehouse Building to the west of the Administration building, from the front of the site (Niche 2021).

Plate 43: View of the Bulk Warehouse Building looking north across the site, from the raised terrace to the west (Niche 2021).

Plate 44: View of the Bulk Warehouse, Main Workshops and Maintenance Area to the west of the Pit Top Site (Niche 2021).

Plate 45: View looking west of the Raised Terrace, Water Tank and Maintenance Area, from the northern corner of the main workshops. (Niche 2021).

Dendrobium Pit Top – 1946 Dendrobium Bathhouse and Centrally-located Support Facilities

These functioning buildings are located north-east of the current administration building, and north-west of the asphalted open area which extends along much of the eastern boundary of Dendrobium Pit Top. This area is currently used as an open storage area (Plate 44). The bathhouse facility was originally constructed in 1946 and consists of showers with separate 'dirty' and 'clean' changing rooms on the upper floor. Briefing rooms and other offices make up the remainder of the building. While a modern addition to increase capacity has been subsequently added to the rear of the building, the interiors retain much of the original detailing, although this facility has seen constant use since it was built. (See Plate 46 to Plate 53).

Plate 46: View of the 1946 Bathhouse Facility from the administration building/main workshop area, looking north (Niche 2021).

Plate 47: View of the Western Façade of the 1946 Bathhouse Facility structure, showing the modern addition, and undercover staging area to the rear (Niche 2021).

Plate 48: South-Eastern View from the 1946 Bathhouse Rooftop (Niche 2021).

Plate 49: Eastern View from the 1946 Bathhouse structure taken from the Rooftop (Niche 2021).

Plate 50: North-eastern View from the 1946 Bathhouse Rooftop towards the Dendrobium Mine Portal at the extent of this bench level. Note the refuel station visible in the foreground (Niche 2021).

Plate 51: View of the Refuel Station and bunding East of the 1946 Bathhouse (Niche 2021).

Plate 52: View inside the 1946 Bathhouse, showing the general area on the first-floor bath facilities (Niche 2021).

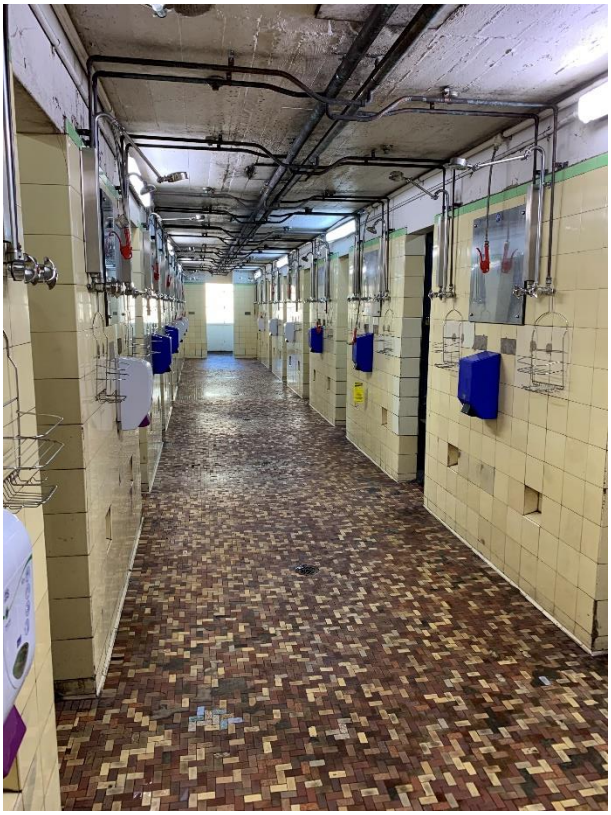

Plate 53: View of the Showers in the interior of the 1946 Bathhouse. Note the patterned tiling and some legacy fittings remain, along with continued updates. Change rooms open off the doorways (Niche 2021).

Dendrobium Pit Top – General locales of Interest: Dendrobium Mine Portal and Bench approach, Lower Bench Level with Settling Pond and Water Treatment Facilities, and the former location of the Pioneer Kerosene Works

The active mine portal (entrance) for the Dendrobium Mine is located in the north of the Dendrobium Pit Top and is approached along an artificial bench, at a level slightly raised above the level of the main building complex. Also, the former portal to the Nebo Colliery workings is located near the active mine portal but has previously been sealed (Plate 54 to Plate 59).

On a lower level towards American Creek (to the southeast of the Pit Top Structures) is the site of a carpark, a settling pond and the wastewater treatment facility for the site. This level was also the location of the historic Pioneer Kerosene Works adjacent American Creek (to the south-east of the Dendrobium Pit Top). The likelihood for archaeological potential in this area and in the adjacent subsurface level below the Dendrobium Pit Top Bench level is indicated by the Local Heritage Item #6411: *Site of Pioneer Kerosene Works* (See Plate 60 to Plate 63).

Plate 54: View of the Dendrobium Mine Portal, at the North-eastern extent of the bench (Niche 2021).

Plate 55: View of the former Nebo Colliery Portal, located closer to the 1946 bathhouse, along the bench (Niche 2021).

Plate 56: View from the Dendrobium Mine Portal down an Access Road towards the lower carpark level (Niche 2021).

Plate 57: View of the Bench from the Dendrobium Mine Portal looking west along the portal's access road (Niche 2021).

Plate 58: View from the 1946 Bathhouse looking along the bench towards the Dendrobium Mine Portal (Niche 2021).

Plate 59: View towards the 1946 Bathhouse showing the former route to the Nebo Colliery Portal (Niche 2021).

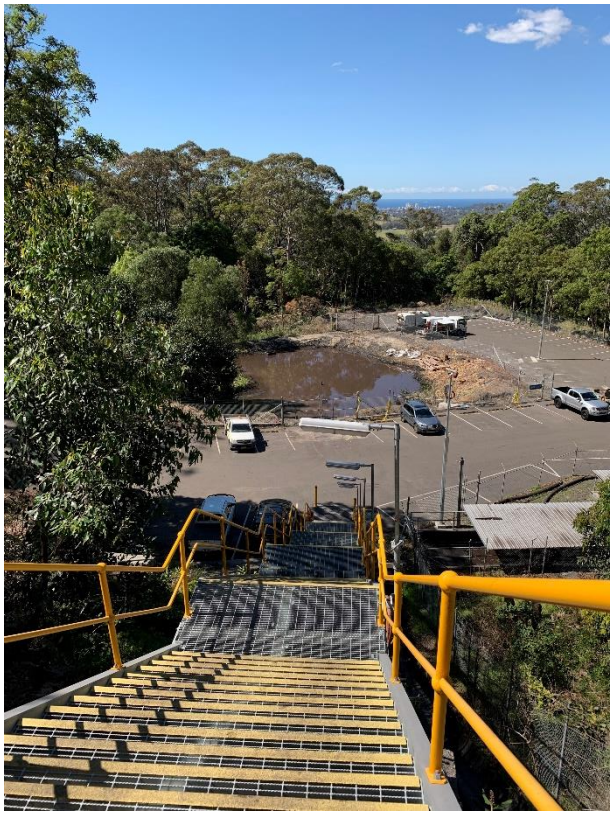

Plate 60: View looking South towards the settling pond on the lower level. American Creek is situated to the east beyond the perimeter fencing. (Niche 2021).

Plate 61: View of the Lower Level with Carpark, Settling Pond, and Wastewater Treatment Facility (Niche 2021).

Plate 62: View of the route to the upper bench from the lower bench level. (Niche 2021).

Plate 63: View looking over the carpark at the lower bench level. This is considered to be the site of the former Pioneer Kerosene Works as per Rodgers 2003 and the local heritage listing (#6411) (Niche 2021).

4.2 Other Archaeological Remains and Previous Assessments of the Subject Area

Approximately 2.5 km west of Cordeaux Dam, the remains of an aircraft wreckage were located within the Metropolitan Special Area. The remains are scattered across an area approximately 20 m x 15 m between two ridgelines (Niche 2015:1). The remains predominately consist of pieces of the aircraft's frame and fuselage. The site is of local significance because it is the remains of a Tugan L.J.W.7 Gannet (TA.52) VH-UUZ, which crashed in densely wooded country on 19 February 1936. The aircraft was designed by Australian aviation pioneer Sir Lawrence James Wackett in 1934. Only eight Tugan Gannets were completed and flown between 1935 and the closure of Tugan Aircraft in 1937 (Niche 2015:3).

The location of the wreckage remains is outside of the Subject Area, away from the locations of the ventilation shaft site, and therefore would not be impacted as part of the Project.

4.2.1 Dendrobium Coal Project: Cultural Heritage Assessment (Navin Officer 2000)

Navin Officer undertook the cultural heritage assessment component of the original EIS submitted to obtain the development consent for the Dendrobium Mine in 2000. The assessment considered both Aboriginal and non-Aboriginal (historical) heritage values. The assessment confirmed that the Nebo Colliery buildings, dating from 1946, are listed on the *Wollongong Local Environmental Plan 2009* (Item ID7104).

4.2.2 Nebo Colliery Pit Top, Mount Kembla: An archival Record (Rogers 2001)

In order to support the Dendrobium Mine mining operations, a number of the former Nebo Colliery Pit Top buildings were demolished while several required substantial alterations. In 2001, an archival record of the Nebo Colliery Pit Top buildings was compiled prior to the demolition and alteration of the remnant mining facilities (see Appendix 2 for Archival Plans (2003)).

In 2003, supplementary archival documents were prepared which incorporated recordings of those buildings demolished and/or altered, and those excavations undertaken in compliance with appropriate approvals (Rogers 2003).

As part of the preparation for the Dendrobium Mine, an auxiliary water supply consisting of a 350 kilolitres tank and pump house was installed in the location of the former staff carpark south of the workshop and offices. The installation of the tank and pump house included the excavation of the area to form a 'flat site'. No historical archaeological remains were recorded during these excavations.

In 2000, excavations for the Eastern Gas Pipeline identified extensive deposits of spent shale along the Kerosene Flats, associated with the early kerosene works. During excavation works in 2002, a stone and brick setting with an iron door were uncovered within the southern portion of the flat. Further archaeological excavations found evidence of two furnaces running east west across the kerosene flats. No archaeological relics were uncovered during excavations undertaken in the northern end of the kerosene flats.

The demolition of the brick and concrete fan motor house, concrete fan drift, brick Collieries Training Centre and the rail turn-in to original Nebo Colliery portal resulted in a series of archaeological investigations at each building location. No archaeological relics were recorded during these excavations. However, during the removal of old Nebo Colliery structures the concrete base for the original fan was uncovered with a large concrete machine foundation exposed along the northern reaches of the Nebo Colliery Pit Top.

In 2003, a series of road works were undertaken across the Nebo Colliery Pit Top east of the offices and bath house and south of the offices and sheltered store. No archaeological relics were recorded during the road work excavations (Rogers 2003).

4.2.3 Sydney Catchment Authority – Metropolitan Dams: Conservation Management Plan (Graham Brooks & Associates Pty Ltd 2003)

Graham Brooks & Associates prepared a CMP in 2003 for the four Metropolitan Dams controlled by the then SCA (now Water NSW). Cataract, Cordeaux, Avon and Nepean Dams were completed between 1907 and 1936 and were built to supply metropolitan Sydney with a secure and reliable water supply. The collective heritage value of the four Metropolitan Dams has been recognised as being of State significance and each dam has been entered onto the SHR. The CMP was prepared for the purpose of providing SCA with a plan for managing the cultural heritage value of the dams, whilst maintaining their operational efficiency.

Volume One of the CMP covers general heritage management issues that apply across the collective dam resource and establishes policies to guide management decisions which generally relate to each of the four dams. Volumes Two to Five outline specific guidelines and exemptions for day-to-day management for each of the individual dams (Volume 3 – Cordeaux Dam; Volume 4 – Avon Dam).

The CMP was endorsed by the Heritage Council of NSW on 27 June 2003 for a period of five years and has therefore now expired (as of 27 June 2008).

4.2.4 Dendrobium Area 3: Archaeological and Cultural Heritage Assessment (Biosis Research 2007)

Biosis Research prepared an archaeological and cultural heritage assessment in 2007 in support of a modification to Area 3 at Dendrobium Mine. The area encompassed an area between Cordeaux and Avon Dams and is located to the west of Area 5. The purpose of the assessment was to identify, record and assess the significance of both Aboriginal and historical archaeological sites within Area 3.

The assessment considered impacts to Cordeaux Dam, given the proximity of Area 3 to the State heritage listed item, but found that Area 3 would not impact on the views and vistas of the Cordeaux Dam wall from the surrounding ridgelines or physical infrastructure associated with the Cordeaux Dam. One new item of historical heritage was identified during the field survey in Area 3C: a small timber bridge on a tributary of the Cordeaux River, seemingly constructed ad hoc from recycled power / telegraph poles and in a very poor condition. Biosis Research (2007) found that there was a low potential for the bridge to be impacted by subsidence movements, given its construction and small size.

In conclusion, Biosis Research (2007:77) found there to be no historical heritage constraints associated with the proposed mining operations within Area 3, noting that:

> *The lack of historic heritage sites within the study area is not inconsistent with the land use history of the area. The study area was unalienated Crown land prior to declaration as a water supply reserve. This lack of sustained historic occupation is reflected in the historic archaeological record of the study area.*

4.2.5 Dendrobium Area 3B, Longwalls 9 to 18: Heritage Impact Assessment (Biosis Research 2012)

Biosis Research prepared a Heritage Impact Assessment for Dendrobium Area 3B, encompassing Longwalls 9-18, in 2012 in support of the Subsidence Management Plan (SMP). The SMP area assessed is located to the south of Area 5. The assessment did not identify any items of historical heritage within the SMP area and therefore no management measures in relation to historical heritage were provided.

4.2.6 Dendrobium Mine – Plan for the Future: Coal for Steelmaking Historical Heritage Assessment (Niche 2017 and an Addendum Report: Niche 2019)

Niche has undertaken previous assessments in 2017 and again in 2019 with an addendum in support of a previous approvals request for an extension of mining for Dendrobium Mine, which included Mining in the region of the Subject Area. The assessments and data captured in these reports have been re-used for this report, as much of this information is directly relevant to this project.

5 Assessment of Heritage Significance

5.1 Methodology for Assessing Significance

The NSW guidelines, *Assessing Heritage Significance* (NSW Heritage Office 2001) provides the following significance assessment and Statement of Significance framework. These guidelines incorporate the seven aspects of cultural heritage value identified in the Burra Charter (Australia ICOMOS 2013) into a framework currently accepted by the NSW Heritage Council and Heritage NSW.

5.1.1 Criteria for Assessing Significance

The NSW Significance Assessment criteria are outlined in *Assessing Heritage Significance* (NSW Heritage Office 2001) and are summarised in Table 4. Using these criteria, a place can be assessed to be of local, state or no heritage significance.

Table 4: Heritage Assessment Criteria

Criteria	Value	Description
Criterion A)	Historical Significance	An item is important in the course, or pattern, of NSW's cultural or natural history (or the cultural of natural history of the local area).
Criterion B)	Associative significance	An item has strong or special association with the life or works of a person or group of persons, of important in NSW's cultural or natural history (or the cultural of natural history of the local area).
Criterion C)	Aesthetic significance	An item is important in demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement in NSW (or the local area).
Criterion D)	Social significance	An item has strong or special association with a particular community or cultural group in NSW (or the local area) for social, cultural or spiritual reasons.
Criterion E)	Research potential	An item has the potential to yield information that will contribute to an understanding of NSW's cultural or natural history (or the cultural or natural history of the local area)
Criterion F)	Rarity	An item possesses uncommon, rare or endangered aspects of the area's cultural or natural history (or the cultural or natural history of the local area).
Criterion G)	Representativeness	An item is important in demonstrating the principal characteristics of a class of NSW's cultural or natural places, or cultural or natural environments. (or a class of the local area's cultural or natural places, or cultural or natural environments.)

5.1.2 Grading of Significance

A five-tier system detailing levels of significance is outlined in *Assessing Heritage Significance* (NSW Heritage Office 2001). The grading system is used to identify the overall significance of items or sites being assessed. The levels of significance and their justification to be applied to items is listed in Table 5 below.

Table 5: Gradings of Significance

Grading	Justification	Status
Exceptional	Rare or outstanding element directly contributing to an item's local or State listing.	Fulfils criteria for local and/or State significance.
High	High degree of original fabric. Demonstrates a key element of the item's significance. Alterations do not detract from significance.	Fulfills criteria for local and/or State significance.
Moderate	Altered or modified elements. Elements with little heritage value, but which contribute to the overall significance of the item.	Fulfills criteria for local and/or State significance.
Little	Alterations detract from significance. Difficult to interpret.	Does not fulfill criteria for local or State listing.
Damaging	Damaging to the item's heritage significance.	Does not fulfill criteria for local or State listing.

5.2 Significance Assessments for Heritage Items

The following Section presents a significance assessment for the identified Heritage Items within the Subject Area. No other heritage items were identified by the background reviews or field surveys.

5.2.1 Avon Dam

The significance assessment provided in Table 6 and Statement of Significance have been reproduced from the SHR listing for Avon Dam (SHR ID: 01358).

Table 6: Significance Assessment for Avon Dam (SHR ID: 01358)

SHR Criterion	Significance
(a) An item is important in the course, or pattern, or NSW's cultural or natural history (or the cultural or natural history of the local area)	Avon Dam is constructed within the Upper Nepean Catchment Area which was developed with the completion of the Cataract and Nepean tunnels in 1888 as the fourth source of water supply for Sydney. The potential of the Upper Nepean Catchment Area to supply water was fully developed through the construction of four major dams between 1903 and 1936. Avon Dam is the third of these dams to have been completed. The Upper Nepean Catchment Area continues to supply the regions of Sydney and the Illawarra, with Avon Dam providing a supply to the Illawarra region through the Upper Avon water pumping station. Avon Dam was the fifth of the major water supply/irrigation dams constructed in NSW during the first half of the twentieth century. The design and technologies used in the construction of the dam are representative of methods developed by the Public Works Department of NSW at the time. In conjunction with the completion of Cordeaux Dam in 1926, the impounded water of the Avon Catchment Area provided one of the major sources of water for domestic and industrial consumption in metropolitan Sydney, the largest city in NSW. In providing water for metropolitan Sydney during this era the dam, in ensuring security of supply, contributed to the extensive residential, commercial and industrial development of Sydney during the 1920s and 1930s.

SHR Criterion	Significance
(b) An item has strong or special associations with the life or works of a person, or group of persons, of importance in the cultural or natural history of NSW (or the cultural and natural history of the local area)	The design and construction of Avon Dam was undertaken by the Water Supply and Sewerage Branch of the NSW Public Works Department. The construction of the dam drew upon the knowledge and experience of a number of the engineers employed in the Branch at the time including Ernest M. De Burgh (engineer in chief), the successful completion of the dam and its continuation of use as a water supply dam are a lasting testament to the professional capabilities of the Federation/Inter War era generation of engineers of the Public Works Department. The former official quarters at Avon Dam has provided for a number of generations, a holiday type residence for the board members of the Water Board. The buildings and grounds have some associations with past identities of the board, which was until comparatively recently one of the major government departments in NSW in regard to its economic and political influence. The tract of West Australian gum trees situated to the north west of the former official quarters was planted out by board members of the Water Board in 1928. The trees have particular memorial associations with the past identities of the Board.
(c) An item is important in demonstrating aesthetic characteristics and/or a high degree of creative or technical achievements in NSW (or the local area)	The wall of Avon Dam is an engineering work imbued with a sense of high aesthetic value expressed through the long curved wall set within the steep valley of the Avon River. The design and finishes of the crest house, entry pylons and lower valve house in the Inter-War Egyptian style were undertaken by the Government Architects Branch of the Public Works Department at that time headed by George McCrae. The architectural detailing of the superstructures evokes a romanticised vision of the 'Ancient Near East' at a time when many Australians had first-hand experience of the area through military service, and through knowledge of archaeological finds reported in the popular press. The dam is set within the valley of the Avon River. Upstream of the dam wall, this setting is characterised by the broad expanse of the pool of water bordered by the crests of the valley sides. Downstream of the dam wall the setting is characterised by the steeper inclines that graduate into the river gorge. The topography, at times of high water level, imparts a picturesque scene when viewed from selective vantage points above and on the dam wall. The former resident officer's cottage erected at the time of construction is an excellent, albeit much modified, example of the high standard of accommodation provided for resident Public Works Department for its senior staff. The landscaping of its lower picnic grounds exhibits a high level of design awareness through its planning, evolution and association with the Botanic Gardens on the original layout and selection of species.
(d) An item has a strong or special association with a particular community or cultural group in NSW (or the local area) for social, cultural or spiritual reasons	The dam and grounds are recognised by the National Trust of Australia (NSW) as being a place which is part of the cultural environment of Australia which has aesthetic, historical, architectural, archaeological, scientific and social significance for future generations, as well as for the present community of NSW. The dam and grounds are recognised by the Heritage Council of NSW as a place which is of significance to NSW in relation to its historical, scientific, cultural, social, archaeological, natural and aesthetic values.

SHR Criterion	Significance
(e) An item has potential to yield information that will contribute to an understanding of NSW's cultural or natural history (or the cultural or natural history of the local area)	The cyclopean masonry of the dam is an excellent and early example of gravity dam construction in the Inter-War era incorporating inspection galleries, contraction, joints and foundation drainage system which collectively demonstrate the principal characteristics of the state development of this technology at the time. The double level discharge, penstock gates and roller gates collectively demonstrate the principal characteristics of the state development of this technology at the time. The terraces and platforms adjoining the dam abutments demarcate the location of plant and equipment used in the construction of the dam, in particular the location of the cableway head towers, the quarry railway terrace, the motor vehicle garage, and the electricity substation. The grounds of the dam retain numerous tree plantings undertaken from the time of the completion of the dam in 1928. Collectively the diversity of these trees present a good record of past horticultural practices. The catchment area in being relatively untouched bushland in close proximity to a major urban area has a high potential for further research into natural ecosystems.
(f) An item possesses uncommon, rare or endangered aspects of NSW's cultural or natural history (or the cultural or natural history of the local area); and	The basin of the reservoir of Avon Dam is the area of the largest impoundment within the Upper Nepean Catchment Area. Avon Dam is one of three dams in NSW which incorporate extensive Inter-War Egyptian Architectural detailing. Avon Dam is however unique in always retaining remnant landscape features that continue to evoke the imagery of an Egyptian revival landscape. Avon Dam is one of two dams in NSW which incorporate pedestrian and vehicular entry pavilions to the crest wall. The crest and valve houses and inlet works retain original ironwork and machinery such as the roller gates and penstock gates and operating mechanism which represent a substantial repository of water supply delivery technology of the era. The spillway channel was the largest in terms of the depth and width constructed up to that date within the Sydney metropolitan area. The purpose built road of access to the dam wall from the railhead at Bargo is unique within the context of the four metropolitan Dams in being the principal means by which the general supplies, men and raw materials were transported during the construction process. The dam wall retains evidence for a scour outlet operating system which was unique to Avon Dam. The dam incorporates cyclopean masonry which is a construction technique unique to the Metropolitan Dams in Australia.

SHR Criterion	Significance
(g) An item is important in demonstrating the principal characteristics of a class of NSW's (or the local area's) ***(i) cultural or natural places; or*** ***(ii) cultural or natural environments.***	Avon Dam is representative of a type of dam (cyclopean masonry gravity dam) constructed in NSW by the Water Supply and sewerage Branch of the Public Works Department during the first half of the twentieth century. Key representative attributes of the dam's design and construction include the use of cyclopean masonry bedded in sandstone concrete, use of blue metal concrete in facing the upstream face, use of sandstone concrete in the facing of the downstream face, use of a spillway set away from the gravity wall, lower valve/crest house attractively designed and finished to a high standard, the use of an array of upstream intakes to regulate the quality of water supply, the internal inspection galleries, the foundation drainage system, the contraction joints, and the internal drainage system. The upgrading works to the spillway and dam wall with the compacted rock embankment and spill weir redesign, competed in 1971 to make the dam meet modern safety requirements, are representative of engineering practice of the day. The upgrading of the valves within the dam wall and ancillary monitoring and operating equipment is representative of modern dam safe operating practice. The construction technologies used at Avon Dam are representative of dams constructed in NSW through the first half of the twentieth century by the Public Works Department. Key representative attributes of the dam's construction techniques include the use of cableways, the building of temporary camps to house labourers and tradesmen, building of permanent cottages to house salaried staff, the construction of terrace platforms to house plant and machinery, mechanisation of concrete production, the construction of a purpose built road of access to transport men, supplies and materials from the nearest railhead to the construction sites, the building of permanent infrastructure such as water supply for plant and men and houses, the use of electricity to power plant and equipment. The rehabilitation of tracts of scarring in the construction process employed at Avon Dam through beautification works is representative of practices undertaken at other dams throughout NSW. Key representative attributes of this practice include utilising the former camp as a picnic area, utilising the former terraced construction platforms as picnic areas and lookouts, and utilising the former construction roads for vehicular access to the dam site and dam wall. The practice of ongoing maintenance of the wall after completion through resident staff and workshop facilities is representative of procedures undertaken at other dams and weirs constructed in NSW.

5.2.2 Statement of Significance Avon Dam (SHR ID: 01358)

The Avon Dam was the third and the largest of the four water supply dams built as part of the development of the Upper Nepean Water Supply Scheme, one of the most important engineering works and items of public infrastructure in Australia, and is still the second largest of all the NSW water supply dams in terms of storage capacity. It was designed by the NSW Public Works Department under the direction of one of Australia's leading water supply engineers, E.M. De Burgh. The completion of the Avon Dam was a significant step in the continuing process of providing a reliable water supply for Sydney and surrounding areas as part of the Upper Nepean Scheme. Even by the international standards of the time, Avon was a high dam with a large impoundment of water and was a significant work of engineering in its day. It continues to play an important role as the major source of supply for the Wollongong, Port Kembla and surrounding towns and areas.

Additionally, the Avon Dam is a handsome, well-proportioned structure with strong Egyptian style architectural character which complements the monumental nature of the structure and its attractive natural surroundings.

The roadway was constructed prior to the Dam between 1918 and 1921, and was used to transport all materials, stores and labour and significantly provided the sole route of transportation, other dam sites relying on a combination of road, tram or ropeway, and continues to be used as the main access to the present time.

The Avon Dam includes a range of ancillary structures which form components of the overall site. One building is believed to be the original Residential Engineers residence and is a fine example of an Interwar Bungalow. The other residential buildings associated with the dam are relatively modern replacements for the original set of houses, but are representative of their type.

The grounds associated with the Avon Dam are of considerable aesthetic and social value.

They contain an important, substantially intact interwar landscape design - including ornamental ponds, grottoes and rustic picnic structures - particularly incorporating various Egyptian Revival references to compliment the thematic treatment of the architecture associated with the main dam structures. The immediate dam area is of distinction as a scenic landscape.

5.3 Cordeaux Dam

The significance assessment provided in Table 7 and Statement of Significance have been reproduced from the SHR listing for Cordeaux Dam (SHR ID: 01360).

Table 7: Significance Assessment for Cordeaux Dam (SHR ID: 01360)

SHR Criterion	Significance
(a) An item is important in the course, or pattern, or NSW's cultural or natural history (or the cultural or natural history of the local area)	Cordeaux Dam is constructed within the Upper Nepean catchment area which was developed with the completion of the Cataract and Nepean tunnels in 1888, as the fourth source of water supply for Sydney. The potential of the Upper Nepean Catchment Area to supply water was fully developed through the construction of four major dams between 1903 and 1936. Cordeaux Dam is the second of these dams to have been completed. The Upper Nepean Catchment Area continues to supply the regions of Sydney and Illawarra. Cordeaux Dam was the fourth of the major water supply dams constructed in NSW during the first half of the twentieth century. The design and technologies used in the construction of the dam are representative of the methods developed by the Public Works Department of NSW at the time. In conjunction with the completion of Avon Dam in 1927, the impounded water of the Cordeaux catchment area provided one of the major sources of water for domestic and industrial consumption in metropolitan Sydney, the largest city in NSW. In providing water for metropolitan Sydney during this era the dam, in ensuring security of supply, contributed to the extensive residential, commercial and industrial development of Sydney during the 1920s and 1930s.

SHR Criterion	Significance
(b) An item has strong or special associations with the life or works of a person, or group of persons, of importance in the cultural or natural history of NSW (or the cultural and natural history of the local area)	The design and construction of Cordeaux Dam was undertaken by the Water Supply and Sewerage Branch of the NSW Public Works Department. The construction of the dam drew upon the knowledge and experience of a number of engineers employed in the Branch at the time, including Ernest M. de Burgh (Chief Engineer). The successful completion of the dam and its continuation of use as a water supply dam are a lasting testament to the professional capabilities of the Federation/Inner War era generation of engineers of the Public Works Department. The tract of Eucalyptus bordering the encircling road of the upper picnic area was planted out by Board members of the former Water Board in 1928. The trees have particular memorial associations with the past identities of the Board.
(c) An item is important in demonstrating aesthetic characteristics and/or a high degree of creative or technical achievements in NSW (or the local area)	The wall of Cordeaux Dam is an engineering work imbued with a sense of aesthetic values expressed through the long curved wall set within the valley of the Cordeaux River. The design and finishes of the crest houses, entry pylons and lower valve houses in the Inter Egyptian style were undertaken by the Government Architect's branch of the Public Works Department at the time headed by George McCrae. The architectural detailing evokes a romanticised version of the Ancient Near East at a time when many Australians had first-hand experience of the area through military service, and through knowledge of archaeological finds reported in the popular press. The dam is set within the valley of the Cordeaux River. Upstream of the dam wall this setting is characterised by the broad expanse of the pool of water bordered by the crests of the valley sides. Downstream of the dam wall the setting is characterised by the steeper inclines that graduate into the gorge created by the river's flow over time. Collectively this topography at times of high water imparts a picturesque scene when viewed from selective vantage points above and on the dam wall. The former resident officer's cottage erected at the time of the dam's construction to house the resident engineer, is an excellent and intact example of the high standard of accommodation provided for Public Works Department senior staff.
(d) An item has a strong or special association with a particular community or cultural group in NSW (or the local area) for social, cultural or spiritual reasons	The dam and grounds are recognised by the National Trust of Australia (NSW) as being a place which is part of the cultural environment of Australia, which has aesthetic, historical, architectural, archaeological, scientific and social significance for future generations, as well as for the present community of NSW. The dam and grounds are recognised by the Heritage Council of NSW as a place which is of significance to NSW in relation to its historical, scientific, cultural, social, archaeological, natural and aesthetic values.

SHR Criterion	Significance
(e) An item has potential to yield information that will contribute to an understanding of NSW's cultural or natural history (or the cultural or natural history of the local area)	The cyclopean masonry of the dam is an excellent early example of gravity dam construction in the Inter War era. It incorporates inspection galleries, contraction joints, and foundation drainage systems which collectively demonstrate the advanced state of this technology at the time. Terraces and platforms adjoining the dam abutments demarcate the location of plant and equipment used in the construction of the dam, in particular the location of the cableway head towers, and concrete batching plant. The plateau of the upper picnic area was the site of the original construction township and retains a road formation, culverts and drainage lines and tennis court from that era. The grounds of the dam retain numerous tree plantings undertaken for the opening of the dam in 1927. Collectively the diversity of these trees present a good record of past horticultural practices.
(f) An item possesses uncommon, rare or endangered aspects of NSW's cultural or natural history (or the cultural or natural history of the local area); and	The wall of the Cordeaux Dam is the longest of all the dams constructed in the Upper Nepean Catchment Area. Cordeaux Dam is one of three dams in NSW which incorporate extensive Inter-War Egyptian architectural detailing. Cordeaux Dam is one of two extant dams in NSW which incorporate pedestrian and vehicular entry pavilions to the crest wall. The crest and valve houses and inlet works retain original ironwork and machinery such as roller gates, penstocks and penstock opening system which represent a substantial repository of water supply delivery technology for the era in NSW. The dam incorporates the first instance of multiple level water discharges and valve houses, and emergency roller gates in NSW. The ensemble of plant buildings either associated with the construction or completion of the dam, such as weatherboard machine shed (adapted to a double garage) and the corrugated iron blacksmiths, are unique *in situ* examples within the broader context of the four Metropolitan Dams. The dam incorporates cyclopean masonry which is a construction technique unique to the Metropolitan Dams in Australia. The dam incorporates the first instance of internal inspection galleries and connecting pipework and V notch weirs in a dam in NSW.

SHR Criterion	Significance
(g) An item is important in demonstrating the principal characteristics of a class of NSW's (or the local area's) ***(i) cultural or natural places; or*** ***(ii) cultural or natural environments.***	Cordeaux Dam is representative of a type of dam (cyclopean masonry gravity dam) constructed in NSW by the Department of Public Works during the first half of the twentieth century. Key representative attributes of the dam design and construction include the use of cyclopean masonry bedded in sandstone concrete, use of blue metal concrete in facing the upstream face, the use of sandstone concrete in facing the downstream wall, use of a spillway that is an extension of the gravity wall, upper and lower valve/crest houses attractively designed and finished to a high standard, the use of an array of upstream intakes to regulate the quality of water supply, the internal inspection galleries, the foundation grouting system, the contraction joints, and the internal drainage system. The upgrading of the valves within the dam wall and ancillary monitoring and operating equipment is representative of modern day safe operating practice. The construction technologies used at Cordeaux Dam are representative of dams constructed in NSW through the first half of the twentieth century. Key representative attributes include the use of cableways, the building of temporary townships to house labourers and tradesmen, building of semi-permanent cottages to house salaried staff, the construction of terrace platforms for plant and machinery, mechanisation of concrete production, the construction of a purpose built road of access and tramway to transport men, supplies and materials from the nearest railhead to the construction site, the building of permanent infrastructure such as water supply for plant, men and horses and the use of electricity to power plant and equipment. The rehabilitation of tracts of land scarred in the construction processes employed at Cordeaux Dam through beautification works is representative of practices undertaken at other dams throughout NSW. Key representative attributes of this practice include utilising the former township as a picnic area, utilising the former terraced construction areas as picnic areas and lookouts, and utilising the former construction roads and tramway for vehicular access to the dam wall. The practice of ongoing maintenance of the wall after completion through surveillance provided by resident staff and workshop facilities is representative of procedures undertaken at other dams in NSW. The provision of public amenity at the dam site is representative of the use of large water supply and irrigation dams in NSW as places for recreation by the greater community.

5.3.1 Statement of Significance Cordeaux Dam (SHR ID: 01360)

Cordeaux Dam was the second of the four water supply dams built as part of the development of the Upper Nepean Water Supply Scheme, one of the most important engineering works and items of public infrastructure in Australia, and still has the longest wall of all the NSW water supply dams. It was designed by the NSW Public Works Department under the direction of one of Australia's leading water supply engineers, E.M. De Burgh. The completion of the Cordeaux Dam was a significant step in the continuing process of providing a reliable water supply for Sydney and surrounding areas as part of the Upper Nepean Scheme. Even by the international standards of the time, Cordeaux was a large dam and was a significant work of engineering in its day. It continues to play an important role as a major source of supply for the Sydney region.

Cordeaux Dam is a handsome, well-proportioned structure with strong Egyptian style architectural character which complements the monumental nature of the structure and its attractive natural surroundings. Cordeaux Dam includes a range of ancillary structures which form components of the overall site, including residential cottages of various ages for operational staff, one of which appears to date from the construction of the dam. This latter is associated with the Residential Engineer for construction and operation of the dam and is a fine example of a late Federation Bungalow style building. The other residences are representative of their age and type.

The public picnic grounds and gardens attached to the Cordeaux Dam contain a cultural landscape resource - including remnants of its interwar period plantings, layout and detailing, and extensive areas of bushland. There is evidence in the landscape design, particularly in the use of palms and tree ferns and battered stonework retaining walls, of an intention to continue the Egyptian Revival references apparent in the design of the main dam structures.

5.4 Dendrobium Pit Top

The following significance assessments have been reproduced from the State Heritage Inventory (SHI) and Wollongong City Council Development Control Plan (DCP) for the Nebo Colliery and the Kembla Heights Heritage Conservation Area.

5.4.1 Nebo Colliery Statement of Significance

The following statement of significance has been reproduced from the SHI listing for the Nebo Colliery in *Wollongong Local Environmental Plan 2009* (number 7104) and listed as an archaeological item.

This site is significant as it was the first mine to be opened as a fully mechanised mine in 1947. It was a green field mine development and its surface facilities were of the most modern design being fully mechanised upon opening. It is also significant for its association with Mt Kembla village and the surrounding area, for its relationship between mines, mining companies and their workers and for the joint ownership of the mine and the associated steel works. It is also significant for its association with the new Dendrobium Mine for which its facilities were chosen to support.

5.4.2 Kembla Heights Heritage Conservation Area Statement of Significance

The following Significance assessment has been taken from the Wollongong City Council DCP (2009) Part E – General Controls – Environmental Controls Chapter E11: Heritage Conservation (20.4)

Kembla Heights is the most intact mining village in the Wollongong Local Government Area with its simple, consistent late Victorian and early Federation period cottages characterised by simple "home renovations".

The pattern of development of the town reflects the type and size of the local mining industry, particularly in terms of its rapid expansion during the 1880s and 1890s following the establishment of the first large coal mine (Kembla Colliery, 1883). Mining relics and remnant buildings have the potential to provide archaeological evidence in and around the settlements of Kembla Heights. The provision of housing by the Mount Kembla Mine to encourage workers to the site demonstrates the early recognition by industries in isolated areas of the need to provide accommodation where transport was limited or non-existent.

The subsequent development of recreational and service facilities such as clubs, halls and the post office, and the development of a close knit community demonstrate the way in which isolation bonds inhabitants and encourages them to develop and fight for services in their community. This is further demonstrated by the pain felt by the local community in response to the Mount Kembla mining disaster (1902) in which many local men and boys were killed. The disaster involved the largest loss of life in mainland Australia in a work place disaster.

5.4.3 Site of Pioneer Kerosene Works Statement of Significance

The following Significance assessment has been taken from the SHI listing sheets and is of limited scope.

The Site of the Pioneer Kerosene Works is located Between American Creek and Cordeaux Road. According to the 1991 Heritage Study: The only visible remnant of kerosene works is an iron retort relocated to the side of the main road. The concrete abutments of the bridge over the creek leading to the old works remain extant. The site has returned to bushland. Until recent years the old retort track was used as a short cut down from Kembla heights until the bush became impenetrable. The entrance to the mine remained visible for many years as did the bridge over the creek. The mine manager's cottage still stands below the old mine. The Site is listed for a) historical value, and e) technological and archaeological value.

5.5 Summary of Significance Assessment

The significance of the Subject Area for the Project is centralised around the identified heritage items, with much of the area assessed to be natural bushland and isolated infrastructure corridors. These wilderness areas are not of historical heritage significance in and of themselves but form the surrounds and setting for the listed items within the Subject Area.

Of the listed heritage items identified, the Avon and Cordeaux Dams structure, picnic areas and associated visual catchments are of State significance, and are listed for their historical, associative, aesthetic, and social significance, as well as their research potential, rarity and level of representativeness. The Avon and Cordeaux Dams are of exceptional value to the history and culture of NSW.

The Dendrobium Pit Top (formerly Nebo Colliery), the Site of the Pioneer Kerosene Works, and the adjacent Kembla Heights Mining Village are of local significance and are important to the understanding of the beginning and progress of mining activities and communities in the Illawarra. These items are of high importance to local cultural and historical value, and are listed for historical, associative, aesthetic, and social significance. These items are also considered to contribute value due to their research potential, rarity and representativeness, despite continuous operation which has involved modification to the historic fabric of these items, and disturbed potential archaeological deposits.

As the process of removing decommissioned mining infrastructure in the Illawarra is progressing, cumulative impact associated with the rehabilitation process can cause an increase in the overall rarity of heritage items associated with pit top locations and could raise the cultural value and significance of these sites.

6 Heritage Impact Assessment

The following section assesses the potential impacts of the Project on the heritage items and their associated heritage values.

6.1 Potential Impacts from the Project

The proposed works under assessment for this report are described in Section 1 (see also Figure 3 and Figure 4) and 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 million tonnes per annum (Mtpa) of ROM coal,
- 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) at the Dendrobium CPP to 2041,
- delivery of product coal from the Dendrobium CPP to the Port Kembla Steelworks for domestic use or to the Port Kembla Coal Terminal for transport to Liberty Primary Steel Whyalla Steelworks or export,
- 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 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,
- 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.

The upgrades at the Dendrobium Pit Top would include construction of additional carpark facilities, south of Cordeaux Road. Other minor upgrades and augmentations are anticipated to occur within the existing footprint of the surface facilities which are in keeping with the ongoing continuous use of this location for active mining. Some elements and existing infrastructure at the Dendrobium Pit Top that are no longer required and is assessed to be of limited heritage value may also be decommissioned and removed. However, specific impacts and plans are not clearly defined in this Project (see Section 6.4).

In addition, the Projects underground mining layout has been designed with the following mine design features:

- no longwall mining beneath existing Avon and Cordeaux reservoirs,
- no longwall mining within 300 m from the full supply levels of Sydney's water supply reservoirs,
- no longwall mining within 1,000 m from dam walls,
- no longwall mining within 400 m from the Avon River, Cordeaux River and Donalds Castle Creek,
- avoidance of the Area 4 "swamp cluster",
- no longwall mining beneath identified key stream features,
- no longwall mining beneath 3rd, 4th and 5th orders (or above) streams, and
- no longwall mining beneath identified high archaeological (scientific) significance Aboriginal heritage sites.

The Cordeaux Dam (SHR ID: 01358) and Avon Dam (SHR ID: 01360) have the potential to be impacted by the Project. Components of work that have the potential to impact the Cordeaux and Avon Dams are subsidence, surface disturbance associated with the Project, equipment involved in the monitoring of potential impacts and potential impacts to views and vistas from Cordeaux Dam or Avon Dam associated with surface infrastructure for the Project. Upgrades to the infrastructure at the Dendrobium Pit Top would also be undertaken as part of the Project.

6.2 The Cordeaux Dam (SHR ID: 01360) and Avon Dam - Potential Impacts

The Cordeaux Dam (SHR ID: 01360) and Avon Dam (SHR ID: 01358) have the potential to be impacted by the Project. Components of work that have the potential to impact the Cordeaux and Avon Dams are subsidence, surface disturbance associated with the Project, equipment involved in the monitoring of potential impacts and potential impacts to views and vistas from Cordeaux Dam or Avon Dam associated with surface infrastructure for the Project. Upgrades to the infrastructure at the Dendrobium Pit Top would also be undertaken as part of the Project.

6.2.1 Cordeaux Dam

Impact Assessment

The NSW Heritage Manual guidelines for preparing Heritage Impact Statements (HIS) pose a range of questions to be considered when assessing heritage impacts for new development adjacent to a heritage item. Relevant considerations in relation to impacts to the Cordeaux Dam are addressed in Table 8.

6.2.2 Statement of Heritage Impact – Cordeaux Dam

The underground mining layout has been designed to reduce potential subsidence impacts and is not located near to the Cordeaux Dam wall structure. Monitoring and investigation works would be conducted at, and surrounding, Cordeaux Dam to maintain the structure in a safe and serviceable condition.

The proposed surface infrastructure for the Project (e.g. the temporary construction carpark off Cordeaux Dam Access Road) would overlap with the curtilage of the Cordeaux Dam, but would be temporary in nature and would have minor to no adverse impacts on the heritage significance of Cordeaux Dam and its associated views and vistas.

The ventilation shaft site 5A would not be visible from Cordeaux Dam wall. The Project would therefore have a negligible impact on views to and from Cordeaux Dam and its visual setting, and its aesthetic values could continue to be appreciated by the public and users.

Table 8: Cordeaux Dam Impact Assessment

Consideration	Response
How is the impact of the new development on the heritage significance of the item or area to be minimised?	This item will not be directly impacted from subsidence movement, as the underground mining at Area 5 would be located over 2 km from the Cordeaux Dam. Monitoring of subsidence movements and geotechnical investigations may occur at, and in the vicinity of, the Cordeaux Dam wall as part of the management of potential subsidence impacts. However, Cordeaux Dam is unlikely to experience adverse impacts due to the proposed longwalls, based on the distances from underground mining and the very low-levels of predicted movement (MSEC 2021).
Why is the new development required to be adjacent to a heritage item?	The Project would provide for the continuation of operations at the Dendrobium Mine. The Project underground mining areas are located within the existing CCL 768 and were determined by the presence of economic coal resources. Access to the mining area and location of electricity feeders traverse the Cordeaux Dam Curtilage – these are necessary to complete the project.
How does the new development affect views to, and from, the heritage item? What has been done to minimise negative effects?	The Project would not affect materially affect views to the heritage item, as public access is restricted to areas outside of the picnic areas and dam wall. The Project would involve the development of surface infrastructure to support underground mining operations, including a ventilation shaft site. During construction, infrastructure would include an approximately 35 m tall drill rig, and during operation may consist of enclosed flare stacks that are approximately 15 m high and ventilation fans that are approximately 8 m high. The ventilation shaft site (No 5A) is located away from the heritage item behind high level topography such as ridgelines and crests and would not be visible from the heritage item.
Is the development sites on any known, or potentially significant archaeological deposits? If so, have alternative sites been considered? Why were they rejected?	The SHR entry and historical research undertaken for this assessment does not identify any areas of archaeological potential within the vicinity of Cordeaux Dam. The land was unalienated Crown Land prior to its declaration as a water supply reserve resulting in a negligible potential for historical archaeological relics. The proposed carpark will be located on the previously cleared access route to the Cordeaux Dam and would therefore have little potential to impact heritage values on this site.
Is the new development sympathetic to the heritage item? In what way (e.g. form, siting, proportions, design)?	The proposed Project surface infrastructure is not sympathetic to Cordeaux Dam Design, however given that it is sited remotely from the dam itself, there would be no impact to the built structures at the Cordeaux Dam. There would not be any longwall extraction near to the Cordeaux Dam wall structure. These factors, along with the recommendations of this HHA, would reduce any direct impact to the fabric of the Cordeaux Dam and associated infrastructure. There would be no impacts to views and vistas from the Cordeaux Dam.
Will the additions visually dominate the heritage item? How has this been minimised?	The proposed Project surface infrastructure would have a negligible impact on the visual amenity of the Cordeaux Dam. Views of both from Cordeaux Dam and its associated picnic areas and roadway would be substantially unaltered (see Figure 6). Following the completion of underground mining operations for the Project, the ventilation shaft site and other supporting infrastructure would be decommissioned and removed, and the site rehabilitated.
Will the public, and users of the item, still be able to view and appreciate its significance?	The proposed Project surface infrastructure would have a negligible impact on the visual setting of Cordeaux Dam. Due to the large crest immediately to the north-west, the views and vistas of the Cordeaux Dam and its landscape would be retained and would still allow for the public and users of the item to appreciate the significance of Cordeaux Dam on multiple levels.

6.3 Avon Dam

6.3.1 Impact Assessment

The NSW Heritage Manual guidelines for preparing HIS pose a range of questions to be considered when assessing heritage impacts for new development adjacent to a heritage item. Relevant considerations in relation to impacts to Avon Dam are addressed in Table 9.

Table 9: Avon Dam Impact Assessment

Consideration	Response
How is the impact of the new development on the heritage significance of the item or area to be minimised?	There would be a minimum 1 km offset of any longwall extraction from the Avon Dam wall, which would reduce the potential for subsidence movements. Monitoring of subsidence movements and geotechnical investigations would occur at, and in the vicinity of, the Avon Dam wall as part of the management of potential subsidence impacts. However, Avon Dam is unlikely to experience adverse impacts due to the proposed longwalls, based on the distances from underground mining and the very low-levels of predicted movement (MSEC 2021).
Why is the new development required to be adjacent to a heritage item?	The Project would provide for the continuation of operations at the Dendrobium Mine. The Project underground mining areas are located within the existing CCL 768 and were determined by the presence of economic coal resources.
How does the new development affect views to, and from, the heritage item? What has been done to minimise negative effects?	The Project would not affect materially affect views to the heritage item, as public access is restricted to areas outside of the picnic areas and the Avon Dam wall. The Project would involve the development of surface infrastructure to support underground mining operations, including surface ventilation, however this surface infrastructure would not be visible from Avon Dam.
Is the development sites on any known, or potentially significant archaeological deposits? If so, have alternative sites been considered? Why were they rejected?	The SHR entry and historical research undertaken for this assessment do not identify any areas of archaeological potential within the vicinity of Avon Dam. The land was unalienated Crown Land prior to its declaration as a water supply reserve resulting in a negligible potential for historical archaeological relics.
Is the new development sympathetic to the heritage item? In what way (e.g. form, siting, proportions, design)?	The proposed Project surface infrastructure is not sympathetic to Avon Dam Design, however given that it is sited remotely from the dam itself, there would be no impact to the built structures at the Avon Dam. There would be a minimum offset of at least 1 km from the Avon Dam wall to any longwall mining in Area 5. These factors, along with the recommendations of this report, would reduce any direct impact to the fabric of the Avon Dam and associated infrastructure. There would be no impacts to views and vistas from the Avon Dam.
Will the additions visually dominate the heritage item? How has this been minimised?	The proposed Project surface infrastructure would have no impact on the visual amenity of the Avon Dam. Views both to and from Avon Dam, its picnic areas, trackways and its main access roadway would be retained.
Will the public, and users of the item, still be able to view and appreciate its significance?	The Project surface infrastructure would have no impact on the visual setting of the heritage item. The views and vistas of the Avon Dam and its landscape would be retained, and still allow for the public and users of the item to appreciate the significance of Avon Dam on multiple levels.

6.3.2 Statement of Heritage Impact – Avon Dam

The underground mining layout has been designed to reduce any subsidence impacts on the structural integrity or external fabric of the Avon Dam wall. There would be a minimum 1 km offset of any longwall extraction from the Avon Dam wall structure. Monitoring and investigation works would be conducted at, and surrounding, the Avon Dam to maintain the structure in a safe and serviceable condition. However, Avon Dam is unlikely to experience adverse impacts due to the proposed longwalls, based on the distances from underground mining and the very low-levels of predicted movement (MSEC 2021).

The proposed surface infrastructure for the Project would have no adverse impacts on the heritage significance of Avon Dam and its associated views and vistas. Further mitigation efforts as recommended in Section 7 would reduce impacts on the views and vistas within the Metropolitan Special Area. The proposed surface infrastructure for the Project would have no impact on views to and from Avon Dam and its visual setting, and its aesthetic values could continue to be appreciated by the public and users.

6.4 Statement of Heritage Impact – Dendrobium Pit Top

The Dendrobium Pit Top is located within the *Nebo Colliery* (LEP heritage item #7104) a locally listed archaeological item, and partially within *the Kembla Heights Mining Village* (Heritage Conservation Area) and *the Site of Pioneer Kerosene Works* (LEP heritage item #7104). Operations at the Dendrobium Pit Top (and therefore the current use of historic Nebo Colliery buildings) are approved as part of the existing Dendrobium Mine in accordance with Development Consent DA 60-03-2001 and would continue for the Project (if approved).

The site has previously been recorded as part of the process of conducting the previous range of site upgrade works authorised under Development Consent DA 60-03-2001.

The proposed upgrades and construction of additional structures at the Dendrobium Pit Top would be designed to minimise potential impacts to the values and significance of the Nebo Colliery and the Kembla Heights Mining Village (Heritage Conservation Area).

The Dendrobium Pit Top has been subject to a series of archaeological excavations prior to the re-commencement of mining activities in 2003. The archaeological excavations identified a number of archaeological remains across the Dendrobium Pit Top area. However, the majority of the remains were identified to the east and south of the proposed new infrastructure locations. The proposed works would be designed to minimise sub-surface impacts.

Based on the conceptual design of the upgrades, it is unlikely that the heritage values of the Nebo Colliery would be significantly adversely impacted by the Project. However, it is noted that a Conservation Management Plan (CMP) has not been completed for the Dendrobium Pit Top, and therefore the heritage values present at the site have not been fully mapped. The Project represents continued and adaptive use wholly consistent with the nature of the item, which is an operational colliery.

7 Conclusions and Recommendations

7.1 Conclusions

The Dendrobium Mine is owned and operated by IMC, which is seeking approval to extend underground mining into Area 5 for the Project, continue the use of existing surface infrastructure and develop new surface facilities, including the ventilation shaft site, ETL, temporary water pipeline and pumping station and pit top car park extensions.

7.1.1 Cordeaux and Avon Dams

Cordeaux Dam and Avon Dam are listed on the SHR and are located in the vicinity of Project (Cordeaux Dam SHR ID: 01360 and Avon Dam SHR ID: 01358).

The underground mining layout for the Project has been designed to reduce potential subsidence impacts on the structural integrity or external fabric of the Cordeaux Dam and Avon Dam walls, with a minimum offset of at least 1 km from longwall mining for the Project. The Subsidence Assessment for the Project (MSEC 2021) concluded it was unlikely that the Cordeaux and Avon Dam walls would experience adverse impacts due to the proposed longwalls, based on their distances from mining and the very low-levels of predicted movement.

The proposed Project surface infrastructure located within Area 5 would be located remotely from the Avon and Cordeaux Dams and therefore would not result in any direct impacts to their fabric or associated infrastructure. Most surface infrastructure would be located in dense bushland in low lying areas or sites hidden by natural topography or vegetation. The infrastructure associated with the surface facilities would result in a negligible visual impact to the heritage items identified. Impacts from the proposed construction car park and ETL within the Cordeaux Dam curtilage would be minor and not significantly impact the fabric of the item.

The potential for *in situ* archaeological deposits to be present in the Subject Area is considered to be very low, given the absence of development in the area aside from activities associated with the construction of the Cordeaux and Avon Dams. If any archaeological deposits survive in the Subject Area, they are likely to be Aboriginal in nature (an assessment which has been conducted separately to this report).

7.1.2 Dendrobium Pit Top

The Dendrobium Pit Top is located within the *Nebo Colliery* (LEP heritage item #7104) a locally listed archaeological item, and partially within *the Kembla Heights Mining Village* (Heritage Conservation Area) and *the Site of Pioneer Kerosene Works* (LEP heritage item #7104).

IMC propose to expand the existing carpark and entrance located on the southern side of Cordeaux Road and undertake upgrades of the Dendrobium Pit Top to support the project. These developments may include:

- extend and/or redevelop existing offices/stores/ buildings where required,
- extend, repair/or redevelop the existing bathhouse/office building,
- construct additional demountable offices/buildings/ bathhouses and support facilities buildings where required,
- remove trees that may be damaging buildings and/or infrastructure; and
- demolish unsafe structures/buildings as required.

Proposed pit top upgrades would be conducted in accordance with the stipulations of a CMP prepared for the site in a manner sympathetic to the heritage value of the items.

Based on the conceptual design of the upgrades, it is unlikely that the heritage values of the Nebo Colliery would be significantly adversely impacted by the Project. The Project represents continued and adaptive use wholly consistent with the nature of the item, which is an operational colliery.

7.2 Recommendations

7.2.1 Cordeaux and Avon Dams

No further historical heritage assessment for Area 5 is considered necessary prior to the commencement of Project.

In order to minimise potential visual impacts to the natural landscape of the Metropolitan Special Area, it is recommended where practicable and feasible enclosed flare stacks, fans and any other structural features (fencing etc.) be coloured either environmental green or black, rather than silver or galvanised surfaces.

It is recommended that installation of any monitoring, surveying and/or investigative works at Cordeaux or Avon Dams should avoid any greater than negligible impact to the heritage fabric and structural integrity of the structures. The design of these works should be based on the advice of an appropriately qualified heritage expert where required.

Monitoring and investigation works would be conducted at, and surrounding, the Avon Dam and Cordeaux Dam to maintain the structures in a safe and serviceable condition. Any such works would be detailed in Extraction Plans which would be prepared for the Project, if approved, and may include:

- surface and subsurface geotechnical investigations,
- monitoring of subsidence movements on and near the structures with temporary sensors,
- installation of temporary fixtures to allow access to the structures for these activities, and
- radar, and other remote scanning, of the structures.

In the unlikely event that historical archaeological relics or Human remains were to be discovered during the Project, the Unexpected Finds Procedure (UEFP) outlined in Appendix 1 should be implemented.

7.2.2 Dendrobium Pit Top

Prior to the commencement of the upgrades to the Dendrobium Pit Top, a Conservation Management Plan (CMP) encompassing the Nebo Colliery heritage item and the Kembla Mining Village Heritage Conservation Area should be developed by a suitably qualified heritage consultant. The CMP would provide guidance for the management and conservation of heritage items moving forward including, during the detailed design, construction and operational phases.

Significant heritage features should be recorded to appropriate standards (if not previously recorded during the 2001 and 2003 archival recording of the Dendrobium Pit Top) in accordance with the CMP if subject to potential demolition works or material alteration.

The proposed carpark located outside the heritage curtilage for this item is considered to have negligible historical heritage impact and no further heritage assessment is required. It is noted that this will include the demolition of a structure which is located outside of a heritage curtilage.

This HHA supports that the current use of the Dendrobium Pit Top as an active mining site is in keeping with the original purpose of the heritage item and is a continued use of the heritage item, and therefore the Project can continue without further heritage assessment.

In the unlikely event that historical archaeological relics or Human remains were to be discovered during the proposed works, the UEFP outlined in Appendix 1 should be implemented.

To manage any potential impacts on the conservation area, the following should be considered during the final design phase of future upgrade works:

- Building form – building form should, where practicable, be consistent with the existing Dendrobium Pit Top structures.
- Fabric – building materials, where appropriate to building function, should be in keeping with existing Dendrobium Pit Top building materials and building fabrics.

In order to minimise impacts to the archaeological item ((*Nebo Colliery* (LEP heritage item #7104) and *the Kembla Heights Mining Village* (Heritage Conservation Area) and *the Site of Pioneer Kerosene Works* (LEP heritage item #7104)), the design should consider construction techniques that do not require sub-surface excavations.

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Appendix 1

Unexpected Finds Procedure

Introduction

The following provide a methodology to follow in the event of unexpected finds being encountered during the Project. These procedures have been prepared in accordance with best practice and are designed to minimise the heritage impact in the unlikely event that Human remains, or archaeological material is encountered on site.

It is noted that these procedures do not provide a guarantee against impacts caused by unexpected finds. However, especially when used in conjunction with archaeological monitoring during works, provide for mitigation of the risk unexpected finds present. Also, the procedure used in the event of human remains is derived from the NSW government guidelines and in no way supplants the authority of the NSW Police or the NSW Coroner's office over human remains found on site.

It is critical for the construction team to be aware that any suspected archaeological evidence must remain as it was found (*in situ*) until it is assessed by a qualified archaeologist, as per the below steps. These objects, and where they are located and the material around them (referred to as the object's 'context') is critical for understanding their value to the site and determining what may be located near to the area of the find. The object and its context are legally protected under the *Heritage Act 1977*.

Discovery of Suspected Human Remains

The following procedure would be followed in the event of the unexpected find of suspected human remains during the works:

- Stop work on site.
- Notify the local NSW Police and NSW Coroner's Office immediately.
- If not historical, follow instructions from NSW Police.
- If historical, contact the NSW heritage council and Local Government Heritage offices and take into consideration any directions or responses from these organisations.
- Works could only resume once any actions from the above organisations are addressed.

Discovery of Unexpected Suspected Archaeological Material

The following procedure would be followed in the event of the unexpected find of suspected archaeological material during the Project. This procedure would be made more efficient by the inclusion of a qualified archaeologist to monitor the excavation during the proposed works, to enable a speedy assessment of finds in the unlikely event suspected archaeological material is discovered.

- Stop work at in a 10 m area around the unexpected find, and secure this area.
- Notify a qualified archaeologist, and engage them to assess the suspected material to determine historical significance of the find.

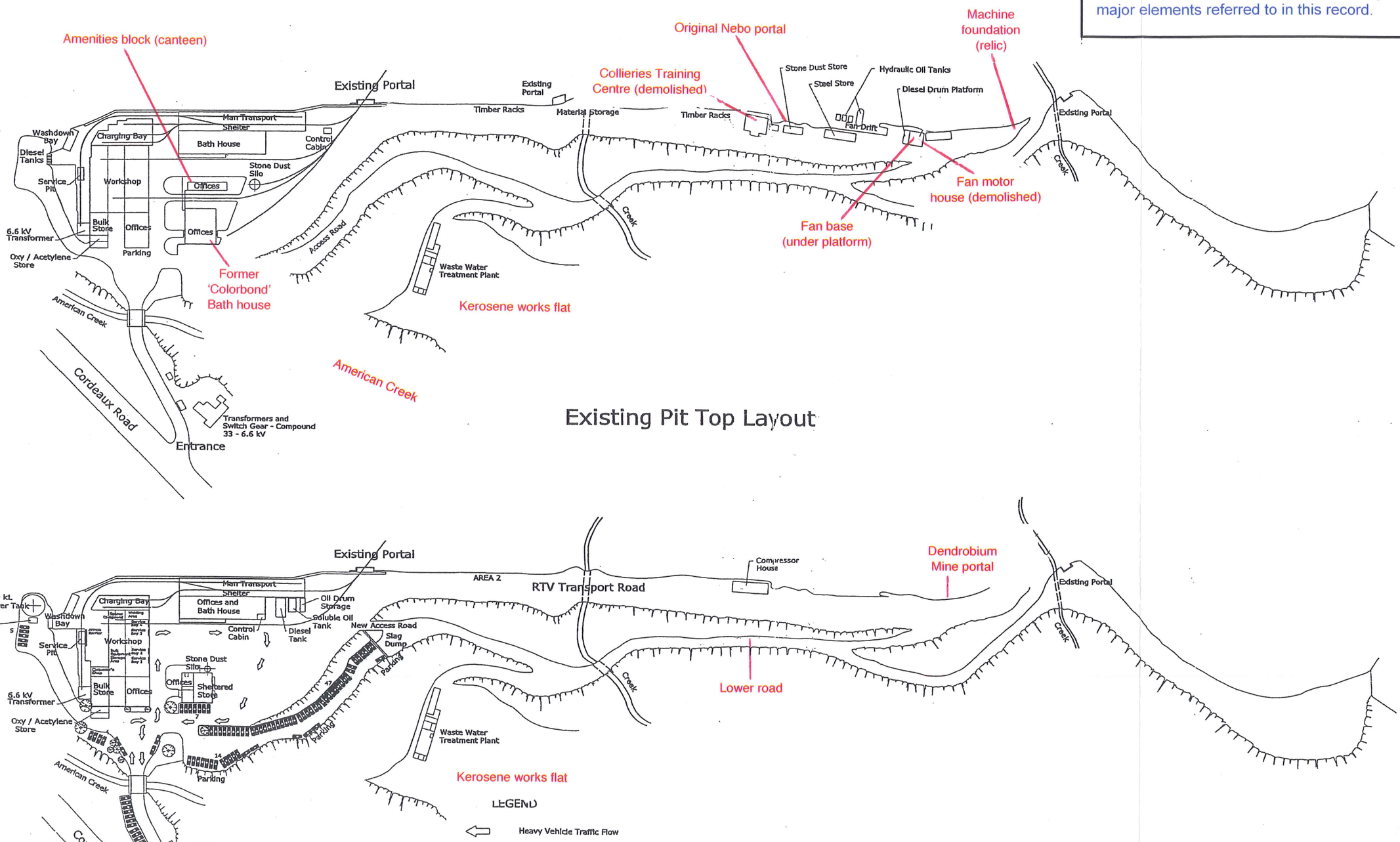
- If assessed to be not culturally significant, proceed with works with caution.
- If assessed to be of cultural value, works must cease in this portion of the site (within 100 m of the find) and NSW Heritage council and Local Government Heritage officers must be contacted. Any directions or responses from these organisations should be considered. Works of this type could include salvage excavation, testing, further monitoring, archival recording

Appendix 2

Plans of the Dendrobium Pit Top

(Source: Rodgers 2003, Illawarra Coal)

Figure 2.
Layout of Nebo/ Dendrobium pit top prior to reconstruction and after proposed development, showing location of major elements referred to in this record.



REFERENCE DRAWINGS

9912431	Main Pit Top Area
9912432	Workshop and Stores Area
9912433	Office and Bath House Layout
9912434	Pit Top Layout - Initial Development

Metres
0 10 20 50 100
SCALE

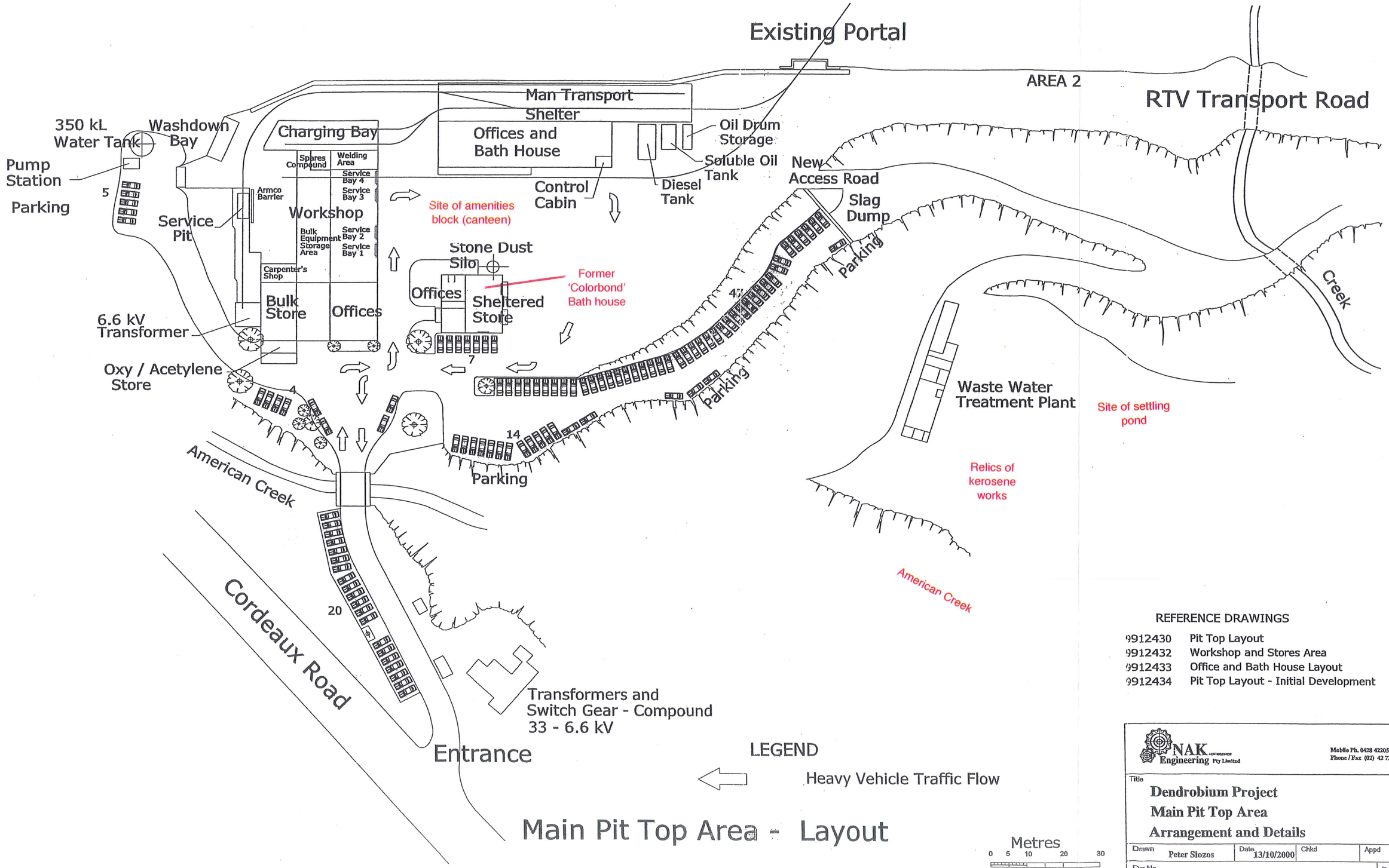
NAK Engineering Pty Limited
Mobile Ph. 0428 422053
Phone / Fax (02) 42 726676

Title
Dendrobium Project
Pit Top Layout
Arrangement and Details

Drawn	Date	Chkd	Appd
Peter Slozos	13/10/2000		

Drg No. 9912430 Rev.

Figure 3.
Southern end of Nebo/ Dendrobium pit top showing layout after proposed reconstruction.



REFERENCE DRAWINGS

9912430	Pit Top Layout
9912432	Workshop and Stores Area
9912433	Office and Bath House Layout
9912434	Pit Top Layout - Initial Development

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Phone / Fax (02) 42 726676

Title
Dendrobium Project
Main Pit Top Area
Arrangement and Details

Drawn	Date	Chkd	Appd
Peter Siozos	13/10/2000		

Drg No. 9912431 Rev.

Figure 4.
Nebo/Dendrobium pit top showing extent of proposed reconstruction in the workshop/stores area. (Shaded areas indicate items to be demolished.)

New 350 kL Water Tank
Grit Trap
Pump Station
Washdown Bay
Remove Diesel Tanks
Remove this section of charge bay and support with 3 columns - leave side open
Remove Rail
Remove Rail
Remove Rail
Remove low section of Roof
Man Transport Shelter
Offices and Bath House
Drg 9912433
Remove back corner for better RTV access around back of charge bay
Charging Bay
Existing Sanders To Be Removed
Remove Rail
Relocate 2 x 2 sets of chargers to here
Servicing Spares Compound
Welding Cutting Bench Area
Radial Drill
Grinder
Service Bay 4
Roller Door For RTV Access
Workshop extension (demolished)
Service Bay 3
Roller Door For RTV Access
Site of amenities block (canteen)
Service Pit
Armco Barrier
Remove this section of workshop
Build wall in workshop
Fitting Bench Area
Workshop
Service Bay Areas to be cleared i.e. Remove lathe, shaper etc
Western half of awning to remain - Eastern half to be removed
Bulk Equipment Storage Area
ie Motors Panels Gearboxes etc
Service Bay 2
Roller Door For RTV Access
Shallow pit to be filled in
Service Bay 1
Roller Door For RTV Access
Former 'Colorbond' Bath house
Stone Dust Silo
Small Awning to remain
Shop
Surface Power "Machine Testing Outlets" 415V - 1000V - 3.3kV
Raise Existing Roof Level
Install New Roller Doors
Shallow pit to be filled in
Sheltered Store
make existing wall solid
Offices
6.6 kV Transformer
Bulk Store
Offices
Oxy / Acetylene Store

REFERENCE DRAWINGS

9912430	Pit Top Layout
9912431	Main Pit Top Area
9912433	Office and Bath House Building
9912434	Pit Top Layout - Initial Development

Metres
0 5 10 15
SCALE

Workshop and Stores Area

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Phone / Fax (02) 42 726676

Title
Dendrobium Project
Workshop and Stores Area
Arrangement and Details

Dawn	Date	Chkd	Appd
Peter Siozos	13/10/2000		

Dg No. 9912432 Rev.

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Ecology and biodiversity
Terrestrial
Freshwater
Marine and coastal
Research and monitoring
Wildlife Schools and training

Heritage management
Aboriginal heritage
Historical heritage
Conservation management
Community consultation
Archaeological, built and landscape values

Environmental management and approvals
Impact assessments
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)