Appendix G.
Aboriginal cultural heritage assessment report

Shoalhaven Hydro Expansion Project - Main Works Environmental Impact Statement

SSI-10033

Origin Energy Eraring Pty Ltd

November 2022

Jacobs Challenging today. Reinventing tomorrow.

Shoalhaven Hydro Expansion Project - Main Works

Aboriginal cultural heritage assessment report

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Acknowledgment of Country

Jacobs proudly acknowledges Aboriginal and Torrens Strait Islander peoples as the Traditional Owners of the lands upon which each Jacobs office is located and those upon which we operate. We recognise that Traditional Owners have cared for and protected these lands for thousands of generations. Traditional Owners always have and always will have strong cultural, social and spiritual connections to the lands, skies, and waters. Jacobs respectfully recognises the Ancestors and Elders, past, present, and future. We acknowledge that sovereignty was never ceded and we are committed to working towards reconciliation.

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Executive summary

Origin Energy Eraring Pty Ltd (a subsidiary of Origin Energy Limited) (collectively, Origin) is the current operator of the Shoalhaven Pumped Hydro Energy Storage Scheme (the existing scheme). The existing scheme is located in the New South Wales (NSW) Southern Highlands, approximately 150 kilometres (km) south east of Sydney. The existing scheme was commissioned in 1977 and currently has a generating capacity of 240 megawatts (MW).

Origin now proposes to almost double the electricity generation capacity of the existing scheme with the Shoalhaven Hydro Expansion Project (the Project), which will provide approximately an additional 235MW of pumped storage generation capacity. The Project would involve the construction and operation of a new pumped hydro power station on and under the land between the Fitzroy Falls Reservoir and Lake Yarrunga. The Project would draw on Origin's existing water allocations to pump water up from Lake Yarrunga consuming energy when it is in less demand. Energy would then be generated through the return of water from Fitzroy Falls Reservoir to Lake Yarrunga when demand for energy increases.

An indicative Project layout consists of the construction and operation of:

- A surface pipeline from the existing Fitzroy Canal control structure to a surge tank
- Vertical shaft and headrace tunnel to an underground power station
- An underground power station cavern housing a reversible generator and pump capable of supplying approximately 235 MW of hydroelectric power, including associated access tunnel and ventilation shaft, transformer and high voltage cable route to the existing Kangaroo Valley Power Station substation
- A tailrace tunnel and intake /outlet structure in the vicinity of the existing Bendeela Power Station on Lake Yarrunga
- A vehicular access tunnel to the underground power station from the vicinity of the existing Kangaroo Valley Power Station
- Ancillary works which may include the carrying out of works to upgrade or construct access roads, spoil disposal sites, utilities infrastructure, construction compounds and construction power supply.

The detailed Project description is provided in Chapter 3 of the Environmental Impact Statement (EIS).

Jacobs completed search of the AHIMS database was undertaken on 11 February 2022 for an area of land at datum GDA, zone 56, eastings 264974 – 273849, northings 6150178 – 6162300 with a buffer of 0 meters. No previously identified Aboriginal sites are located within the Project area. Archaeological survey was undertaken on the 27th and 28th of June 2022. The survey resulted in the identification of the Promised Land Trail ST01 (AHIMS ID 52-4-0730) within Survey Unit 3 in the curtilage of Morton National Park.

Archaeological test excavations were undertaken over two days with RAP Sites Officers on 29 June and 30 June 2022 at the Bendeela Power Station PAD. The results of which are as follows:

- A total of five test pits were excavated during the two day program
- Aboriginal objects were retrieved from all five test pits excavated by Jacobs Archaeologists and RAP Sites Officers
- Two charcoal samples were taken from Spit 7 and 8 of Test Pit 5, being Sample #1 and Sample #2 respectively
- As a result of the test excavations, Bendeela Power Station PAD has been renamed Bendeela Hydro AS01 (AHIMS ID 52-4-0729)

According to current design plans, Bendeela Hydro AS01 (AHIMS ID 52-4-0729) will be subject to harm by the proposed works that will result in a partial loss of value. Promised Land Trail ST01 will not be harmed.

It is therefore recommended that:

- Where possible, impacts to identified Aboriginal sites should be avoided
- Where impacts to Bendeela Hydro AS01 (AHIMS ID 52-4-0729) cannot be avoided, the approved Minister's Conditions of Approval (MCoA) must be issued by DPE to authorise impacts through the Project. Works cannot proceed in these locations until the approved MCoA has been received and all requirements addressed

- Salvage excavations should take place prior to any impacts to Bendeela Hydro AS01 (AHIMS ID 52-4-0729). The salvage excavations would require approval through the MCoA as authorisation for harm to the site
- Salvage excavations at Bendeela Hydro AS01 (AHIMS ID 52-4-0729) should be undertaken in accordance with the methodology provided in Section 11 of this ACHAR
- No mitigation measures will be required for Promised Land Trail ST01 (AHIMS ID 52-4-0730) as it will not be impacted by the amended Project. However, it is recommended that an exclusion zone and fence is established to protect the site from accidental damage
- A CHMP should be developed to provide guidance on the procedure for the identification of unexpected Aboriginal objects and the long-term management of Aboriginal objects retrieved from Bendeela Hydro AS01 (AHIMS ID 52-4-0729)
- If suspected human remains are located during any stage of the Project, work should stop immediately, and the NSW Police and Coroner's Office should be notified. Heritage NSW should be notified if the remains are found to be Ancestral Aboriginal
- If changes are made to the Project to include impacts outside the Project area as delineated in this document, further archaeological investigation must be conducted.

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Glossary and terms

Term	Definition
ACHAR	Aboriginal Cultural Heritage Assessment Report
AHIMS	Aboriginal Heritage Information Management System
AHIP	Aboriginal Heritage Impact Permit
ALR Act	*Aboriginal Land Rights Act*
ASIRF	Aboriginal Site Impact Recording Form
ATSIHP Act	*Aboriginal Torres Strait Islander Heritage Protection Act*
CHL	Commonwealth Heritage List
CHMP	Cultural Heritage Management Plan
DECCW	Department of Environment, Climate Change & Water
DPE	Department of Planning and Environment
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
EIS	Environmental Impact Statement
ESD	Ecological Sustainable Development
GPS	Global Position System
km	Kilometre
LALC	Local Aboriginal Land Council
LEP	Local Environmental Plan
LGA	Local Government Area
M	Metres
MCoA	Minister's Conditions of Approval
MNES	Matters of national environmental significance
MW	Megawatts
NEM	National Energy Market
NHL	National Heritage List
NNTT	National Native Title Tribunal
NPW Act	*National Parks and Wildlife Act 1974*
NSW	New South Wales
OEH	Office of Environment and Heritage
PAD	Potential Archaeological Deposit
RAP	Registered Aboriginal Party
SEAR	Secretary's Environmental Assessment Requirements
SPC	Single Platform Core
SSI	State Significant Infrastructure
UNESCO	United Nations Educational, Scientific and Cultural Organization
WHL	World Heritage List

1. Introduction

1.1 Project overview

Origin Energy Eraring Ltd (Origin) proposes to develop the Shoalhaven Hydro Expansion Project, to construct and operate a new pumped hydro power station on and under the land between the Fitzroy Falls Reservoir and Lake Yarrunga (the Project) (see Figure 1-1). The Project would draw on Origin's existing water allocations to pump water up from Lake Yarrunga consuming energy when it is in less demand. Energy would then be generated through the return of water from Fitzroy Falls Reservoir to Lake Yarrunga when demand for energy increases.

The Project would involve almost doubling the electricity generation capacity of the Shoalhaven Pumped Hydro Energy Storage Scheme (the existing scheme), providing an approximate additional 235 megawatts (MW) of generation capacity. The operation of the scheme would respond to the needs of the National Energy Market (NEM) and involving up to one pumping and generation cycle per day. Each generation cycle is anticipated to involve up to eight hours of generation and 16 hours of pumping, each of which could be divided into shorter durations to best satisfy the needs of the NEM.

The indicative Project layout is shown in Figure 1-2 and consists of the construction and operation of:

- Upper scheme components (Upper Scheme) including:
  - Connection to existing upper intake control structure at the southern end of the Fitzroy Falls Canal
  - A surface penstock (water transfer pipeline and associated infrastructure) from the existing Fitzroy Canal control structure to the vicinity of the Existing Scheme surge tank
  - A new surge tank adjacent to the Existing Scheme surge tank
  - A further section of surface penstock, adjacent to the Existing Scheme, from the new surge tank to the high pressure shaft.
- Underground works (Underground Works) including:
  - Vertical shaft and headrace tunnel connecting to the southern end of Upper Scheme surface penstock to an underground power station
  - An underground power station cavern housing a transformer, reversible motor generator and pump turbine capable of supplying a nominal 235 MW of hydroelectric power
  - Associated access tunnel and multipurpose (egress, ventilation and services) tunnel with an entrance in the vicinity of the existing Kangaroo Valley Power Station
  - A tailrace tunnel, including an underground surge chamber located just downstream of the underground power station, terminating west of the existing Bendeela Power Station on Lake Yarrunga.
- Lower scheme surface components (Lower Scheme) including:
  - Lower intake /outlet structure west of the Bendeela Power Station connected to the tailrace tunnel
  - Spoil emplacement facility east of Bendeela Pondage
  - High voltage network connection to existing Kangaroo Valley substation
  - Operational surface infrastructure including administration building, water treatment infrastructure and ventilation building.

The Project would also require ancillary works which may include the carrying out of works to upgrade or construct access roads, spoil disposal sites, utilities infrastructure, construction compounds and construction power and water supply.

Importantly, the Project essentially duplicates the existing scheme and as such, the Project does not propose any new water storages or connections between waterbodies that have not already been utilised for the existing scheme. The existing scheme was designed to allow for expansion and much of the required infrastructure needed for duplicating the scheme is already in place. As a result, there is unconstructed expansion capacity at the site which was contemplated in the original Fitzroy Canal, switchyard located near the Kangaroo Valley Power Station and transmission lines, while the earthworks for duplicating the above ground pipeline on the plateau was also completed. In addition, no transmission line augmentations are required to receive or distribute electricity from the existing Kangaroo Valley Power Station substation. A full Project description is provided in Chapter 3 of the Environmental Impact Statement (EIS).

Legend

- Points of interest
- Indicative Project footprint
- Project location
- NPWS Reserve
- State Forest

0 5 10 km

1:300,000 at A4

GDA2020 MGA Zone 56

Data sources

Jacobs 2022
Department of Planning and Environment 2022
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Figure 1-1 Shoalhaven Hydro Expansion Project Location

Date: 14/06/2022 Path: \\ausyd0vs01\gispro\NSW_IS392600_ShoalhavenEIS\Apps\IS392600_GENERAL.aprx
Created by: JB | QA by: HK

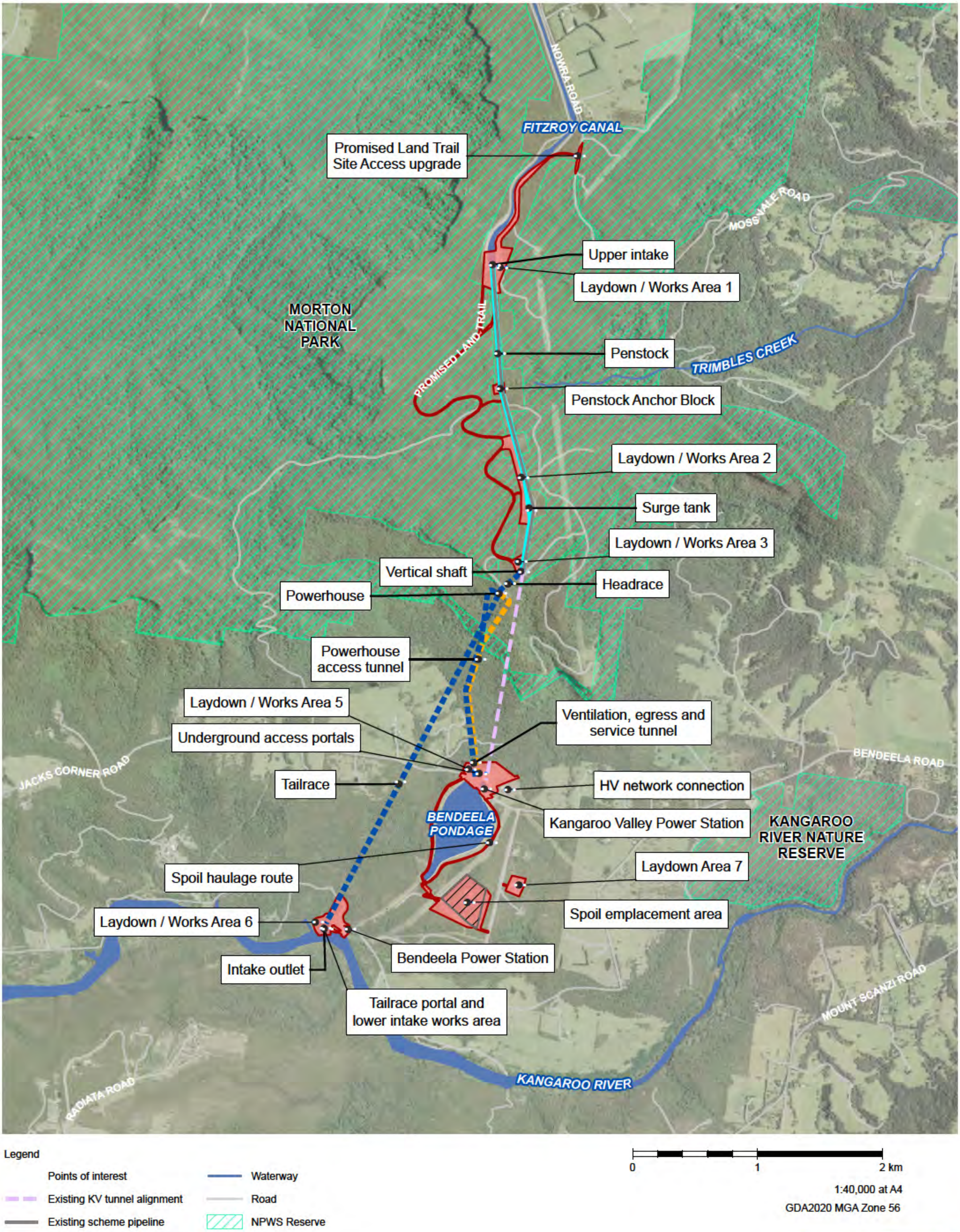

Figure 1-2 Indicative Project layout

Data sources

Jacobs 2022
Department of Planning and Environment 2022
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1.2 Definition of project area

The Project would be carried out in the Wingecarribee and Shoalhaven Local Government Areas (LGAs). Access to the upper portion of the Project on the plateau, for pipeline, surge tank and vertical shaft construction would be via the Promised Land Trail. The Promised Land Trail is accessed from Moss Vale Road and traverses both WaterNSW land and the Morton National Park and was constructed as part of the original scheme. Access to the lower portion of the Project within Kangaroo Valley would be via Bendeela Road from Moss Vale Road in the vicinity of the townships of Kangaroo Valley and Barrengarry.

The Project area is shown on Figure 1-2 as the maximum disturbance area required to accommodate the reference design. The project area forms the basis of the study area for this assessment.

1.3 Secretary's Environmental Assessment Requirements

This assessment forms part of the EIS for the Project. The EIS has been prepared under Division 5.2 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). This assessment has been prepared to address the Secretary's Environmental Assessment Requirements (SEARs) [SSI-10033] relating to Aboriginal impacts and will assist the Minister for Planning to make a determination on whether or not to approve the Project.

Table 1-1 outlines the SEARs relevant to this assessment along with a reference to where these are addressed.

Table 1-1 SEARs relevant to Aboriginal impacts

Secretary's requirement	Where addressed in this report
Heritage – including: - an assessment of the Aboriginal cultural heritage items (cultural and archaeological) in accordance with the Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW (OEH, 2011) and the Code of Practice for the Archaeological Investigation of Aboriginal Objects in NSW (DECCW, 2010);	This report is an Aboriginal Cultural Heritage Assessment Report (ACHAR) and serves to satisfy this requirement
- archival and oral history recording for any items with significant heritage values likely to be disturbed or impacted by the Project; and	This requirement is regarding non-Aboriginal heritage values and has been excluded from this document
- evidence of adequate consultation with the local Aboriginal community in determining and assessing impacts, developing options and selecting options and mitigation measures (including the final proposed measures), having regard to the Aboriginal Cultural Heritage Consultation Requirements for Proponents (OEH, 2010); and	Section 3 provides details of consultation
- assessment of the impacts to historic heritage having regard to the NSW Heritage Manual;	This requirement is regarding non-Aboriginal heritage values and has been excluded from this document

1.4 Structure of this report

The structure and content of this report are outlined in Table 1-2.

Table 1-2 Structure and content

Chapter	Description
Chapter 1 Introduction	Outlines key elements of the Project, SEARs and the purpose of this report (this Chapter)
Chapter 2 Legislative and policy and context	Provides an outline of the statutory context, including applicable legislation and planning policies
Chapter 3 Summary of Aboriginal stakeholder consultation	Provides details of compliance with the Consultation Requirements for Proponents 2010 (DECCW 2010a). Includes a summary of responses received from RAPs and any actions taken to address comments
Chapter 4 Summary and analysis of background information	Provides an overview of desktop research completed prior to field investigations
Chapter 5 Summary of field work	Presents a summary of the methods and outcomes of archaeological field investigations – survey and test excavations
Chapter 6 Cultural heritage values	Provides a summary of cultural values identified through Aboriginal stakeholder engagement and consultation as well as desktop research
Chapter 7 Significance assessment	Assessment of the historic, aesthetic, socio/cultural and scientific value of the sites identified during the completion of this assessment
Chapter 8 Impact assessment	Presents the outcomes of the operational impact assessment
Chapter 9 Cumulative impacts	Presents the qualitative assessment of potential cumulative construction and operational Aboriginal heritage with other projects near the Project
Chapter 10 Mitigation measures	Presents the Aboriginal heritage management measures applicable for the Project
Chapter 11 Salvage methodology	Provides further information on the requirements of archaeological salvage as a mitigation measure
Chapter 12 Conclusion	Summarises the findings of this report

2. Legislative and policy context

2.1 Commonwealth legislation

2.1.1 Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (Cth) (EPBC Act) provides for the protection of the environment, especially in matters of national environmental significance (MNES). Under the EPBC Act, a person must not take an action that has, will have, or is likely to have a significant impact on any of the MNES without approval from the Commonwealth Minister for the Environment. The definition of the environment under the EPBC Act includes both natural and cultural elements. Under the EPBC Act, heritage items can be listed on the National Heritage List (NHL) (for items of National heritage significance) or the Commonwealth Heritage List (CHL) (for items of heritage significance on land owned or managed by the Commonwealth). The EPBC Act also enhances the management and protection of Australia's heritage places, including World Heritage properties listed on the World Heritage List (WHL).

The NHL is a list of places with outstanding heritage value to Australia, including places overseas. Any proposed actions on NHL places must be assessed for their impact on the heritage values of the place in accordance with *Significant Impact Guidelines 1.1 - Matters of National Environmental Significance* (Department of Sustainability, Environment, Water, Population and Communities 2013). The guidelines require the proponent to undertake a self-assessment process to decide whether or not the action is likely to have a significant impact on a MNES, including the national heritage value of places. If an action is likely to have a significant impact an EPBC Act referral must be prepared and submitted to the Minister for approval.

The CHL is established under the EPBC Act. The CHL is a list of properties owned by the Commonwealth that have been assessed as having significant heritage value. Any proposed actions on CHL places must be assessed for their impact on the heritage values of the place in accordance with Significant Impact Guidelines 1.2 - Actions on, or impacting upon, Commonwealth land, and actions by Commonwealth agencies (Department of Sustainability, Environment, Water, Population and Communities 2013). The guidelines require the proponent to undertake a self-assessment process to decide whether or not the action is likely to have a significant impact on the environment, including the heritage value of places. If an action is likely to have a significant impact an EPBC Act referral must be prepared and submitted to the Minister for approval.

There are no Aboriginal places or items within or near the Project area that are listed on the NHL, the CHL or the WHL.

2.1.2 Aboriginal and Torres Strait Islander Heritage Protection Act 1984

The *Commonwealth Aboriginal and Torres Strait Islander Heritage Protection Act 1984* (ATSIHP Act), deals with Aboriginal cultural property (intangible heritage) in a wider sense. Such cultural property intangible heritage includes any places, objects and folklore that "are of particular significance to Aboriginals in accordance with Aboriginal tradition". These values are not currently protected under the *National Parks and Wildlife Act 1974* (NPW Act). In most cases, archaeological sites and objects registered under the State Act will also be Aboriginal places subject to the provisions of the Commonwealth Act. There is no cut-off date and the ATSIHP Act may apply to contemporary Aboriginal cultural property as well as ancient sites. The ATSIHP Act takes precedence over state cultural heritage legislation where there is conflict. The Commonwealth Minister who is responsible for administering the ATSIHP Act can make declarations to protect these areas and objects from specific threats of injury or desecration. The responsible Minister may make a declaration under Section 10 of the Commonwealth Act in situations where state or territory laws do not provide adequate protection of intangible heritage places.

2.1.3 Native Title Act 1993

The *Native Title Act 1993* (Cth) recognises and protects Native Title in Australia. The National Native Title Tribunal (NNTT) maintains the following registers:

- National Native Title Register
- Register of Native Title Claim
- Unregistered claimant applications

- Register of Aboriginal land use agreements.

The *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (DECCW 2010a) stipulates that consultation must be conducted with Native Title holders or registered Native Title claimants. The Project would not be undertaken in an area covered by any identified Native Title claims.

2.2 State legislation

2.2.1 Environmental Planning and Assessment Act 1979

The EP&A Act regulates environmental planning and assessment for NSW. Land use planning requires that environmental impacts are considered as part of the assessment of development, including impacts on Aboriginal cultural heritage.

Division 5.2 of Part 5 of the EP&A Act applies to development declared to be State Significant Infrastructure (SSI). If the Project is declared to be SSI, the consent authority for will be the Minister for Planning (Minister). An Aboriginal Heritage Impact Permit (AHIP) under section 90 of the NPW Act is not required for development for which an SSI development consent has been granted (Section 5.23 (1d) of the EP&A Act). However, an EIS is required for SSI projects and the SEARs issued for the Project include assessment of Aboriginal heritage.

2.2.2 National Parks and Wildlife Act 1974

The NPW Act protects Aboriginal heritage within NSW. Protection of Aboriginal heritage is outlined in Section 86 of the NPW Act, as follows:

> *"a person must not harm or desecrate an object that the person knows is an Aboriginal object" (Section 86(1))*
>
> *"a person must not harm an Aboriginal object" (Section 86(2)), and*
>
> *"a person must not harm or desecrate an Aboriginal place" (Section 86(4)).*

Section 87(1) of the NPW Act provides that it is a defence to these provisions if the harm or desecration is authorised by an AHIP.

Harm is defined under the NPW Act as:

> *'any act or omission that destroys, defaces or damages the object including moving the object from the land on which it has been situated or causes or permits the object to be harmed'.*

As outlined in Section 2.2.1, an AHIP is not required for development for which a SSI development consent has been granted and the provisions of the NPW Act that prohibit an activity without such an authority do not apply (Section 5.23 (1d) of the EP&A Act).

2.2.3 Native Title Act 1994

The *Native Title Act 1994* was introduced to ensure that the laws of NSW are consistent with the Commonwealth Native Title Act 1993. Native Title claims, registers and Indigenous Land Use Agreements are administered under the Act.

A search of the National Native Title Tribunal database, on 10 February 2022, found that the Project area is located within an identified Native Title claim area with the South Coast people. Details regarding the claim have been summaries in Table 2-1 below.

Table 2-1 Schedule of Native Title Determination applications

Tribunal ID	Name	Date lodged	Registration status
NC2017/003	South Coast People	3 August 2017	Accepted for registration 31 January 2018

2.2.4 Aboriginal Land Rights Act 1983

The *Aboriginal Land Rights Act 1983* (ALR Act) established Aboriginal Land Councils (at State and Local levels). These bodies have a statutory obligation under the ALR Act to:

> *"(a) take action to protect the culture and heritage of Aboriginal persons in the council's area, subject to any other law, and*
>
> *(b) promote awareness in the community of the culture and heritage of Aboriginal persons in the council's area".*

The Project area is predominantly located across the boundaries of the Illawarra Local Aboriginal Land Council (LALC), bordered to the south by the boundaries of the Nowra LALC.

2.3 Regulatory policies/relevant guidelines

Guidelines and standards were established by Heritage NSW, to guide the assessment, conservation and mitigation of Aboriginal heritage in New South Wales. Many of the guidelines are designed to obtain permits and approvals under the NPW Act.

Not all guidelines are applicable for Division 5.2 project approvals; however, they are useful documents to guide the general direction of assessment of the significance of heritage sites; and their conservation and mitigation.

Relevant guidelines include:

- *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales* (Department of Environment Climate Change and Water [DECCW] 2010a) (the Due Diligence Code).
- *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW 2010b) (the Code of Practice).
- *Aboriginal cultural heritage consultation requirements for proponents 2010* (DECCW 2010c) (the Consultation Requirements).
- *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (OEH 2011) (the Guide).

3. Summary of Aboriginal stakeholder consultation

3.1 Compliance with consultation requirements

3.1.1 Stage 1

3.1.1.1 Agency letters

In accordance with Stage 4.1.2 of the Consultation Requirements, Jacobs corresponded with the following organisations, on 12 November 2021 to obtain the names of Aboriginal people who may hold cultural knowledge of the Project area:

- Illawarra Local Aboriginal Land Council
- Nowra Local Aboriginal Land Council
- Shoalhaven Council
- Wingecarribee Shire Council
- Southeast - Local Land Services
- Heritage NSW
- NTS Corp
- National Native Title Tribunal
- Office of the Registrar.

3.1.1.2 Advertisement

In accordance with Step 4.1.3 of the Consultation Requirements, an advertisement was placed in the South Coast Register and Koori Mail on 1 December 2021 inviting Aboriginal individuals or organisations to register an interest in the Project by 15 December 2021.

3.1.1.3 Development of stakeholder list

Following the receipt of responses from the agencies listed above, a list of potential Aboriginal stakeholders was compiled. An invitation to register interest in the Project was sent to all potential Aboriginal stakeholders on 1 December 2021, requesting a response by 15 December 2021.

Table 3-1 List of potential Aboriginal stakeholders

Contact person	Organisation
[redacted]	Yurrandaali
[redacted]	Badu (Murrin Clan/Peoples)
[redacted]	Barraby Cultural Services
[redacted]	Bellambi Indigenous Corporation Gandangara Traditional Owners
[redacted]	Biamanga (Murrin Clan/Peoples)
[redacted]	Bilinga (Murrin Clan/Peoples)
[redacted]	*Individual*
[redacted]	*Individual*
[redacted]	Cubbitch Barta
[redacted]	Cullendulla (Murrin Clan/Peoples)

Contact person	Organisation
[redacted]	Dharug (Murrin Clan/Peoples)
[redacted]	Duncan Falk Consultancy
[redacted]	Clive Freeman
[redacted]	Gadhu Dreaming
[redacted]	Goobah Development PTY LTD (Murrin Clan/Peoples)
[redacted]	Gundungurra Aboriginal Heritage Association Inc.
[redacted]	Gundungurra Tribal Council Aboriginal Corporation
[redacted]	Gundungurra Tribal Technical Services
[redacted]	Gundungurra Tribal Technical Services
[redacted]	Gundungurra Tribal Technical Services
[redacted]	Gundungurra Tribal Technical Services
[redacted]	Gundungurra Tribal Technical Services
[redacted]	Gundungurra Tribal Technical Services
[redacted]	Gundungurra Tribal Technical Services
[redacted]	Gundungurra Tribal Technical Services
[redacted]	Gunyuu (Murrin Clan/Peoples)
[redacted]	Jerringong (Murrin Clan/Peoples)
[redacted]	Karrial (Murrin Clan/Peoples)
[redacted]	Illawarra Local Aboriginal Land Council
[redacted]	Munyunga (Murrin Clan/Peoples)
[redacted]	Mura Indigenous Corporation (icn:8991)
[redacted]	Murramarang (Murrin Clan/Peoples)
[redacted]	Murra Bidgee Mullangari Aboriginal Corporation
[redacted]	Murrumbul (Murrin Clan/Peoples)
[redacted]	Nundagurri (Murrin Clan/Peoples)
[redacted]	Pejar Local Aboriginal Land Council
[redacted]	Pemulwuy (Murrin Clan/Peoples)
[redacted]	South Coast NSW Aboriginal Elders

Contact person	Organisation
[redacted]	South West Rocks Corporation
[redacted]	South West Rocks Corporation
[redacted]	Tharawal Local Aboriginal Land Council
[redacted]	Thoorga Nura
[redacted]	Three Ducks Dreaming Surveying and Consulting
[redacted]	Tungai Tonghi
[redacted]	Walbunja (Murrin Clan/Peoples)
[redacted]	Walgalu (Murrin Clan/Peoples)
[redacted]	Warra Bingi Nunda Gurri
[redacted]	Wingikara (Murrin Clan/Peoples)
[redacted]	Woronora Plateau Gundungara Elders Council
[redacted]	Wullung (Murrin Clan/Peoples)
[redacted]	Yamanda Aboriginal Association
[redacted]	Yerramurra (Murrin Clan/Peoples) and Taste of Tradition Native Aboriginal Corporation
[redacted]	Ngunawal Heritage Aboriginal Corporation
[redacted]	*Individual*
[redacted]	Gilay Consultants
[redacted]	Batemans Bay Local Aboriginal Land Council
[redacted]	*Individual*
[redacted]	*Individual*
[redacted]	Darug Land Observations
[redacted]	Eora Heritage Group
[redacted]	Gumaraa
[redacted]	Guunamaa Dreamin Sites and Surveying
[redacted]	Jerrinja Local Aboriginal Land Council
[redacted]	Minnamunnung

Contact person	Organisation
[redacted]	Nowra Local Aboriginal Land Council
[redacted]	Shoalhaven Elders and Friends Organisation
[redacted]	Ulladulla Local Aboriginal Land Council
[redacted]	Walgalu (Murrin Clan/Peoples)
[redacted]	*Individual*
[redacted]	*Individual*
[redacted]	*Individual*
[redacted]	South Coast People

3.1.1.4 Establishment of RAPs for the Project

The Aboriginal stakeholder consultation described above, resulted in the identification of 15 Registered Aboriginal Parties (RAPs), summarised in Table 3-2 below.

Table 3-2 Summary of RAPs identified through Stage 1

Organisation	Contact Person
South Coast People	[redacted]
Nowra Local Aboriginal Land Council	*No contact nominated*
DNC	[redacted]
Freeman & Marx Pty Ltd	[redacted]
Murra Bidgee Mullangari Aboriginal Corporation	[redacted]
Illawarra Local Aboriginal Land Council	[redacted]
Yurrandaali Pty Ltd	[redacted]
Barraby Cultural Services	[redacted]
Woronora Plateau Gundangara Elders Council	[redacted]
Duncan Falk Consultancy	[redacted]
Individual	[redacted]
Goobah Development PTY LTD (Murrin Clan/Peoples)	[redacted]
Warragil Cultural Services	[redacted]
Individual	[redacted]

Organisation	Contact Person
Individual	[redacted]

3.1.2 Stage 2

Stage 2 of the consultation process is to provide RAPs with information about the scope of the proposed Project and the proposed cultural heritage assessment process.

The RAPs were provided with a letter outlining the Project, and a copy of the archaeological methodology on 20 December 2021. Comments were received from the RAPs, and they were invited to contact Jacobs and Origin at any time throughout the assessment process to discuss the Project.

Three RAPs (Murra Bidgee Mullangari Aboriginal Corporation, Goobah Development PTY LTD, and Illawarra Local Aboriginal Land Council) provided a response to the methodology, summaries in Table 3-3 below.

Table 3-3 Summary of comments and responses to feedback on the methodology

Organisation	Comment	Action
Murra Bidgee Mullangari Aboriginal Corporation	Endorse the methodology	Noted
Goobah Development PTY LTD	Endorse the methodology	Noted
Illawarra Local Aboriginal Land Council	Confirm receipt of the methodology	Noted

RAPs were invited to register as Site Officers for the archaeological survey and were issued with information to ensure safety and preparedness for work.

3.1.3 Stage 3

Stage 3 consultation facilitates a process whereby RAPs can contribute to culturally appropriate information gathering and the research methodology, provide information that will enable the cultural significance of Aboriginal objects and/or places on the proposed Project area to be determined, and have input into the development of any cultural heritage management options.

3.1.3.1 Sensitive cultural information and management protocol

It is possible that during the consultation process, the RAPs will provide sensitive cultural information to which access needs to be restricted. In the event that such information was supplied, the RAP supplying the information would state to Origin how they wish that information to be treated, and how access to the information should be restricted. Origin would follow the stated wishes provided by the RAP group in question when managing and using the information provided to Jacobs. All stated restrictions of access, communication and publication of the information would be followed. These might include:

- Restrictions on reproducing the information (in whole or in part) in reports
- Restrictions on reproducing the information in reports provided to different audiences (for example, the version provided to the client, the version provided to DPIE and the Aboriginal Heritage Information Management System (AHIMS) database)
- Restrictions on communication of the information in other ways
- Restrictions on the location/storage of the information
- Other required processes relating to handling the information
- Any names and contact details of persons authorised within the relevant Aboriginal group to make decisions concerning the information, and their degree of authorisation
- Any details of any consent given in accordance with customary law
- Any restrictions on access to and use of the information by RAPs.

3.1.4 Stage 4

Stage 4 of the consultation process is to prepare and finalise an ACHAR with input from RAPs. As outlined in the ACHCRP (DECCW 2010a), a copy of this ACHAR was provided to all RAPs for the Project for review and comment on 23 August 2022. A review period of at least 28 days was commenced ending on Wednesday 21 September 2022.

3.2 Participation in assessment process

All RAPs were invited to participate in the completion of an archaeological survey and test excavation program. A list of organisations that participated in field investigations is included in Table 3-4.

Table 3-4 Test excavation and Site Inspection Attendance

Group	Role	Name	Date/s
Murra Bidgee Mullangari Aboriginal Corporation	Sites Officer	[redacted]	27th – 30th June 2022
Woronora Plateau Gundangara Elders Council	Sites Officer	[redacted]	27th – 30th June 2022
Yurrandaali Pty Ltd	Sites Officer	[redacted]	27th – 30th June 2022
DNC	Sites Officer	[redacted]	27th – 30th June 2022
Freeman & Marx Pty Ltd	Sites Officer	[redacted]	27, 29, 30th June 2022
Freeman & Marx Pty Ltd	Sites Officer	[redacted]	28th June 2022

3.3 Outcomes of consultation

On 25 August 2022[redacted] on behalf of Woronora Plateau Gundangara Elders Council issued a response to the draft ACHAR, agreeing with the proposed methodology and salvage excavation program for Bendeela Hydro AS01 (#52-4-0729).

[redacted]ontacted Jacobs via phone and submitted an email response on 21 September 2022 to the draft ACHAR. In the phone call[redacted] highlighted the importance of considerations towards the impact of the Project on the natural values of Kangaroo Valley. Further concern was raised on impact of the Project on the water cycles, sources, courses as a result of Project.

3.3.1 Summary of how items raised during fieldwork were addressed

During the completion of the fieldwork program[redacted] (Woronora Plateau Gundangara Elders Council) provided cultural information regarding the Project area and wider region. These comments have been documented in this report (Section 6). [redacted] (Murra Bidgee Mullangari Aboriginal Corporation) requested that a single test pit be placed close to Kangaroo River as he identified the River as a place of cultural significance for its connection to the ancestors. This request was facilitated through the establishment of Test Pit 5.

3.3.2 Summary of how consultation has influenced the Project and management measures

As a result of consultation with RAPs both on site and through the formal consultation process, the following amendments have been made:

- The addition of Test Pit 5 during the test excavation program, to respond to [redacted]'s request for further investigation in an area of cultural significance

- Concerns raised by [redacted] about the environmental impact of the Project more broadly have been provided to the relevant project personnel for further consideration.

4. Summary and analysis of background information

This section summarises Section 3 of the Aboriginal Archaeological report (AAR) (Appendix B).

4.1 Summary of archaeological background

Previous archaeological investigations summarised in the AAR (Jacobs, 2022) indicate that the Shoalhaven and specifically the Shoalhaven River are of high cultural significance and will contain varying densities of archaeological deposits. Previous archaeological investigations within the region, such as by Harper et al. (2012); Navin Officer (2002; 2005) indicate that within the specific Project area archaeological deposits occur on low/ medium density levels. Site types found are typically isolated sites, artefact scatter, or PADs. A possible explanation for the low potential of sites found may correlate with the low number of archaeological assessments which have happened in the region. As such an examination of the local environment and the various cultural factors in the region will add to this existing knowledge and enable the creations of a predictive model that will assist in locating more Aboriginal sites.

4.2 Summary of environmental background

The closest water sources include Fitzroy Falls Reservoir to the North of the Project area, Bendeela Pondage and Lake Yarrunga to the South of the Project area, Yarrunga Creek to the West and Miller Creek to the East. As a result of the close proximity of multiple waterways, the soils present within the Project area are a part of a fluvial landscape featuring active flood plains with levees and backwater swamps on alluvium (Artefact Heritage 2012:4). The levees present within the soil are made up of brownish black fine sandy loam which overlays brown sandy clay loam also known as Prairie Soils.

In 1805 it was recorded by James Meehan that the area comprised grasslands, freshwater swamps, as well has areas covered by 'rainforest, brush cedar, softwoods, coachwood, blackbutt, sassafras, flame trees, brushes, palms, ferns, vines, orchids, eucalyptus, and casuarinas' (as cited in Bayley 1975:18). Since European settlement much of the original vegetation has been cleared for pastoral practices. Original vegetation would have been largely in the form of the Shoalhaven Sandstone Forest which is an open Eucalypt forest or woodland. The area would have had abundant sclerophyll shrub stratum and a groundcover dominated by sedges (Artefact Heritage 2018:20).

4.3 Summary of AHIMS search results

A search of the AHIMS database was undertaken on 11 February 2022 for an area of land at datum GDA, zone 56, eastings 264974 – 273849, northings 6150178 – 6162300 with a buffer of 0 meters. The search area extends 2km beyond the maximum extent Project area in all directions to gain information on the archaeological context of the local area (Figure 4-1). No registered AHIMS sites are located within the Project area.

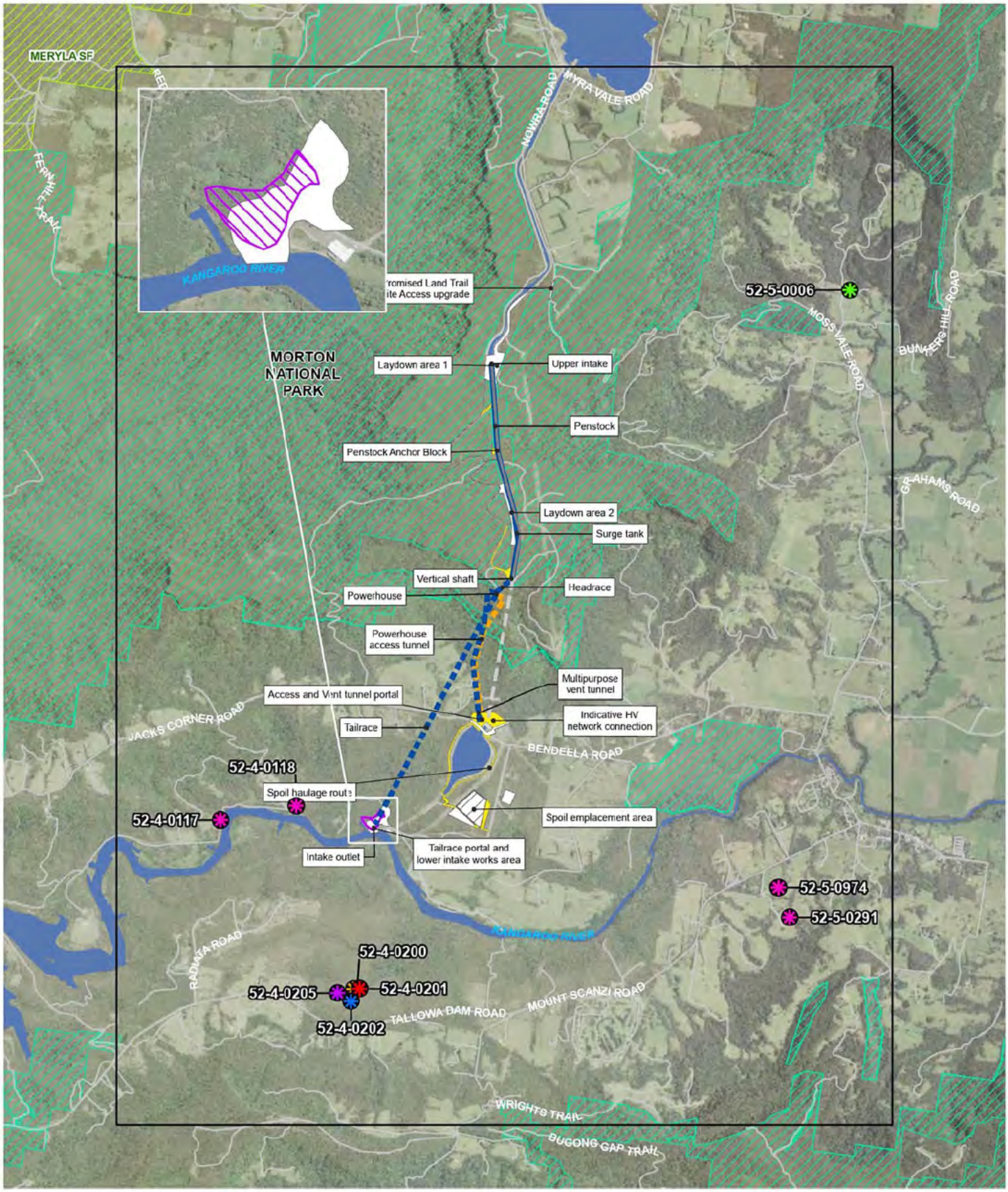
4.4 Predictive model

The desktop assessment indicates that certain landscape contexts within the Project area have a higher likelihood to contain archaeological sites and deposits than others. Predictive modelling was used to determine the archaeological sensitivity for Aboriginal cultural heritage of particular landforms within the proposed Project area. Within the Project area differing degrees of ground disturbance and development has resulted in fluctuations of disturbed archaeological integrity, mainly as an effect of alluvial, colluvial, agricultural and decreased preservation processes.

Based on the search of the AHIMS and Australian Heritage database and review of previous archaeological reports pertaining to the broader Project area, the following site types, characteristics and potential location of Aboriginal places within the Project area are proposed:

- Artefact scatters, grinding grooves, areas of potential archaeological deposit (PAD), scarred trees and rock shelters are likely to be associated with primary resources zones along major rivers and also evident along higher order creek flats, slopes and terraces

- Grinding grooves and rock shelters are a likely site type to occur in the broader area. Rock shelters are likely to occur in steep drainage depressions or spur crest units or sloping terrain. Grinding grooves are likely to occur on homogenous stone outcrops such as sandstone close to water sources
- Artefacts scatters and isolated artefacts are a likely to occur. These are likely to be located along alluvial floodplains and are likely to include surface and subsurface deposits
- Areas of PAD are likely to occur where intact deposits are retained. Surface scatters may likely indicate potential for sub-surface deposit
- Scarred trees are a less likely site type to encounter in the valley. These are less abundant and are likely to occur on mature vegetation and in the vicinity of or in association with other cultural and archaeological material. If scarred trees are located within or in proximity to the Project area, it is likely they will be encountered within vegetation on the escarpment at Promised Land Trail and Morton National Park.



Legend

- Existing KV tunnel alignment
- Existing scheme pipeline
- Indicative above ground pipeline
- Indicative tunnel alignment
- Indicative access tunnel
- Disturbance area
- Spoil site
- Additional areas since 2019
- Art (Pigment or Engraved), Artefact, Potential Archaeological Deposit (PAD)
- Art (Pigment or Engraved), Artefact, Potential Archaeological Deposit (PAD), Grinding Groove
- Art (Pigment or Engraved), Grinding Groove, Potential Archaeological Deposit (PAD)
- Art (Pigment or Engraved), Ochre Quarry, Water Hole
- Artefact
- Grinding Groove
- Potential archaeological sensitivity
- AHIMS search extent
- State Forest
- NPWS Reserve
- Road
- Waterway
- Waterbody

0 1 2 km

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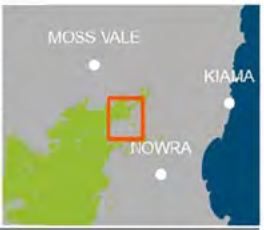
GDA2020 MGA Zone 56



Data sources

Jacobs 2022
Department of Planning and Environment 2022
© Department of Customer Service 2020

Figure 4-1 AHIMS search results

5. Summary of field work

5.1 Archaeological survey

This section summarises Section 4 of the Aboriginal Archaeological Report (Appendix B).

5.1.1 Aims

A preliminary site inspection was conducted within the Project area in order to gauge where impacts would occur, and to identify where whether or not Aboriginal objects are, or are likely to be, present, and whether or not the proposal is likely to harm Aboriginal objects. The site inspection had the following objectives:

- Inspect areas of higher visibility and soil exposures
- Inspect elevated areas near waterways, water bodies and creek lines
- Inspect all rock shelters within the Project area
- Inspect all mature trees in the Project area for cultural modification or scarring.

The aim of the archaeological survey was to visit all areas where impacts are proposed within the Project area to identify whether or not Aboriginal objects are, or are likely to be, present, and whether or not the proposal is likely to harm Aboriginal objects. The archaeological survey was undertaken in conjunction with the RAPs. The survey confirmed areas of potential archaeological deposit (PAD) that would be subject to archaeological test excavation and as part of the current program.

5.1.2 Survey personnel

The archaeological survey was undertaken on the 27th and 28th of June 2022. The personnel in attendance for the survey are listed in Table 5-1.

Table 5-1 Survey team attendance

Group	Role	Name	Date/s
Jacobs	Senior Archaeologist	Ryan Taddeucci	27 / 28 June 2022
Jacobs	Project Archaeologist	Matt Finlayson	27 / 28 June 2022
Murra Bidgee Mullangari Aboriginal Corporation	Sites Officer	[redacted]	27 / 28 June 2022
Woronora Plateau Gundangara Elders Council	Sites Officer	[redacted]	27 / 28 June 2022
Yurrandaali Pty Ltd	Sites Officer	[redacted]	27 / 28 June 2022
DNC	Sites Officer	[redacted]	27 / 28 June 2022
Freeman & Marx Pty Ltd	Sites Officer	[redacted]	27 June 2022
Freeman & Marx Pty Ltd	Sites Officer	[redacted]	28 June 2022

5.1.3 Sample strategy and approach

In accordance with Requirement 5 of the Code of Practice (DECCW 2010), the archaeological survey adopted a sampling strategy targeting survey on each distinct landform within a given soil landscape. The survey covered all accessible areas and known Aboriginal objects or features where objects are likely to be. The survey area was divided into 10 survey units based on access and landform type.

The survey was carried out on foot by a team of archaeologists and Aboriginal representatives. A handheld Global Positioning System (GPS) was used to track the path of the survey team and record the coordinates of

identified features and disturbances. Detailed aerial maps marked with grid coordinates for the survey unit was carried by the survey team. The coordinate system projection used for all data recording was GDA94 MGA 56. A photographic record was kept during the survey. Photographs were taken to record aspects of each survey unit including disturbance and recorded Aboriginal sites. Scales were used for photographs where appropriate.

5.1.4 Results

Survey effectiveness was generally low across the Project area due to low surface visibility and exposure (see Table 5-2 for a summary of survey coverage). However, the archaeological survey resulted in the identification of one scarred tree, Promised Land Trail ST01 (Figure 5-1), located at the intersection of McPhails Fire trail and Promised Land Trail. Tree scar has been burned but is significantly regrown. The scar is unlikely to have been caused by machine damage from historic forestry. No axe marks are visible on the tree, however there is sign of chipping adjacent to the scar. The chipping however appears to be modern in origin. While the shape of the scar is irregular, it is suspected that this is due to overgrowth impacting the top of the scar. [redacted] commented that the tree type appears consistent with local / regional scarred trees and that it could possibly be a shield tree.

Table 5-2 Survey coverage summary

Survey Unit	Landform	Survey Unit Area (Sqm)	Visibility (%)	Exposure (%)	Effective Coverage Area (Sqm)	Effective Coverage (%)
Survey Unit 1	Slope	72165	10	40	2886	4
Survey Unit 2	Slope	10637	40	70	2978	28
Survey Unit 3	Rolling Hills	9723	30	20	583	6
Survey Unit 4	Rolling Hills	58325	20	50	5832	10
Survey Unit 5	Slope	13180	80	40	4217	32
Survey Unit 6	Slope	76249	30	20	4574	6
Survey Unit 7	Flat Plain	18612	90	90	15075	81
Survey Unit 8	Flat Plain	121875	30	30	10968	9
Survey Unit 9	Slope	22171	40	50	4434	20
Survey Unit 10	Hill Top	54920	20	10	1098	2

5.2 Test excavation

This section summarises Section 5 of the Aboriginal Archaeological Report (Appendix B).

5.2.1 Aims

Sub-surface testing is required to determine the presence of sub-surface archaeological deposits in areas where it is known or likely that Aboriginal objects are present and harm to them cannot be avoided as a result of the Project. Testing therein aims to identify the nature, depth and extent of archaeological deposits – if present.

5.2.2 Timing and personnel

Archaeological test excavations were undertaken over two days on 29 June and 30 June 2022 at the Bendeela Power Station PAD. The Jacobs staff and RAP Sites Officers in attendance under the supervision of Origin Project Manager Tony Schinkel are listed in Table 5-3.

Table 5-3 Test excavation attendance

Group	Role	Name	Date/s
Jacobs	Senior Archaeologist	Ryan Taddeucci	29 / 30 June 2022
Jacobs	Project Archaeologist	Matt Finlayson	29 / 30 June 2022
Murra Bidgee Mullangari Aboriginal Corporation	Sites Officer	[redacted]	29 / 30 June 2022
Woronora Plateau Gundangara Elders Council	Sites Officer	[redacted]	29 / 30 June 2022
Yurrandaali Pty Ltd	Sites Officer	[redacted]	29 / 30 June 2022
DNC	Sites Officer	[redacted]	29 / 30 June 2022
Freeman & Marx Pty Ltd	Sites Officer	[redacted]	29 / 30 June 2022

5.2.3 Test excavation methodology

The sub-surface testing was completed in accordance with Requirements 15 and 16 of the Code of Practice (DECCW 2010). Test pit locations were identified within the PAD where vegetation opened to facilitate for excavation amidst the thick scrub surrounding Bendeela Power Station. Five test pits were determined to be adequate to achieve the aims to determine the nature of archaeological deposits within the PAD.

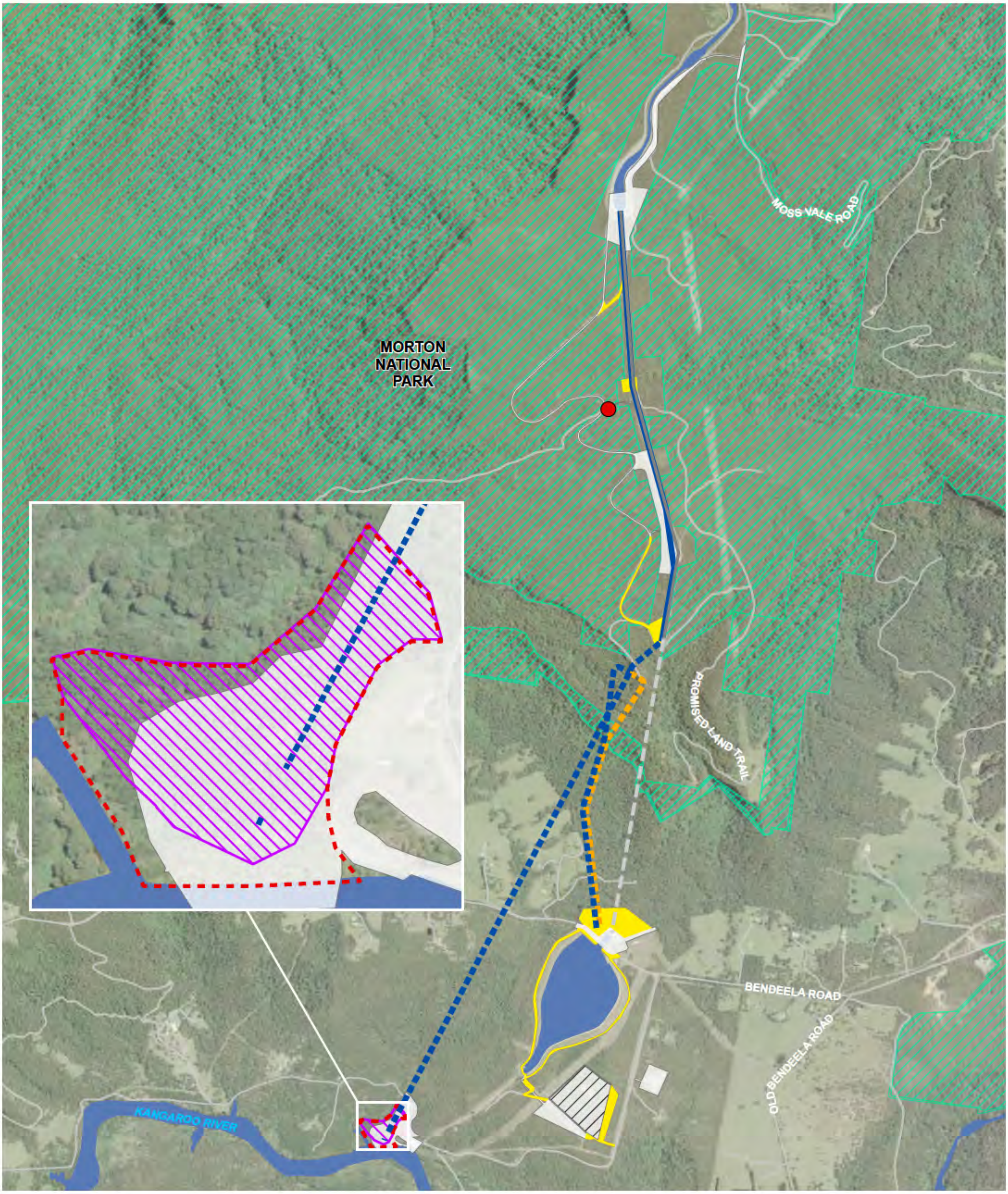
5.2.4 Results

The test excavation program resulted in the identification of one artefact scatter, Bendeela Hydro AS01 (AHIMS ID 52-4-0729) (Figure 5-1). The site was located on a densely vegetated hilltop, sloping down to Kangaroo River in the south. The site is bordered to the west by Kings Creek and a road associated with the Bendeela Hydroelectric pumping plant to the north and east. The test excavation resulted in the recovery of 49 Aboriginal objects.

The subsurface assemblage was primarily comprised of sediment stone (chert and mudstone) (n=21, 42.86%) with lesser numbers of quartzite, basalt, quartz, and silica (silcrete and chalcedony) (Table 6.8). These lithologies are considered common within the local and regional context. One piece of flaked ceramic was identified and may be indicative of post-contact occupation of the site, this will be discussed further in Section 7.

The assemblage predominantly comprised of complete flakes (n=24, 48.98%) and flake fragments (n=14, 28.57). The relatively high presence of flake fragments is indicative of post-depositional site disturbances that have damaged the artefact deposit, this will be further discussed in Section 7. The assemblage also included a single platform core (SPC), four core fragments and six pieces of debris. These are the by-products of stone tool manufacturing, and it is possible that tool manufacturing occurred within the site.

[redacted] commented that the portions of the site closest to Kangaroo River would have been a place where Aboriginal people would be camped. Kangaroo River is considered of particular significance to contemporary Aboriginal people for its connection with the ancestors.



Legend

- Existing KV tunnel alignment
- Existing scheme pipeline
- Indicative above ground pipeline
- Indicative tunnel alignment
- Indicative access tunnel
- Project area / Disturbance area
- Spoil site
- Additional areas since 2019
- Potential archaeological sensitivity
- Promised Land Trail ST01
- Bendeela Hydro AS01
- NPWS Reserve
- Road
- Waterway
- Waterbody

0 1 2 km

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GDA2020 MGA Zone 56

Data sources

Jacobs 2022
Department of Planning and Environment 2022
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Figure 5-1 Locations of newly identified sites

6. Cultural heritage values

This chapter describes the process used to inform, and summarises the outcomes from, the cultural values assessment.

6.1 Identified Aboriginal cultural heritage values

General discussions with Aboriginal people and knowledge holders have identified various key elements that makeup cultural heritage values within the landscape of the Project area (Table 6-1).

Table 6-1 Identified Aboriginal cultural heritage values from the Project area

Cultural heritage values	Description
Resource gathering locations and techniques	Indigenous communities note that fish, plants and other foods are still collected throughout the region. The primary resource gathering locations, and the techniques used, are known and passed down through the generations
Campsites	Indigenous people identify campsites as culturally significant as they provide a link to the ancestral past. Identifying significant resource zones, pathways taken by their ancestors through the landscape and communication between other groups. Bendeela Hydro AS01 (AHIMS ID 52-4-0729) was likely the location of an open Aboriginal camp site due to the presence of sub-surface Aboriginal objects and the advantageous location of the site in relation to the nearby river and valley
Culturally modified or scarred trees	Scarred trees are of great importance to knowledge holders as they are of sacred and ceremonial importance. European land use and agricultural practices has resulted in scarred trees can often be the only remaining markers for ceremonial sites and burials in the landscape. It is also noted that scarred trees may be located at junctions, ceremonial sites or other significant points in the landscape. The Promised Land Trail ST01 scarred tree was identified as a result of the archaeological survey. However, the tree will not be impacted by the construction works. The tree is believed to be a shield tree by Aboriginal stakeholders
Transit routes/pathways through the landscape and songlines	Aboriginal people place cultural value through the pathways and routes that their ancestors would have taken. These pathways connect ceremonial and spiritual sites as well as a connection route for trading and meeting with neighbouring tribes. No comments have been provided by Aboriginal stakeholders as to potential transit routes / pathways or songlines relevant to the Project Area. Bursill et al. (2015:4) state that a 'well known' path once ran 150 km from Jervis Bay, through Kangaroo Valley, Wilde's Meadow, Robertson and finally to Appin spanning a 5 day journey. This pathway is inferred to have likely been a seasonal transit route from the coast to the Southern Highlands
Water courses, water holes, springs, and waterfalls	Permanent water bodies are culturally significant as a central location for the gathering of people, resource collection and camping. [redacted] (Murra Bidgee Mullangari) commented that the Kangaroo River is of particular significance to contemporary Aboriginal people for its connection with ancestors
Plants and animals	Flora and fauna are not only seen as resources but hold cultural significance in spiritual and ceremonial values. Boot (1994) postulates that significant faunal and floral species recorded in ethnohistorical sources include kangaroo, possum, wombat, birds, worms, goanna, honey, native cranberry, honeysuckle, pigface, macrozamia, cabbage tree and yams. However, it is noted that observations of use of

Cultural heritage values	Description
	these food sources have been made in a coastal context within the Wodi Wodi boundaries. No commentary has been received from Aboriginal stakeholders on significant fauna/ floral resources relevant to the Project area
Burial sites	Burial sites are of great importance and their protection is a high concern to Aboriginal people as the locations of burials are rarely documented. There have been no known locations that have been identified within the confines of the Project area
Post contact sites	Post-contact sites are places that have gained significance to Aboriginal people since the arrival of European settlers. Defined an as an area where Indigenous people would of have had deep interaction with settlers. Contact sites predominantly depict an altering and destructive process, as European settlers left destruction and death in their wake. No post-contact sites are known to occur within the Project area
Massacre sites	These sites are highly significant and share great importance to Aboriginal people. No massacres sites are known to be within, or within close proximity to the Project area. The closest known massacre site is indicated to be the Minnamurra River Site (c.1818) located at Kiama (Ryan et al. 2017)
Astronomy	Indigenous Australians are the world's oldest astronomers, presenting an unprecedented knowledge of the stars over the span of thousands of years of observation. Astronomy was used by indigenous Australians to develop calendars and navigate the land. Each tribe lived according to the cycle of the stars, which influenced what they hunted and ate, and where they travelled. Aboriginal people would have taken advantage of the high elevation of certain ridgelines and mountains within the Project area

6.2 Aboriginal cultural values within the Project area

Two specific locations within the Project area, being the Promised Land Trail ST01 and Bendeela AS01 (AHIMS ID 52-4-0729) are known to have Aboriginal cultural values. However, the entirety of the Kangaroo Valley likely has cultural significance to Aboriginal people who have inhabited the region for thousands of years (Table 6-1).

6.2.1 Kangaroo Valley & River

The Kangaroo Valley has been used and modified anthropogenically by Aboriginal people for thousands of years prior to European contact. Based on ethnographic accounts, fire was used systematically and regularly to cultivate the vegetation of the valley to create grasslands and with less frequent burning, open woodlands (Bursill et al. 2015:16). The use of fire not only maintained vegetation but promoted growth of floral species such as Kangaroo Grass (*Themeda triandra*) which is a preferred food for Kangaroos (Bursill et al. 2015:17).

[redacted] commented that the Kangaroo River is of particular significance to contemporary Aboriginal people for its connection with ancestors.

[redacted] has additionally stated that he possesses knowledge of sites in the Fitzroy Falls area and has knowledge of cultural areas within and around the Project area.

6.2.2 Promised Land Trail ST01

The Promised Land Trail ST01 scarred tree is of cultural value to Aboriginal stakeholders. This type of site is particularly rare in areas that have been subject to urbanisation or where historic forestry practices have taken place.

Aboriginal stakeholders noted that the *Eucalyptus spp*. is the common scarred tree type of the area. A knowledge holder noted that the scar was most likely consistent with that of a shield tree.

6.2.3 Bendeela Hydro AS01 (AHIMS ID 52-4-0729)

Test excavations undertaken at Bendeela Hydro AS01 (AHIMS ID 52-4-0729) recovered 49 subsurface artefacts, comprising an artefact scatter of worked stone of various materials. One Aboriginal stakeholder noted that the portions of Bendeela Hydro AS01 (AHIMS ID 52-4-0729) closest to the Kangaroo River adjacent to the south would have been a place where Aboriginal people camped. The location of this site immediately adjacent to the Kangaroo River suggests that Bendeela Hydro AS01 (AHIMS ID 52-4-0729) likely has at least moderate cultural values to the local Aboriginal community.

6.3 Additional sites

6.3.1 Hill 60, Port Kembla

[redacted] noted a connection between Kangaroo Valley and the Aboriginal community of Hill 60, Port Kembla (Donaldson et al. 2017). The Aboriginal families living on Hill 60 were evicted in 1942 for use by the Australian Military during World War 2.

[redacted] stated that members of those families came to the Kangaroo Valley for farm work to pick berries. It is known that members of the Hill 60 community were displaced to work on Bundiwalla Farm at Berry, to Lake Illawarra and many families set up camp at Port Kembla Beach and at Coomaditchie Lagoon in an area which had served as a Depression Era camp from 1932 (Donaldson et al. 2017). Those at Coomaditchie often lived in 'sugar bag shacks' and other makeshift shelters (Donaldson et al. 2017:46).

6.3.2 Aboriginal cultural landscape

The Country of the Kangaroo Valley and escarpment where the Shoalhaven Hydro Expansion is proposed is an incredibly rich cultural landscape, containing at least two known sites of cultural origin within the Project area. The Project area is within a valley landscape that has been modified by Aboriginal people for thousands of years.

Further consultation should be undertaken with Aboriginal stakeholders to provide further understanding about the cultural landscape of Kangaroo Valley and surrounds, with particular regard to the importance of natural features such as topographical high points, water and the intangible connection of contemporary Aboriginal people with the physical landscape.

7. Significance assessment

7.1 Overview

The cultural values assessment includes cultural information collected during consultation, desktop research, field surveys and during the test excavation program. The below information provides a summary of cultural values information to inform the Project.

7.2 Cultural significance

Cultural significance is associated, or attached to any place, places, and objects by any individual, group or groups of people. Cultural significance is representative in the place itself; its fabric, setting, use, associations, meanings, records, connected places and objects. 'Place' is a geographically defined area and may include tangible features that embody the physically identifiable landscape; as well as intangible features such as conceptual ideas or spiritual beliefs held over places or landscapes irrespective of observable physical evidence (NSW Heritage Office 2001).

Australia ICOMOS (2013) defines cultural significance as:

> *'Cultural significance means aesthetic, historic, scientific, social or spiritual value for past, present or future generations. Cultural significance is embodied in the place itself, its fabric, setting, use, associations, meanings, records, related places and related objects.'*

7.3 Cultural landscape

The understanding and perception of the landscape expressed by the knowledge holders and the community is an area traversed by an interconnecting network of physical, social and spiritual places. The World Heritage Convention of United Nations Educational, Scientific and Cultural Organization (UNESCO) define an associative cultural landscape as one which has 'powerful religious, artistic or cultural associations of the natural element rather than material cultural evidence, which may be insignificant or even absent' (UNESCO 1991). The relationship between Aboriginal Australians and the land can often be conceived in spiritual terms rather than primarily in material terms (Andrews et al. 2006).

Aboriginal cultural knowledge has been defined as:

> *'Accumulated knowledge which encompasses spiritual relationships, relationships with the natural environment and the sustainable use of natural resources, and, relationships between people, which are reflected in language, narratives social organisation, values, beliefs and cultural laws and customs.' (Andrews et al. 2006).*

Aboriginal cultural knowledge was traditionally bequeathed through oral traditions from generation to generation. Within all Aboriginal communities there was a time of dislocation and upheaval associated with the arrival of European settlers. This widespread disruption resulted in the loss of varying degrees of detailed knowledge and understanding of many of the elements of the cultural landscape from Aboriginal communities.

No explicit concerns were raised by Aboriginal stakeholders regarding this loss of knowledge of the cultural landscape and the meanings embedded in the landscape. However, [redacted] noted a general concern about the potential impact of the Project on the broader environment.

It should be noted that Indigenous communities across Australia are extremely diverse, and generally defy generalisation. The above descriptions are common conceptions of Aboriginal cultural landscapes and values; however, a large range of beliefs and practices are evident across Australia and uniformity should not be assumed.

7.4 Assessment criteria

An assessment of the cultural heritage significance of an item or place is required in order to form the basis of its management. *The Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW*

(DECCW 2011) provides guidelines, in accordance with the *Burra Charter* (Australia ICOMOS 2013) for significance assessment with assessments being required to consider the following criteria:

- Social values – does the area have a strong or special association with a particular community or cultural group for social, cultural or spiritual reasons
- Historic values – is the area important to the cultural or natural history of the local area and/or region and/or state
- Scientific values – does the area have the potential to yield information that will contribute to an understanding of the cultural and natural history of the local area and/or region and/or state
- Aesthetic values – is the area important in demonstrating aesthetic characteristics in the local area and/or region and/or state.

Scientific values should be considered in light of the following criteria:

- Research potential – does the evidence suggest any potential to contribute to an understanding of the area and/or region and/or state's natural and cultural history?
- Representativeness – how much variability (outside and/or inside the subject area) exists, what is already conserved, how much connectivity is there?
- Rarity – is the subject area important in demonstrating a distinctive way of life, custom, process, land-use, function or design no longer practised? Is it in danger of being lost or of exceptional interest?
- Education potential – does the subject area contain teaching sites or sites that might have teaching potential?

It is important to note that heritage significance is a dynamic value.

7.5 Results of the significance assessment

7.5.1 Historic value

The guidelines to the *Burra Charter* include the following discussion of historic significance:

> *A place may have historic value because it has influenced, or has been influenced by, an historic figure, event, phase or activity. It may also have historic value as the site of an important event. For any given place the significance will be greater where evidence of the association or event survives in situ, or where the settings are substantially intact, than where it has been changed or evidence does not survive. However, some events or associations may be so important that the place retains significance regardless of subsequent treatment. (Australia ICOMOS 2013)*

In relation to Aboriginal cultural heritage, many post-contact places and sites would have historic value. Pre-contact places and items may also be significant according to this criterion, although the association with historic figures, events, phases or activities may be more difficult to establish. Places of historic significance may include sacred or ceremonial sites, sites of resistance battles and massacres, places associated with Aboriginal communities after colonisation and the more recent past, and archaeological sites with evidence of technological developments.

The region surrounding the study includes the location of Hill 60, Port Kembla, which is a site of historic significance to Aboriginal people. However, the sites identified within the Project area do not include features indicative of a significant event or activity in the pre-contact or post-contact past. Therefore, at this level of assessment, the Project area is considered to be of low historic value.

7.5.2 Aesthetic value

This criterion refers to aspects of sensory perception and the ability of the site to elicit emotional responses referred to as sensory or sensori-emotional values. The guidelines to the *Burra Charter* note that assessments may include consideration of the form, scale, colour, texture and material of the item or place, as well as sounds and smells. With regard to pre-contact Aboriginal cultural heritage sites, the placement within the landscape would be considered under this criterion as would memoryscapes and the ability of the site to transmit such memories. It is important to consider that sensori-emotional values are not always equated with 'beauty'; for example, massacre sites or sites of incarceration may have value under this criterion. Individual artefacts, sites and site features may also have aesthetic significance.

The Project area has been subject to historic land use and modification which has compromised the aesthetic value of the Project area. However, the Project area is considered to be of moderate aesthetic value based on proximity to aesthetically pleasing features such as the creek and trees.

7.5.3 Socio/cultural value

Socio/cultural value concerns the relationship and importance of sites to the contemporary Aboriginal community. Aspects of socio/cultural value include people's traditional and contemporary links with a place or object as well as an overall concern by Aboriginal people for sites and their continued protection. Aboriginal cultural values may partially reflect or follow on from archaeological values, historic values, aesthetic values or be tied to values associated with the natural environment. This criterion requires the active participation of Aboriginal people in the assessment process as it is their knowledge and values that must be articulated.

Scarred trees, such as the Promised Land Trail ST01 are of great importance to knowledge holders as they are of sacred and ceremonial importance. [redacted] (Murra Bidgee Mullangari Aboriginal Corporation) noted that the close proximity of Kangaroo River to Bendeela Hydro AS01 (AHIMS ID 52-4-0729) is of particular significance to contemporary Aboriginal people for its connection with ancestors.

Overall, the Project area is considered to hold moderate socio/cultural value.

7.5.4 Scientific value

7.5.4.1 Promised Land Trail ST01

No previously recorded scarred trees were identified within the local area during the AHIMS search, and a scarred tree is therefore considered rare in the local context. The scarred tree was found to be in good condition and featured diagnostic characteristic. Therefore, Promised Land Trail ST01 is considered to be of moderate educational and representative value. Dendrochronological analysis could be completed on the tree to determine the age of tree and provide further insight into the occupational and utilisation of the Project area by Aboriginal people. As a result, Promised Land Trail ST01 is considered to be of moderate research value. Overall, Promised Land Trail ST01 is of moderate scientific value.

7.5.4.2 Bendeela Hydro AS01 (AHIMS ID 52-4-0729)

Based on the results of the AHIMS search, artefact scatters are relatively rare within the local context. Bendeela Hydro AS01 (AHIMS ID 52-4-0729) features diagnostic stone artefacts that are representative of Aboriginal occupation and artefact manufacturing processes. Therefore, the site is considered to be of moderate educational and representative value. Charcoal samples were exacted during the test excavation program, and there is potential to further investigate the date of the site through Radiocarbon (C14) dating. The nature of the assemblage has indicated that it likely dates to the Middle Bondaian phase (4000 – 1000 years BP), C14 dating may challenge or support this interpretation.

7.5.4.3 Summary of scientific values

A summary of scientific significance for the Project area is provided in Table 7-1.

Table 7-1 Summary of scientific values

Site name (AHIMS ID)	Research potential	Representativeness	Rarity	Education potential	Overall significance assessment
Promised Land Trail ST01 (AHIMS ID 52-4-0730)	Moderate	Moderate	Moderate	Moderate	Moderate
Bendeela Hydro AS01 (AHIMS ID 52-4-0729)	Moderate	Moderate	Moderate	Moderate	Moderate

7.5.5 Statement of significance

Based on the aesthetic, historic and social context of the identified Aboriginal objects; the Project area is considered to be of moderate cultural heritage significance. The Aboriginal objects present within the Project area are tangible expressions of Aboriginal life prior to contact and have potential to connect the contemporary community with traditional practices that have been disrupted by colonial activity.

8. Impact assessment

8.1 Potential construction and operational impacts

An indicative Project layout based on the current reference design consists of the construction and operation of:

- A surface pipeline from the existing Fitzroy Falls Canal control structure to a surge tank
- Vertical shaft and headrace tunnel to an underground power station
- An underground power station cavern housing a reversible generator and pump capable of supplying approximately 235 MW of hydroelectric power, including associated access tunnel and ventilation shaft, transformer and high voltage cable route to the existing Kangaroo Valley Power Station substation;
- A tailrace tunnel and intake /outlet structure in the vicinity of the existing Bendeela Power Station on Lake Yarrunga
- A vehicular access tunnel to the underground power station from the vicinity of the existing Kangaroo Valley Power Station
- Operational surface infrastructure including an administration building, water treatment infrastructure and a ventilation building
- Ancillary works which may include the carrying out of works to upgrade or construct access roads, spoil disposal sites, utilities infrastructure, construction compounds and construction power supply.
- Ancillary works at Laydown / Works Area 6, including construction of the lower intake control structure and tailrace tunnel portal. Surface works will be limited to ventilation, spoil handling and water treatment.

8.2 Potential Aboriginal heritage impact

Based on the current design plans, Promised Land Trail ST01 will not be impacted by any works and will not be harmed.

Ground disturbing works are planned to take place within the extent of Bendeela Hydro AS01 (AHIMS ID 52-4-0729) that will result in partial harm and a partial loss of value.

A summary of the assessed impacts in accordance with the Code of Practice is included in Table 8-1.

Table 8-1 Summary of potential impacts

Site name (AHIMS ID)	Type of harm	Degree of harm	Consequence of harm
Promised Land Trail ST01 (#)	None	None	None
Bendeela Hydro AS01 (AHIMS ID 52-4-0729)	Direct	Partial	Partial loss of value

8.3 Ecological Sustainable Development principles

The Guide (OEH 2011) specifies that Ecological Sustainable Development (ESD) principles must be considered when assessing harm and recommending mitigation measures in relation to Aboriginal objects.

The following relevant ESD principles are outlined in Section 3A of the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999:*

- Decision-making processes should effectively integrate both long term and short term economic, environmental, social and equitable considerations (the 'integration principle')
- If there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation (the 'precautionary principle')
- The present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations (the 'principle of intergenerational equity').

8.3.1 The integration principle

The proposal would comply with the integration principle in regard to Aboriginal heritage. The Aboriginal heritage values of the Project area have been considered as part of the planning process for the proposed works.

8.3.2 The precautionary principle

Promised Land Trail ST01 (AHIMS ID 52-4-0730) and Bendeela Hydro AS01 (AHIMS ID 52-4-0729) were identified during the archaeological investigations completed for the Project. Promised Land Trail ST01 (AHIMS ID 52-4-0730) will not be impacted by the proposed works but a precautionary approach would be to consider the establishment of an exclusion zone to ensure accident damage is avoided.

To ensure full scientific confidence and retrieve a sample of the identified archaeological resource prior to impacts, targeted salvage is recommended within the subsurface artefact concentration at Bendeela Hydro AS01 (AHIMS ID 52-4-0729). This excavation would provide better scientific confidence and contribute to the archaeological record providing information regarding land use, task specialisation and resource gathering strategies of Aboriginal people over a potentially long timespan.

8.3.3 The principle of intergenerational equity

The proposed works would adhere, as close as possible, to the principle of intergenerational equity by collating scientific and cultural information on former Aboriginal occupation of the Project area through the previous investigations and this ACHAR.

Further archaeological investigations through a salvage excavation of Bendeela Hydro AS01 (AHIMS ID 52-4-0729) has been recommended in order to mitigate against impacts to the subsurface artefact concentration within the Project area.

9. Cumulative impacts

Cumulative impacts have the potential to occur when impacts from a Project interact or overlap with impacts from other projects and can potentially result in a larger overall effect (positive or negative) on the environment, businesses or local communities. Cumulative impacts may occur during construction stages when projects are constructed concurrently or consecutively. Projects constructed consecutively (or sequentially) can result in construction activities occurring over an extended period of time with little or no break in construction activities, potentially causing increased impacts and construction fatigue for local communities.

The extent to which another development or activity could interact with the construction of the proposal would depend on its scale, location and/or timing of construction. Generally, cumulative impacts would be expected to occur where multiple long-duration construction activities are undertaken close to, and over a similar timescale to, construction activities for the proposal, or where consecutive construction occurs in the same area.

The overall effect of cumulative benefits or impacts could be positive or negative, depending on the nature of the projects and the nearby communities and environment.

9.1 Identification of projects

The assessment methodology for potential cumulative impacts is set out in Chapter 6 of the EIS. Projects that were considered in the cumulative impact assessment are:

- Shoalhaven Hospital Redevelopment
- Nowra Biogas Project
- Shoalhaven Starches Mod 22 – Beverage Grade Ethanol Plant Stage 3
- Shoalhaven Starches Modification 25 Rail Line Extension & Addition to Product Dryers
- Dendrobium Mine Extension
- Moss Vale Plastics Recycling Facility
- New Shellharbour Hospital and Integrated Services
- Berrima Cement Works Solid Waste Derived Fuels & Delivery Variation Project
- Sutton Forest Sand Quarry
- Moss Vale Road Urban Release Area: Maculata Park and Taylors Landing
- Shoalhaven Community and Recreational Precinct – Artie Smith Oval Development
- Shoalhaven Community and Recreational Precinct – Shoalhaven Indoor Sports Centre (SISC) Extension
- Shoalhaven Community and Recreational Precinct – Northern Section – Bomaderry Sporting Complex
- Moss Vale Sewage Treatment Plant Upgrade
- Moss Vale Bypass
- Ritters Creek, Meryla Road, Meryla - Bridge Replacement
- Fitzroy Falls RFS
- Bowral and District Hospital Redevelopment Stage 2
- Bay and Basin Leisure Centre Redevelopment
- East Nowra Sub Arterial Road ENSA
- Shoalhaven Resource Recovery Facility (RRF) and West Nowra Resource Recovery Park Stage 2
- Nowra Bridge Project – Princes Highway Upgrade
- Jervis Bay Road and Princes Highway intersection upgrade at Falls Creek.

9.2 Assessment of cumulative impacts

Archaeological sites are a non-renewal resource and harm to any Aboriginal object constitutes irreversible cumulative harm. It has been identified that the proposal will pose harm to the extent of Bendeela Hydro AS01 (AHIMS ID 52-4-0729) that will result in a partial loss of value.

At the time this report was prepared, no known impacted to Aboriginal objects within the region beyond the current proposal were identified. As a result, there are no predicted cumulative impacts to this site from other identified projects.

10. Mitigation measures

10.1 Guiding principles

Where possible, cultural heritage should be conserved and protected in situ. However, where conservation is not practical, measures should be implemented to mitigate against the loss of scientific value. These mitigation measures are based of the assessed significance of the site again the proposed impacts:

- Low scientific value – Conservation where possible. If conservation is not possible, some form of mitigation should be considered, but may not be required, The Minister's Conditions of Approval (MCoA) would be required to impact the site before works can commence
- Moderate scientific value – Conservation where possible. If conservation was not practicable further archaeological investigation would be required such as salvage excavations or surface collection under the MCoA
- High scientific value – Conservation as a priority. The MCoA would be required only if other practical alternatives have been discounted. Recommendations for the conditions of the MCoA would depend on the nature of the site, but may comprehensive, large scale salvage excavations.

Promised Land Trail ST01 will not be impacted by the Project, and no mitigation is required. However, it is recommended that an exclusion zone and fencing (approximately 10m buffer) is established to protect the site for accidental damage.

Bendeela Hydro AS01 (AHIMS ID 52-4-0729) moderate significance. Therefore, where conservation is not practical, mitigation measures, such as salvage excavations may be required. Salvage works would require the Minister's Conditions of Approval as authorisation.

10.2 Cultural Heritage Management Plan and unexpected finds procedure

A Cultural Heritage Management Plan (CHMP) and accompanying unexpected finds procedure will provide a method to manage Aboriginal objects recovered through the testing and salvage excavation programs and unexpected finds that may occur during construction works.

The long-term storage of any recovered Aboriginal objects will be developed in conjunction with RAPs and other relevant stakeholders (eg WaterNSW and Origin) during the completion of the CHMP. It is likely to include (in preferential order):

- Re-burial on site, in an appropriate location in the vicinity of the Project
- Lodged with a RAP under a Care and Control Agreement
- Deposition with the Australian Museum.

The CHMP will be provided to WaterNSW for review and to consult and negotiate on potential locations to rebury Aboriginal objects on WaterNSW land. WaterNSW will provide advice on ideal locations for reburial that will be most protected from future / maintenance works to be conducted on WaterNSW land.

10.3 Discovery of human remains

If any human remains are discovered and/or harmed in, on or under the land, the following actions must be taken:

- Do not further move or disturb these remains
- Immediately cease all works at the particular location
- Secure the area so as to avoid further harm to the remains
- Notify the NSW Police
- Notify Heritage NSW on the Environment Line (131 555) as soon as practicable and provide any available details of the remains and their location
- Not to recommence any work at the particular location unless advised in writing by Heritage NSW.

10.4 Changes to the Project

Advice provided within this report is based upon the most recent information provided by the proponent at the time of writing. Any changes made to the Project should be assessed by an archaeologist in consultation with the RAPs. Any changes that may impact on Aboriginal sites not assessed as part of the Project may warrant further investigation and result in changes to the recommended management and mitigation measures.

10.5 Salvage excavations

Bendeela Hydro AS01 (AHIMS ID 52-4-0729) has been assessed as being of moderate archaeological significance. Therefore, it is recommended that further archaeological investigations occur within the Project area. The artefact concentration should be subject to a salvage excavation program to record the full extent of the intact artefact concentration.

The aim of salvage excavations would be to mitigate impacts by further investigating the areas of high density identified during test excavation. Targeted salvage would be an appropriate mitigation measure based on the lack of integrity identified across the wider site extent and the lack of ability to reduce proposed impacts associated with future use.

10.6 Summary of mitigation measures

The following mitigation measures detailed in Table 10-1 have been developed to specifically manage potential Aboriginal heritage impacts which have been predicted during construction and operation of the Project.

Table 10-1 Aboriginal heritage environmental management measures

Reference	Impact	Mitigation measure	Timing
AH1	Potential impact to Promised Land Trail ST01 (AHIMS ID 52-4-0730)	Establishment of exclusion zone and fencing.	Immediately/As soon as practical
AH2	Harm to Bendeela Hydro AS01 (AHIMS ID 52-4-0729)	Salvage excavation	Following receipt of Minister's Conditions of Approval and notification of RAPs

11. Salvage methodology

11.1 Rationale

11.1.1 Aims

The purpose of salvage excavation is to ensure that sufficient archaeological information is obtained from the archaeological site prior to any loss of value as a result of the proposed impacts taking. Information obtained from salvage excavation allows for a more complete understanding of how people lived in the land in the past. It also provides a form of 'conservation-by-record' where in situ conservation is not achievable. This form of conservation goes some way towards addressing intergenerational equity – although the site will no longer exist, information about what was there is recorded for present and future generations.

The salvage excavation aims to:

- Identify, record and recover any Aboriginal objects within the excavation area
- Document the nature and extent of in-situ subsurface stratified deposit, within the excavation area
- Further investigate the density of artefacts on varying landforms within the excavation area
- Assess the scientific significance of each of the salvage area(s) following analysis of the excavation results.

11.1.2 Research questions

1. Are there any variations in stone tool typologies across the different landscape regions, between sites or within sites?
    a. Are there variations in cortex percentages on stone tools at sites on 45-4-1097 (GWH 7)?
    b. Are these changes related to material types and if so, what do these variations suggest?
    c. Does previous research in the region inform on these results?
    d. Are there variations in the tool typology, density and distribution across sites in the Project area and are these comparable to other sites in the broader region or variations in the Australian Small Tool Tradition / late Holocene assemblages?
    e. Is there evidence for intra-site temporal changes in tool typology?
    f. How does this inform on cultural changes in adaptations to the local environment?
2. What is the chronology of the sites identified in the detailed investigation area and are there variations in stone tool typologies across time?
3. Are there variations in site usage that relate to proximity to resource areas or water sources?
    a. Is there archaeological evidence (hearths, oven mounds) to suggest the area adjacent to the creeks were used for camping?
    b. Are there correlations between the intensity of site usage and distance to ephemeral and permanent water sources?
    c. Is there evidence for site use being seasonal, permanent or opportunistic?
    d. Can the evidence contribute information not available from any other source, location or environmental setting?

11.2 Approach to excavations

11.2.1 Sample strategy

Excavation would consist of contiguous 1m^2 excavation pits totalling up to 100m^2 of targeted manual excavation. The decision to cease or continue with investigations would be made by the supervising archaeologist based on the following variables:

- High density of artefacts
- Rare or unusual artefact types
- Unusual raw material types and changes in raw material types
- Archaeological features such as hearths and/ or middens
- Cultural material with potential for scientific dating
- Any other features identified by the supervising archaeologist and Aboriginal stakeholder representatives.

A salvage excavation is considered to constitute an action that will harm an Aboriginal site. Therefore, salvage excavations outside the approval boundary would be a breach of the *National Parks and Wildlife Act 1974*. To minimise the risk of excavations occurring beyond the approvals area, it is recommended that a surveyor mark the boundary of the work zone prior to the commencement of the salvage excavations. Salvage excavations will focus on the location of Test Pit 4 (Figure 11-1).

11.2.2 Excavation procedure

All excavation would be undertaken manually, using shovels and trowels and other hand tools as required, by a team of archaeologists and Aboriginal stakeholders. Excavation would occur in arbitrary 100 mm spits, which would provide vertical control, especially if a conjoin analysis is to be performed.

Each excavation pit would be given an alphanumeric label for identification purposes. All excavated pits would be recorded in detail including photographs, level readings, plans and context sheets. Stratigraphic sections detailing the stratigraphy and features within the excavated deposit would also be drawn.

All material retrieved from the excavated pits would be hand sieved through a 3 mm mesh. Where suspected knapping floors are identified, a 1 mm sieve may be used. Wet sieving would be preferred, especially in clay soils. However, the supervising archaeological may elect to dry sieve where material suitable for residue and use-ware analysis is suspected to be present.

All recovered stone artefacts would be placed in resealable bags (excavation unit [EU] bags) labelled with the corresponding excavation unit information (site name, transect number, salvage pit ID, and spit number). An inventory of the artefacts and excavation units should be produced in the field to establish a chain of custody. The inventory would also note which excavation units contain artefacts. All artefacts to be temporarily stored at the Jacobs North Sydney office, or with relevant specialists where additional analysis is required.

11.2.3 Soil sampling method

Palaeo-environmental samples for potential OSL dating, radiocarbon dating, pollen analysis or particle analysis will be undertaken if suitable material is identified during excavations. Any samples will be decided by the supervising archaeologist. The validity of processing samples will be analysed on site.

During salvage excavation, samples of organic material suitable for radiometric dating (charcoal, bone, shell, wood) will be collected for the dating of archaeological deposits. The number of samples sent for dating will be determined on the suitability of the sample and the significance of the site. Samples will be collected as follows:

- Samples will be collected using clean nitrile gloves and placed in clean plastic sample bags
- Samples will be removed to the relevant temporary keeping place and dried out to avoid fungal growth during transport
- Samples will be packaged within hard plastic cases for transport to a radiocarbon dating laboratory.

Investigations by a geomorphologist will be an integral part of the excavation program. Investigations by a geomorphologist will likely include auguring, and the collection of soil and sediment samples from auguring locations.

Pollen analysis samples will be taken from any suitable natural soil deposits that contain a high humic content. Samples will be collected in a resealable labelled bag. Particle analysis provides higher-level characterisation than simple visual description and would substantially increase the degree to which the stratigraphic process can be determined. Samples for particle analysis will be taken from a representative section at one test pit location (more if changes in stratigraphy are evident across testing area) at 50mm increments. Samples will be collected in resealable labelled bag.

The procedure for the extraction of OSL samples requires that the samples are extracted in the absence of green-blue spectrums of light. Where stratigraphic layers are identified suitable for OSL dating, these samples must be extracted under a red light. A geomorphologist would be involved in the investigation process to facilitate the retrieval of samples for OSL dating.

11.2.4 Human remains

If suspected human skeletal remains are uncovered at any time throughout the excavation program, the following actions will be followed:

- Cease all excavation activity
- Do not further disturb or move the remains
- Notify NSW Police.

An Aboriginal community representative must be present where it is reasonably suspected burials or human remains may be encountered. If human remains are unexpectedly encountered and they are thought to be Aboriginal, the Aboriginal community must be immediately notified.

Recording of Aboriginal ancestral remains must be undertaken, or reviewed by, a specialist physical anthropologist or other suitable qualified person.

Archaeological reporting of Aboriginal ancestral remains must be undertaken, or reviewed by, a specialist physical anthropologist or other suitable qualified person, with the intent of using respectful and appropriate language and treating the ancestral remains of Aboriginal people rather than as scientific specimens.

11.3 Post excavation tasks

11.3.1 Management of recovered artefacts

Arrangements will be made for the recovered artefacts to be securely stored on Country, once relevant analyses have been completed, if the analysis cannot occur on Country (see section 11.3.2). The location of the artefacts will be recorded on a Jacobs database, to create an electronic record of the date they were depositioned into this temporary storage location.

Artefacts will be stored in the double-bagged resealable bags they were placed in during the excavation program. Durable labels made from aluminium plate or similar material will be placed inside bags to provide a resilient label of the artefacts' provenance.

Artefacts will be kept in the same temporary storage location until a strategy for repatriation or permanent storage can be implemented.

11.3.2 Analysis of recovered material

Depending on the nature of the recovered artefact assemblage, specialist analysis may be required. All efforts will be made to store the artefacts on Country and complete all required analysis on Country. However, where this is not feasible, the artefacts may be temporarily relocated and stored in a secure location for specialist analysis. Once all specialist analysis has been completed, the artefacts will be returned to the temporary storage location on Country.

The post-excavation analysis would be designed to address the research objectives and specific research questions, along with other relevant questions that may arise based on the results of the excavation. Results of analysis would be presented in relation to comparative site data where possible and where useful in addressing the research questions.

Post-excavation analysis may include (but not be limited to):

- Lithic Analysis: cataloguing of all cultural material recovered, including measurements, weight, raw material, reduction and tool identification. A program of conjoin analysis, and investigation of usewear/residue analysis may also be considered
- Geomorphology: collection of soil samples excavation to assist in understanding the site formation and post-depositional disturbance
- Palaeo-environmental: this analysis can utilise the material from the geomorphological samples and should include the investigation of pollen and phytoliths to understand the past vegetation and climate of the region prior to, and during periods of Aboriginal visitation and occupation
- Chronology: OSL and/or radiocarbon samples should be collected during the program and should bracket any cultural materials recovered from each open area excavation to provide a strong chronology for the deposit.

The aim of this work is to both adequately document, analyse and record the cultural deposits and assemblages for future generations, and to build upon the findings of the archaeological test excavation analysis.

It is anticipated that most, if not all, of the objects recovered from excavation will be stone artefacts. These will be analysed by a suitably qualified archaeologist. A number of standard attributes will be recorded for every artefact (following requirements of DECCW, 2010b):

- Heat damage
- Post-depositional weathering
- Presence/absence of fresh damage
- Material type
- Artefact type
- Platform surface type
- Platform type
- Termination type
- Cross sectional angle (spine angle) of dorsal surface (flakes only)
- Length in millimetres (mm)
- Width in mm
- Thickness in mm.

A number of additional attributes beyond those required by Heritage NSW (previously referred to as Office of Environment and Heritage) will also be recorded for each artefact, including:

- Flake fragment category (complete, proximal fragment, distal fragment etc)
- Type of cortex and amount of cortex on dorsal surfaces of flakes
- On retouched flakes, various observations of the retouched edges, including retouch type, invasiveness, height of retouch scars
- On cores, various observations including number of core rotations, the orientation of different platforms to one another, whether the core is bipolar or not
- On ground artefacts such as axe/hatchet heads or grindstones, various observations such as size of the ground area, angle of ground edges.

Photographs will be taken of a representative sample of artefacts, to create a visual record of the general types of artefacts within the assemblage. Atypical artefacts or artefacts of high significance will also be photographed. Images will be taken from several orientations, following procedures for archival-quality artefact photography (Fisher 2009 and Prokop 1985).

Further analytical techniques might be employed on a sub-sample of artefacts if it is judged that these techniques have the potential to yield information. Further techniques might include functional analysis through examination of residues or use-wear, for example. Any such analyses would be carried out by a suitably qualified specialist.

Any Aboriginal artefacts that are not made from stone will be analysed using appropriate techniques. Analysis would conform to the requirements of the Code of Practice (DECCW, 2010b). Specific analysis procedures would be decided following excavation and would be made from an assessment of the types of artefacts recovered, the materials from which they are made, their condition of preservation, and the information that could be obtained from them.

11.3.3 Reporting

An Aboriginal Archaeological Salvage Excavation Report detailing the results of the archaeological excavation program would be prepared once excavation, artefact recording, and any other analytic activities are concluded. The excavation report would provide details on the established extent and scientific significance of any Aboriginal archaeological material retrieved during the excavation process. The salvage report would also address the research questions proposed in this document.

The reporting would be developed to fulfil any future development consent conditions in relation to the archaeological salvage, to provide input into management plans (if required) and any interpretive outcomes from the Project. The report would be developed in accordance with Heritage NSW guidelines (as current best practice), and may include the following broad sections:

- A short summary
- Describe Aboriginal consultation undertaken during the Project
- Provide details of the Aboriginal objects which were partially or completely harmed (i.e. recovered through the excavations) during the works
- Provide a description of the methods and results of the any excavations
- Comment on the effectiveness of the mitigation measures (i.e. salvage excavations)
- Comment on the effectiveness of any management plan if in place
- The current and proposed long term location of any Aboriginal objects recovered
- Details the results of any analysis of recovered Aboriginal objects.
- Ensure the necessary Site Impact Recording Forms are lodged with DPIE at completion of the Project.

11.3.4 Site Recording Forms

Following the completion of the test excavation program, artefact analysis and reporting, a site card update, or Aboriginal Site Impact Recording Forms (ASIRF) will be lodge with the AHIMS database, where necessary.

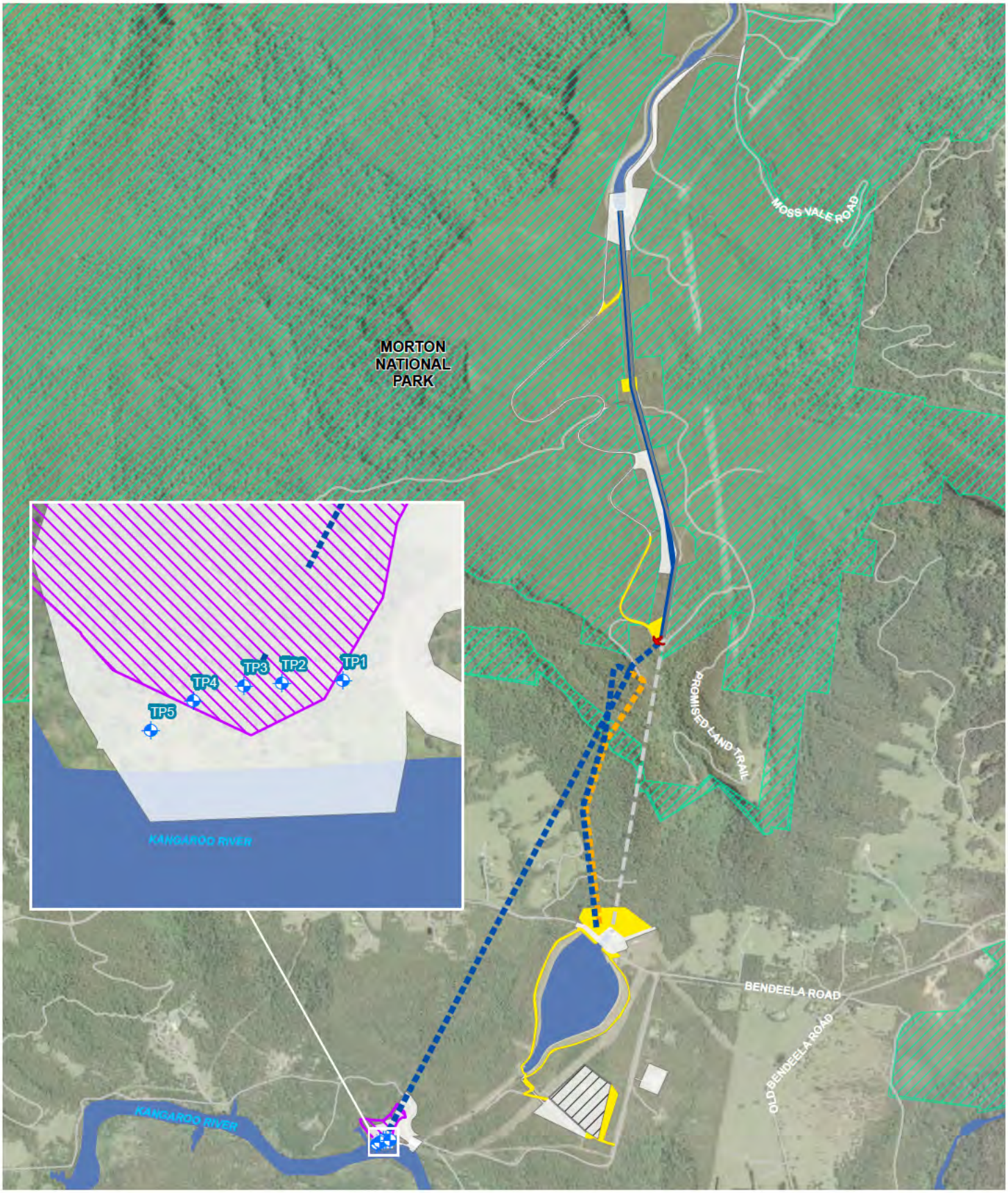

Figure 11-1 Location of test pits

12. Conclusion

The following recommendations are based on consideration of:

- Statutory requirements under the *National Parks and Wildlife Act 1974*
- The requirements of SEARs SSI-10033
- The results of this ACHAR and the ACHAR.

It was found that:

- A search of the AHIMS database was undertaken on 11 February 2022 for an area of land at datum GDA, zone 56, eastings 264974 – 273849, northings 6150178 – 6162300 with a buffer of 0 meters. No previously identified Aboriginal sites are located within the Project area.
- The archaeological survey was undertaken on the 27th and 28th of June 2022. The results of which are as follows:
  - No Aboriginal sites and / or objects were identified in Survey Units 1, 2, 4 – 10
  - One new site, being Promised Land Trail ST01 (AHIMS ID 52-4-0730) was identified in Survey Unit 3 within the curtilage of Morton National Park.
- Archaeological test excavations were undertaken over two days with RAP Sites Officers on 29 June and 30 June 2022 at the Bendeela Power Station PAD. The results of which are as follows:
  - A total of five test pits were excavated during the two day program
  - Aboriginal objects were retrieved from all five test pits excavated by Jacobs Archaeologists and RAP Sites Officers
  - Two charcoal samples were taken from Spit 7 and 8 of Test Pit 5, being Sample #1 and Sample #2 respectively
- As a result of the test excavations, Bendeela Power Station PAD has been renamed Bendeela Hydro AS01 (AHIMS ID 52-4-0729).
- According to current design plans, Bendeela Hydro AS01 (AHIMS ID 52-4-0729) will be subject to harm by the proposed works that will result in a partial loss of value. Promised Land Trail ST01 will not be harmed.

It is therefore recommended that:

- Where possible, impacts to identified Aboriginal sites should be avoided
- Where impacts to Bendeela Hydro AS01 (AHIMS ID 52-4-0729) cannot be avoided, the approved MCoA must be issued by DPE to authorise impacts through the Project. Works cannot proceed in these locations until the approved MCoA has been received and all requirements addressed
- Salvage excavations should take place prior to any impacts to Bendeela Hydro AS01 (AHIMS ID 52-4-0729). The salvage excavations would require the approved MCoA as authorisation for harm to the site through salvage works
- Salvage excavations at Bendeela Hydro AS01 (AHIMS ID 52-4-0729) should be undertaken in accordance with the methodology provided in Section 11 of this ACHAR
- No mitigation measures will be required for Promised Land Trail ST01 (AHIMS ID 52-4-0730) as it will not be impacted by the amended Project. However, it is recommended that an exclusion zone and fence is established to protect the site from accidental damage
- A CHMP should be developed to provide guidance on the procedure for the identification of unexpected Aboriginal objects and the long-term management of Aboriginal objects retrieved from Bendeela Hydro AS01 (AHIMS ID 52-4-0729)
- If suspected human remains are located during any stage of the Project, work should stop immediately, and the NSW Police and Coroner's Office should be notified. NSW Heritage should be notified if the remains are found to be Ancestral Aboriginal remains
- If changes are made to the Project to include impacts outside the Project area as delineated in this document, further archaeological investigation must be conducted.

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Appendix A Consultation records

Contact	Organisation	Contacted by	Organisation	Method	Date	Comment/ response
AGENCY LETTERS 4.1.2 NOTIFICATION						
	Illawarra Local Aboriginal Land Council	Ryan Taddeucci	Jacobs	Email	12/11/2021	
	Nowra Local Aboriginal Land Council	Ryan Taddeucci	Jacobs	Email	12/11/2021	
	Shoalhaven Council	Ryan Taddeucci	Jacobs	Email	12/11/2021	Auto response received on 12/11/2021
	Wingecarribee Shire Council	Ryan Taddeucci	Jacobs	Email	12/11/2021	
	Southeast - Local Land Services	Ryan Taddeucci	Jacobs	Email	12/11/2021	Auto response received on 12/11/2021
	Heritage NSW	Ryan Taddeucci	Jacobs	Email	12/11/2021	Auto response received on 12/11/2021 List of potential RAPs sent on 15/11/2021
	NTS Corp	Ryan Taddeucci	Jacobs	Email	12/11/2021	Requests that the South Coast People are registered for consultation (30/11/2021).
	National Native Title Tribunal	Ryan Taddeucci	Jacobs	Email	12/11/2021	Request to complete search form, 12/11/2021. Confirmation of receipt of email received on 15/11/2021 Note that South Coast People have an overlapping Native Title Application (17/11/2021).
	Office of the Registrar	Ryan Taddeucci	Jacobs	Email	12/11/2021	
4.1.3 ADVERTISMENT						
	South Coast Register	Ryan Taddeucci	Jacobs	Email/online	1/12/2021	Published on 1/12/2021 requesting registration by 15 December 2021

Contact	Organisation	Contacted by	Organisation	Method	Date	Comment/ response
	Koori Mail	Ryan Taddeucci	Jacobs	Email/online	1/12/2021	Published on 1/12/2021 requesting registration by 15 December 2021
REGISTRATION OF INTEREST - Outgoing						
[redacted]	Yurrandaali	Ryan Taddeucci	Jacobs	Email	1/12/2021	
[redacted]	Badu (Murrin Clan/Peoples)	Ryan Taddeucci	Jacobs	Email	1/12/2021	
[redacted]	Barraby Cultural Services	Ryan Taddeucci	Jacobs	Email	1/12/2021	
[redacted]	Barraby Cultural Services	Ryan Taddeucci	Jacobs	Email	1/12/2021	
[redacted]	Bellambi Indigenous Corporation Gandangara Traditional Owners	Ryan Taddeucci	Jacobs	Email	1/12/2021	
[redacted]	Biamanga (Murrin Clan/Peoples)	Ryan Taddeucci	Jacobs	Email	1/12/2021	
[redacted]	Bilinga (Murrin Clan/Peoples)	Ryan Taddeucci	Jacobs	Email	1/12/2021	
[redacted]		Ryan Taddeucci	Jacobs	Email	1/12/2021	
[redacted]		Ryan Taddeucci	Jacobs	Email	1/12/2021	
[redacted]		Ryan Taddeucci	Jacobs	Email	1/12/2021	
[redacted]	Cubbitch Barta	Ryan Taddeucci	Jacobs	Email	1/12/2021	
[redacted]	Cullendulla (Murrin Clan/Peoples)	Ryan Taddeucci	Jacobs	Email	1/12/2021	

Contact	Organisation	Contacted by	Organisation	Method	Date	Comment/ response
[redacted]	Dharug (Murrin Clan/Peoples)	Ryan Taddeucci	Jacobs	Email	1/12/2021	
[redacted]	Duncan Falk Consultancy	Ryan Taddeucci	Jacobs	Email	1/12/2021	
[redacted]	[redacted]	Ryan Taddeucci	Jacobs	Email	1/12/2021	
[redacted]	Gadhu Dreaming	Ryan Taddeucci	Jacobs	Email	1/12/2021	
[redacted]	Goobah Development PTY LTD (Murrin Clan/Peoples)	Ryan Taddeucci	Jacobs	Email	1/12/2021	
[redacted]	Gundungurra Aboriginal Heritage Association Inc.	Ryan Taddeucci	Jacobs	Email	1/12/2021	
[redacted]	Gundungurra Tribal Council Aboriginal Corporation	Ryan Taddeucci	Jacobs	Email	1/12/2021	
[redacted]	Gundungurra Tribal Technical Services	Ryan Taddeucci	Jacobs	Email	1/12/2021	
[redacted]	Gundungurra Tribal Technical Services	Ryan Taddeucci	Jacobs	Email	1/12/2021	
[redacted]	Gundungurra Tribal Technical Services	Ryan Taddeucci	Jacobs	Email	1/12/2021	
[redacted]	Gundungurra Tribal Technical Services	Ryan Taddeucci	Jacobs	Email	1/12/2021	
[redacted]	Gundungurra Tribal Technical Services	Ryan Taddeucci	Jacobs	Email	1/12/2021	

Consultation records

Contact	Organisation	Contacted by	Organisation	Method	Date	Comment/ response
[redacted]	Gundungurra Tribal Technical Services	Ryan Taddeucci	Jacobs	Email	1/12/2021	
[redacted]	Gundungurra Tribal Technical Services	Ryan Taddeucci	Jacobs	Email	1/12/2021	
[redacted]	Gunyuu (Murrin Clan/Peoples)	Ryan Taddeucci	Jacobs	Email	1/12/2021	
[redacted]	Jerringong (Murrin Clan/Peoples)	Ryan Taddeucci	Jacobs	Email	1/12/2021	
[redacted]	Karrial (Murrin Clan/Peoples)	Ryan Taddeucci	Jacobs	Email	1/12/2021	
[redacted]	Illawarra Local Aboriginal Land Council	Ryan Taddeucci	Jacobs	Email	1/12/2021	
[redacted]	Munyunga (Murrin Clan/Peoples)	Ryan Taddeucci	Jacobs	Email	1/12/2021	
[redacted]	Mura Indigenous Corporation (icn:8991)	Ryan Taddeucci	Jacobs	Email	1/12/2021	
[redacted]	Murramarang (Murrin Clan/Peoples)	Ryan Taddeucci	Jacobs	Email	1/12/2021	
[redacted]	Murra Bidgee Mullangari Aboriginal Corporation	Ryan Taddeucci	Jacobs	Email	1/12/2021	
[redacted]	Murrumbul (Murrin Clan/Peoples)	Ryan Taddeucci	Jacobs	Email	1/12/2021	
[redacted]	Nundagurri (Murrin Clan/Peoples)	Ryan Taddeucci	Jacobs	Email	1/12/2021	

Consultation records

Contact	Organisation	Contacted by	Organisation	Method	Date	Comment/ response
	Pejar Local Aboriginal Land Council	Ryan Taddeucci	Jacobs	Email	1/12/2021	
[redacted]	Pemulwuy (Murrin Clan/Peoples)	Ryan Taddeucci	Jacobs	Email	1/12/2021	
[redacted]	South Coast NSW Aboriginal Elders	Ryan Taddeucci	Jacobs	Email	1/12/2021	
[redacted]	South West Rocks Corporation	Ryan Taddeucci	Jacobs	Mail	1/12/2021	
[redacted]	South West Rocks Corporation	Ryan Taddeucci	Jacobs	Mail	1/12/2021	
[redacted]	Tharawal Local Aboriginal Land Council	Ryan Taddeucci	Jacobs	Email	1/12/2021	
[redacted]	Thoorga Nura	Ryan Taddeucci	Jacobs	Email	1/12/2021	
[redacted]	Three Ducks Dreaming Surveying and Consulting	Ryan Taddeucci	Jacobs	Email	1/12/2021	
[redacted]	Tungai Tonghi	Ryan Taddeucci	Jacobs	Email	1/12/2021	
[redacted]	Walbunja (Murrin Clan/Peoples)	Ryan Taddeucci	Jacobs	Email	1/12/2021	
[redacted]	Walgalu (Murrin Clan/Peoples)	Ryan Taddeucci	Jacobs	Email	1/12/2021	
[redacted]	Warra Bingi Nunda Gurri	Ryan Taddeucci	Jacobs	Email	1/12/2021	
[redacted]	Wingikara (Murrin Clan/Peoples)	Ryan Taddeucci	Jacobs	Email	1/12/2021	

Consultation records

Contact	Organisation	Contacted by	Organisation	Method	Date	Comment/ response
[redacted]	Woronora Plateau Gundungara Elders Council	Ryan Taddeucci	Jacobs	Email	1/12/2021	
[redacted]	Wullung (Murrin Clan/Peoples)	Ryan Taddeucci	Jacobs	Email	1/12/2021	
[redacted]	Yamanda Aboriginal Association	Ryan Taddeucci	Jacobs	Email	1/12/2021	
[redacted]	Yerramurra (Murrin Clan/Peoples) and Taste of Tradition Native Aboriginal Corporation	Ryan Taddeucci	Jacobs	Email	1/12/2021	
[redacted]	Ngunawal Heritage Aboriginal Corporation	Ryan Taddeucci	Jacobs	Email	1/12/2021	
[redacted]		Ryan Taddeucci	Jacobs	Email	1/12/2021	
[redacted]	Gilay Consultants	Ryan Taddeucci	Jacobs	Email	1/12/2021	
	Batemans Bay Local Aboriginal Land Council	Ryan Taddeucci	Jacobs	Email	1/12/2021	
[redacted]		Ryan Taddeucci	Jacobs	Email	1/12/2021	
[redacted]		Ryan Taddeucci	Jacobs	Mail	1/12/2021	
[redacted]	Darug Land Observations	Ryan Taddeucci	Jacobs	Email	1/12/2021	
[redacted]	Eora Heritage Group	Ryan Taddeucci	Jacobs	Email	1/12/2021	
[redacted]	Gumaraa	Ryan Taddeucci	Jacobs	Email	1/12/2021	

Contact	Organisation	Contacted by	Organisation	Method	Date	Comment/ response
[redacted]	Guunamaa Dreamin Sites and Surveying	Ryan Taddeucci	Jacobs	Email	1/12/2021	
[redacted]	Jerrinja Local Aboriginal Land Council	Ryan Taddeucci	Jacobs	Email	1/12/2021	
[redacted]	Jerrinja Local Aboriginal Land Council	Ryan Taddeucci	Jacobs	Email	1/12/2021	
[redacted]	Minnamunnung	Ryan Taddeucci	Jacobs	Email	1/12/2021	
	Nowra Local Aboriginal Land Council	Ryan Taddeucci	Jacobs	Email	1/12/2021	
[redacted]	Shoalhaven Elders and Friends Organisation	Ryan Taddeucci	Jacobs	Mail	1/12/2021	
	Ulladulla Local Aboriginal Land Council	Ryan Taddeucci	Jacobs	Email	1/12/2021	
	Ulladulla Local Aboriginal Land Council	Ryan Taddeucci	Jacobs	Email	1/12/2021	
[redacted]	Walgalu (Murrin Clan/Peoples)	Ryan Taddeucci	Jacobs	Email	1/12/2021	
[redacted]		Ryan Taddeucci	Jacobs	Email	1/12/2021	
[redacted]		Ryan Taddeucci	Jacobs	Email	1/12/2021	
[redacted]		Ryan Taddeucci	Jacobs	Email	1/12/2021	
[redacted]	South Coast People	Ryan Taddeucci	Jacobs	Email	1/12/2021	
REGISTRATION OF INTEREST Incoming						
Ryan Taddeucci	Jacobs	[redacted]	South Coast People	Email		

Contact	Organisation	Contacted by	Organisation	Method	Date	Comment/ response
Ryan Taddeucci	Jacobs		Nowra Local Aboriginal Land Council	Email		
Ryan Taddeucci	Jacobs	[redacted]	DNC	Email		
Ryan Taddeucci	Jacobs	[redacted]	Freeman&marx Pty Ltd	Email		
Ryan Taddeucci	Jacobs	[redacted]	Murra Bidgee Mullangari Aboriginal Corporation	Email		
Ryan Taddeucci	Jacobs	[redacted]	Illawarra Local Aboriginal Land Council	Email		
Ryan Taddeucci	Jacobs	[redacted]	Yurrandaali Pty Ltd	Email		
Ryan Taddeucci	Jacobs	[redacted]	Barraby Cultural Services	Email		
Ryan Taddeucci	Jacobs	[redacted]	Woronora Plateau Gundangara Elders Council	Email/phone		[redacted] from the area and connected to the area and connected to the Chalkers. [redacted] has experience and training in archaeology.
Ryan Taddeucci	Jacobs	[redacted]	Duncan Falk Consultancy	Email		
Ryan Taddeucci	Jacobs	[redacted]		Email		
Ryan Taddeucci	Jacobs	[redacted]	Goobah Development PTY LTD (Murrin Clan/Peoples)	Email		
Ryan Taddeucci	Jacobs	[redacted]	Warragil Cultural Services	Email		
Ryan Taddeucci	Jacobs	[redacted]		Email		

Contact	Organisation	Contacted by	Organisation	Method	Date	Comment/ response
Ryan Taddeucci	Jacobs	[redacted]	South Coast People	Email/phone		
METHODOLOGY outgoing						
[redacted]	South Coast People	Ryan Taddeucci	Jacobs	Email	20/12/2021	
	Nowra Local Aboriginal Land Council	Ryan Taddeucci	Jacobs	Email	20/12/2021	
[redacted]	Didge Ngunawal Clan	Ryan Taddeucci	Jacobs	Email	20/12/2021	
[redacted]	Freeman&marx Pty Ltd	Ryan Taddeucci	Jacobs	Email	20/12/2021	
[redacted]	Murra Bidgee Mullangari Aboriginal Corporation	Ryan Taddeucci	Jacobs	Email	20/12/2021	Endorse the methodology
[redacted]	Illawarra Local Aboriginal Land Council	Ryan Taddeucci	Jacobs	Email	20/12/2021	Confirm receipt of methodology
[redacted]	Yurrandaali Pty Ltd	Ryan Taddeucci	Jacobs	Email	20/12/2021	
[redacted]	Barraby Cultural Services	Ryan Taddeucci	Jacobs	Email	20/12/2021	
[redacted]	Woronora Plateau Gundangara Elders Council	Ryan Taddeucci	Jacobs	Email	20/12/2021	Agrees with the methodology. Notes that she and [redacted] have a connection to the area and that other groups registered may not. Contacted via phone – 12/01/2022
[redacted]	Duncan Falk Consultancy	Ryan Taddeucci	Jacobs	Email	20/12/2021	
[redacted]		Ryan Taddeucci	Jacobs	Email	20/12/2021	

Contact	Organisation	Contacted by	Organisation	Method	Date	Comment/ response
[redacted]	Goobah Development PTY LTD (Murrin Clan/Peoples)	Ryan Taddeucci	Jacobs	Email	20/12/2021	Endorse the methodology
[redacted]	Warragil Cultural Services	Ryan Taddeucci	Jacobs	Email	20/12/2021	
[redacted]		Ryan Taddeucci	Jacobs	Email	20/12/2021	
[redacted]	South Coast People	Ryan Taddeucci	Jacobs	Email	20/12/2021	
DRAFT ACHAR - outgoing						
	[redacted]	Fran Scully	Jacobs	Email	23/08/2022	Responded with several concerns about the broader environmental impact of the project by phone and email
Goobah Development PTY LTD (Murrin Clan/Peoples)	[redacted]	Fran Scully	Jacobs	Email	23/08/2022	
Warragil Cultural Services	[redacted]	Fran Scully	Jacobs	Email	23/08/2022	
	[redacted]	Fran Scully	Jacobs	Email	23/08/2022	
Barraby Cultural Services	[redacted]	Fran Scully	Jacobs	Email	23/08/2022	
Woronora Plateau Gundangara Elders Council	[redacted]	Fran Scully	Jacobs	Email	23/08/2022	Have read the through the ACHAR and agree with the proposed methodology and salvage excavation program at the Bendeela Power Station/Bendeela Hydro AS01 (AHIMS ID 52-4-0729)
Duncan Falk Consultancy	[redacted]	Fran Scully	Jacobs	Email	23/08/2022	
	[redacted]	Fran Scully	Jacobs	Email	23/08/2022	
Yurrandaali Pty Ltd	[redacted]	Fran Scully	Jacobs	Email	23/08/2022	

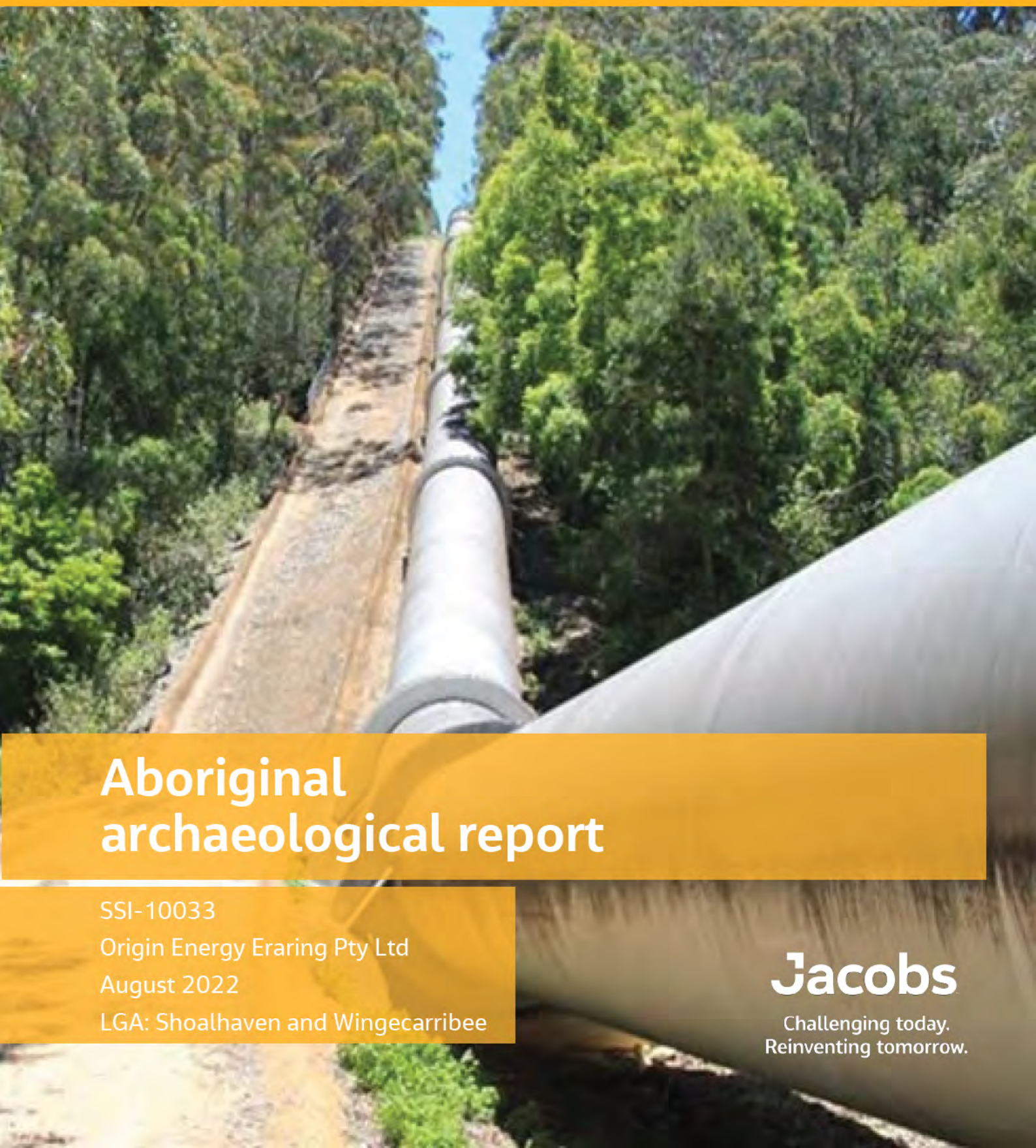
Contact	Organisation	Contacted by	Organisation	Method	Date	Comment/ response
Illawarra Local Aboriginal Land Council	[redacted]	Fran Scully	Jacobs	Email	23/08/2022	Acknowledgement of receipt of draft ACHAR and stated that it has been passed on to ILALC's Heritage Manager for review
Freeman & Marx Pty Ltd	[redacted]	Fran Scully	Jacobs	Email	23/08/2022	
Murra Bidgee Mullangari Aboriginal Corporation	[redacted]	Fran Scully	Jacobs	Email	23/08/2022	Read the project information and ACHAR and endorses the recommendations made
Didge Ngunawal Clan	[redacted]	Fran Scully	Jacobs	Email	23/08/2022	
South Coast People	[redacted]	Fran Scully	Jacobs	Email	23/08/2022	
Nowra Local Aboriginal Land Council		Fran Scully	Jacobs	Email	23/08/2022	
REMINDER ABOUT CLOSING DATE FOR CONSULTATION - outgoing						
	[redacted]	Matt Finlayson	Jacobs	Email	21/10/2022	
Goobah Development PTY LTD (Murrin Clan/Peoples)	[redacted]	Matt Finlayson	Jacobs	Email	21/10/2022	
Warragil Cultural Services	[redacted]	Matt Finlayson	Jacobs	Email	21/10/2022	
	[redacted]	Matt Finlayson	Jacobs	Email	21/10/2022	
Barraby Cultural Services	[redacted]	Matt Finlayson	Jacobs	Email	21/10/2022	
Woronora Plateau Gundangara Elders Council	[redacted]	Matt Finlayson	Jacobs	Email	21/10/2022	
Duncan Falk Consultancy	[redacted]	Matt Finlayson	Jacobs	Email	21/10/2022	
	[redacted]	Matt Finlayson	Jacobs	Email	21/10/2022	
Yurrandaali Pty Ltd	[redacted]	Matt Finlayson	Jacobs	Email	21/10/2022	

Consultation records

Contact	Organisation	Contacted by	Organisation	Method	Date	Comment/ response
Illawarra Local Aboriginal Land Council	[redacted]	Matt Finlayson	Jacobs	Email	21/10/2022	
Freeman & Marx Pty Ltd	[redacted]	Matt Finlayson	Jacobs	Email	21/10/2022	
Murra Bidgee Mullangari Aboriginal Corporation	[redacted]	Matt Finlayson	Jacobs	Email	21/10/2022	
Didge Ngunawal Clan	[redacted]	Matt Finlayson	Jacobs	Email	21/10/2022	
South Coast People	[redacted]	Matt Finlayson	Jacobs	Email	21/10/2022	
Nowra Local Aboriginal Land Council		Matt Finlayson	Jacobs	Email	21/10/2022	

Appendix B Aboriginal Archaeological Report

Shoalhaven Hydro Expansion Project - Main Works



Aboriginal archaeological report

SSI-10033

Origin Energy Eraring Pty Ltd

August 2022

LGA: Shoalhaven and Wingecarribee

Jacobs

Challenging today.
Reinventing tomorrow.

Shoalhaven Hydro Expansion Project - Main Works

Aboriginal archaeological report

Acknowledgment of Country

Jacobs proudly acknowledges Aboriginal and Torrens Strait Islander peoples as the Traditional Owners of the lands upon which each Jacobs office is located and those upon which we operate. We recognise that Traditional Owners have cared for and protected these lands for thousands of generations. Traditional Owners always have and always will have strong cultural, social and spiritual connections to the lands, skies, and waters. Jacobs respectfully recognises the Ancestors and Elders, past, present, and future. We acknowledge that sovereignty was never ceded and we are committed to working towards reconciliation.

Jacobs Group (Australia) Pty Limited
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North Sydney, NSW 2060
PO Box 632
North Sydney, NSW 2059
Australia

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www.jacobs.com

Executive Summary

Origin Energy Eraring Pty Ltd (a subsidiary of Origin Energy Limited) (collectively, Origin) is the current operator of the Shoalhaven Pumped Hydro Energy Storage Scheme (the existing scheme). The existing scheme is located in the New South Wales (NSW) Southern Highlands, approximately 150 kilometres (km) south east of Sydney (refer to **Figure 1-1**). The existing scheme was commissioned in 1977 and currently has a generating capacity of 240 megawatts (MW).

Origin proposes to almost double the electricity generation capacity of the existing scheme with the Shoalhaven Hydro Expansion Project (the project), which will provide approximately an additional 235MW of pumped storage generation capacity. The project would involve the construction and operation of a new pumped hydro power station on and under the land between the Fitzroy Falls Reservoir and Lake Yarrunga. The project would draw on Origin's existing water allocations to pump water up from Lake Yarrunga consuming energy when it is in less demand. Energy would then be generated through the return of water from Fitzroy Falls Reservoir to Lake Yarrunga when demand for energy increases.

An indicative project layout based on the current reference design is provided in and consists of the construction and operation of:

- A surface pipeline from the existing Fitzroy Falls Canal control structure to a surge tank and a vertical shaft;
- Vertical shaft and headrace tunnel to an underground power station;
- An underground power station cavern housing a reversible generator and pump capable of supplying approximately 235 MW of hydroelectric power, including associated access tunnel and ventilation shaft, transformer and high voltage cable route to the existing Kangaroo Valley Power Station substation;
- A tailrace tunnel and intake /outlet structure in the vicinity of the existing Bendeela Power Station on Lake Yarrunga;
- A vehicular access tunnel to the underground power station from the vicinity of the existing Kangaroo Valley Power Station;
- Operational surface infrastructure including administration building, water treatment infrastructure and ventilation building; and
- Ancillary works which may include the carrying out of works to upgrade or construct access roads, spoil disposal sites, utilities infrastructure, construction compounds and construction power supply.

A more detailed project description is provided in the Environmental Impact Statement (EIS).

Jacobs completed search of the AHIMS database was undertaken on 11 February 2022 for an area of land at datum GDA, zone 56, eastings 264974 – 273849, northings 6150178 – 6162300 with a buffer of 0 meters. No previously identified Aboriginal sites are located within the project area. Archaeological survey was undertaken on the 27th and 28th of June 2022. The survey resulted in the identification of a scarred tree, Promised Land Trail ST01 (#52-4-0730) within Survey Unit 3 in the curtilage of Morton National Park.

Archaeological test excavations were undertaken over two days with RAP Sites Officers on 29 June and 30 June 2022 at the Bendeela Power Station PAD. The results of which are as follows:

- A total of five test pits were excavated during the two-day program
- Aboriginal objects were retrieved from all five test pits excavated by Jacobs Archaeologists and RAP Sites Officers
- Two charcoal samples were taken from Spit 7 and 8 of Test Pit 5, being Sample #1 and Sample #2 respectively.

According to current design plans, Bendeela Hydro AS01 will be subject to harm by the project that will result in a partial loss of value. Promised Land Trail ST01 will not be harmed. As a result, the following recommendations have been made.

An ACHAR should be prepared in compliance with the Aboriginal heritage requirements of SEARS application no. SSI-10033.

The ACHAR should include a methodology for the targeted salvage excavation of the subsurface artefact concentration within Bendeela Hydro AS01.

Long term arrangements for the management of excavated artefacts should be further discussed within the ACHAR.

To keep consultation current, the registered Aboriginal parties should be sent an update on the project every six months, until project approval has been obtained.

Contents

Appendices

Tables

Figures

Acronyms and abbreviations

ADD	Aboriginal Due Diligence
AHIMS	Aboriginal Heritage Information Management System
ASL	Above Sea Level
DECCW	Department of Environment, Climate Change & Water
DPE	Department of Planning and Environment
EIS	Environmental Impact Statement
LALC	Local Aboriginal Land Council
LEP	Local Environmental Plan
LGA	Local Government Area
MW	Megawatts
NPW Act	National Parks and Wildlife Act 1974
OEH	Office of Environment and Heritage
PAD	Potential Archaeological Deposit
REF	Review of Environmental Factors
SEPP	State Environmental Planning Policy
SHI	State Heritage Inventory
SHR	State Heritage Register
SSD	State Significant Development
SSDA	State Significant Development Application
SSI	State Significant Infrastructure

1. Introduction

1.1 Project brief

Origin Energy Eraring Pty Ltd (a subsidiary of Origin Energy Limited) (collectively, Origin) proposes to develop the Shoalhaven Hydro Expansion Project, to construct and operate a new pumped hydro power station on and under the land between the Fitzroy Falls Reservoir and Lake Yarrunga (the project). The project would draw on Origin's existing water allocations to pump water up from Lake Yarrunga consuming energy when it is in less demand. Energy would then be generated through the return of water from Fitzroy Falls Reservoir to Lake Yarrunga when demand for energy increases.

The project would involve almost doubling the electricity generation capacity of the Shoalhaven Pumped Hydro Energy Storage Scheme (the existing scheme), providing an approximate additional 235 megawatts (MW) of generation capacity. The operation of the scheme would respond to the needs of the National Energy Market (NEM) and involving up to one pumping and generation cycle per day. Each generation cycle is anticipated to involve up to 8 hours of generation and 16 hours of pumping, each of which could be divided into shorter durations to best satisfy the needs of the NEM.

The project is located in the New South Wales (NSW) Southern Highlands, approximately 150 kilometres (km) south-east of Sydney (refer to **Figure 1-1**).

1.2 Description of development proposal

An indicative project layout based on the current reference design is provided in **Figure 1-2** and consists of the construction and operation of:

- Upper scheme components including:
  - Connection to upper intake control structure at the southern end of the Fitzroy Falls Canal
  - A surface pipeline from the existing Fitzroy Falls Canal control structure to the vicinity of the existing scheme surge tank
  - A new surge tank adjacent to the existing scheme surge tank
  - A further section of surface pipeline from the new surge tank to adjacent to the existing scheme high pressure shaft
- Underground works including:
  - Vertical shaft and headrace tunnel connected to the southern extent of upper scheme surface pipeline to an underground power station
  - An underground power station cavern housing a transformer, reversible generator and pump capable of supplying approximately 235 MW of hydroelectric power
  - Associated access tunnel and ventilation shaft and power evacuation tunnel to the vicinity of the existing Kangaroo Valley Power Station
  - A tailrace tunnel to the vicinity of the existing Bendeela Power Station on Lake Yarrunga including underground surge chamber
- Lower scheme surface components including:
  - Lower intake /outlet structure west of the Bendeela Power Station connected to the tailrace tunnel
  - Spoil emplacement facility east of Bendeela Pondage
  - High voltage network connection from ventilation and power evacuation tunnel to existing Kangaroo Valley substation
  - Operational surface infrastructure including administration building, water treatment infrastructure and ventilation building.

The project would also require ancillary works which may include the carrying out of works to upgrade or construct access roads, spoil disposal sites, utilities infrastructure, construction compounds and construction power and water supply.

Importantly, the Shoalhaven Hydro Expansion Project essentially duplicates the existing scheme and as such, the project does not propose any new water storages or connections between waterbodies that have not

already been utilised for the existing scheme. The existing scheme was designed to allow for expansion and much of the required infrastructure needed for duplicating the scheme is already in place. As a result, there is unconstructed expansion capacity at the site which was contemplated in the original Fitzroy Falls canal, switchyard located near the Kangaroo Valley Power Station and transmission lines, while the earthworks for duplicating the above ground pipeline on the plateau was also completed. In addition, no transmission line augmentations are required to receive or distribute electricity from the existing Kangaroo Valley Power Station substation.

A full project description is provided in Chapter 3 of the Environmental Impact Statement (EIS).

1.3 Description of study area

The project site is located in the NSW Southern Highlands, approximately 150km south east of Sydney. The project would be predominantly located within the Shoalhaven Local Government Area with access and water for the scheme drawn from and returned to the existing Fitzroy Falls canal and reservoir located within the Wingecarribee Local Government Area (Refer to **Figure 1-1**). The major features of the area surrounding the project include:

- The existing scheme;
- Morton National Park;
- Bendeela Recreation Area; and
- Rural landholdings.

The Project's surface works would be largely limited to land owned by WaterNSW associated with the existing Kangaroo Valley and Bendeela Power Stations and water transfer operations. Access to the Fitzroy Falls Canal control structure, surface pipeline, surge tank and vertical shaft on the plateau during construction would be required via existing access tracks through the Morton National Park. Below ground works for the high-pressure headrace tunnel would be required beneath a 100 metre (m) wide strip of Morton National Park located below the escarpment. These works would also be required beneath private freehold land located between the surge tank and Jacks Corner Road.

The Morton and Budawang National Parks together comprise an area of over 190,000 hectares on the eastern escarpment of the Southern Tablelands. They stretch from Bundanoon in the north to southeast of Braidwood and covers a diverse, rugged and scenically magnificent landscape. The Morton National Park is managed in accordance with the Morton and Budawang National Parks Plan of Management (NSW NPWS, 2001). This document recognises the important landscape, geology, biodiversity, heritage and wilderness values of the Morton National Park. The document also recognises existing uses associated with water and electricity infrastructure.

The project would require access during construction and ongoing operation via short sections of existing access tracks established as part of the construction of the existing scheme. It would also involve the establishment of a tunnel deep below a small section of the National Park. No ongoing surface impacts to the National Park are anticipated as a result of the project.

The main project features are located in close proximity to the existing scheme and generally in areas of prior disturbance as illustrated in **Figure 1-3**. Despite this prior disturbance history, the project is located in an area of elevated environmental sensitivity. In particular, the project is located partly within the WaterNSW Shoalhaven Special Area catchment. The above ground pipeline, surge tank and vertical shaft is located within a narrow (80 – 300 m wide) strip of land excised from the Morton National Park associated with the existing scheme.

1.4 Purpose and objectives of assessment

This report has been prepared to satisfy the requirements of Secretary's Environmental Assessment Requirements (SEARs) application no. SSI-10033 and the following relevant guidelines:

- Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales 2010 (the Code of Practice) (Department of Environment Climate Change and Water [DECCW] 2010a)
- Aboriginal cultural heritage consultation requirements for proponents 2010 [the Consultation Requirements] (DECCW 2010b)

Accordingly, the objectives of this report are to:

- Identify any Aboriginal objects or places within the study area, including areas where Aboriginal objects may be present below the ground surface
- Assess the scientific significance of any identified Aboriginal objects or places
- Evaluate and discuss the impacts of the project on identified Aboriginal objects or places
- Develop management measures for the proposed impacts to identified Aboriginal objects or places.

1.5 List of investigators and contributors

This report was prepared by Ryan Taddeucci (Senior Archaeologist, Jacobs) and Matt Finlayson (Project Archaeologist, Jacobs), with technical review and management input from Fran Scully (Principal Archaeologist, Jacobs). Mapping was prepared by Chris Counsell (Associate Spatial Consultant, Jacobs) and Hamid Karimi (Spatial Consultant, Jacobs).

Legend

- Points of interest
- Indicative Project footprint
- Project location
- NPWS Reserve
- State Forest

0 5 10 km

1:300,000 at A4

GDA2020 MGA Zone 56

Data sources

Jacobs 2022
Department of Planning and Environment 2022
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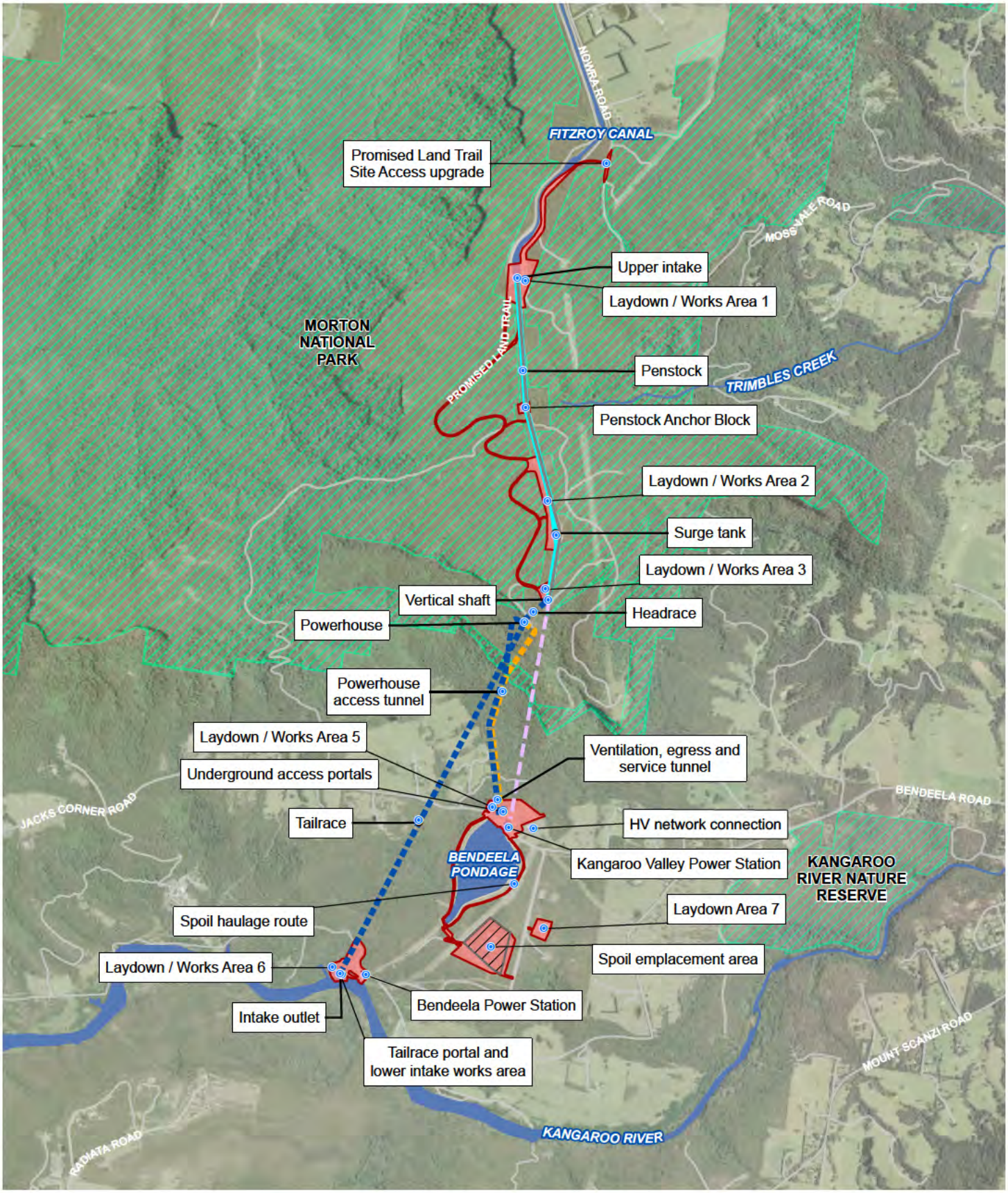
Figure 1-1 Regional context

Date: 14/06/2022 Path: \\ausyd0vs01\gispro\NSW_IS392600_ShoalhavenEIS\Apps\IS392600_GENERAL.aprx
Created by: JB | QA by: HK



Legend

- Points of interest
- Existing KV tunnel alignment
- Existing scheme pipeline
- Indicative above ground pipeline
- Indicative tunnel alignment
- Indicative access tunnel
- Disturbance area
- Spoil site
- Waterway
- Road
- NPWS Reserve
- Waterbody

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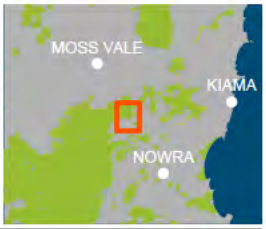

Data sources

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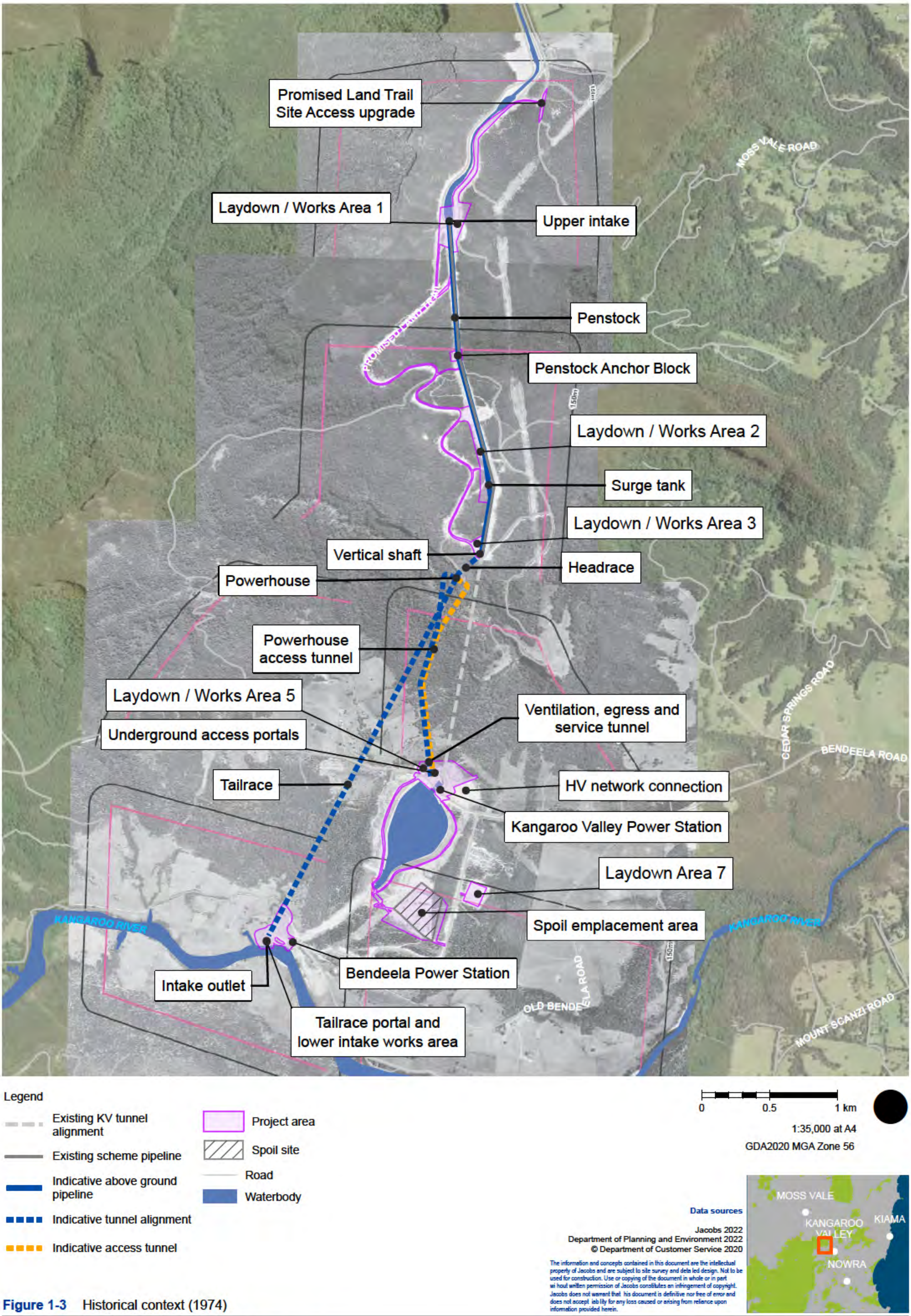
Figure 1-2 Indicative Project layout



Data sources

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Figure 1-3 Historical context (1974)

2. Consultation completed for development of test excavation methodology

2.1 Consultation undertaken for this project

Consultation was undertaken for this project in accordance with the Consultation Requirements. Full details of the consultation are provided in the ACHAR.

2.2 Registered Aboriginal Parties

Aboriginal stakeholder consultation was completed in accordance with the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (ACHCRP) (DECCW 2010a) to inform the development of the test excavation methodology. The consultation process resulted in the registration of 20 groups and/or individuals, summarized in **Table 2-1** below.

Table 2-1. Summary of RAPs identified through Stage 1 consultation

Organisation	Contact Person
South Coast People	[redacted]
Nowra Local Aboriginal Land Council	[redacted]
DNC	[redacted]
Freeman & Marx Pty Ltd	[redacted]
Murra Bidgee Mullangari Aboriginal Corporation	[redacted]
Illawarra Local Aboriginal Land Council	[redacted]
Yurrandaali Pty Ltd	[redacted]
Barraby Cultural Services	[redacted]
Woronora Plateau Gundangara Elders Council	[redacted]
Duncan Falk Consultancy	[redacted]
-	[redacted]
Goobah Development PTY LTD (Murrin Clan/Peoples)	[redacted]
Warragil Cultural Services	[redacted]
-	[redacted]
-	[redacted]

Following the completion of stakeholder consultation undertaken to inform the development of the ACHAR (Jacobs 2020), a draft test excavation methodology was developed. The draft test excavation methodology was distributed to the RAPs on 20 December 2021 with a 28-day period for review and comment. By the end of the review period two groups had provided comment (Goobah Development PTY LTD and Murra Bidgee Mullangari Aboriginal Corporation), both in support of the methodology. The methodology was finalised following the receipt of comments and the end of the 28-day consultation period.

2.3 RAP participation in archaeological investigations

All RAPs were invited to participate in the completion of an archaeological survey and test excavation program. A list of organisations that participated in field investigations is included in **Table 2-2.**

Table 2-2. Test excavation and Site Inspection Attendance

Group	Role	Name	Date/s
Jacobs	Senior Archaeologist	Ryan Taddeucci	27th – 30th June 2022
Jacobs	Project Archaeologist	Matt Finlayson	27th – 30th June 2022
Murra Bidgee Mullangari Aboriginal Corporation	Sites Officer	[redacted]	27th – 30th June 2022
Woronora Plateau Gundangara Elders Council	Sites Officer	[redacted]	27th – 30th June 2022
Yurrandaali Pty Ltd	Sites Officer	[redacted]	27th – 30th June 2022
DNC	Sites Officer	[redacted]	27th – 30th June 2022
Freeman & Marx Pty Ltd	Sites Officer	[redacted]	27, 29, 30th June 2022
Freeman & Marx Pty Ltd	Sites Officer	[redacted]	28th June 2022

3. Background

3.1 Summary of previously completed archaeological works within the vicinity of the study area.

3.1.1 Regional

Some of the earliest archaeological research in the Shoalhaven was conducted by the Shoalhaven Antiquities Committee, established in 1963 'for the purpose of preserving the Aboriginal Tribal Grounds and historical tribal relics within the [Shoalhaven] Shire' (Antill 1982:237). A large number of rock shelters, axe grinding groove sites, and artefacts scatters were recorded and provided the start to more investigations within the region.

The following archaeological investigations provide a summary of previous Aboriginal Heritage assessments within the local area.

Towle, C. C. 1941 as cited in (Bindon 1976)

Work by Bindon (1976) examines research conducted by Towle, C. C. in 1941 which concentrated in the Mundamia Creek area. In this area a variety of archaeological sites were uncovered, including rock art, scarred trees and a bora ground. Photographs on glass plate negatives were taken and allow the stone arrangements and scarred trees to be examined as they no longer exist. Similarly, the rock art which was recorded has deteriorated due to vandalism and graffiti.

Donlan (1991)

In Cabbage Tree Flat, Aboriginal skeletal remains were uncovered as a result of erosion of the bank of the Shoalhaven River. The skeletal remains comprised a few cranial bones which were not dated. The bones were described as being found 2-4 metres above high tide mark on a steeply sloping collapsed bank of the Shoalhaven River and were thought to be in situ. The presence of the remains found in situ in an area prone to flooding is up for debate as seems an unlikely location for a burial. Other skeletal remains representing at least three Aboriginal individuals were uncovered in sand dunes at Shoalhaven Heads, during upgrading of the sewerage treatment works.

Navin (1992)

Previous survey within the Shoalhaven region also included work by Navin (1992) which resulted in the identification of two isolated artefacts, a ground edge hatchet (APPM Isolated Find 1, DECC #52-5-288 and 52-5-289), and a broken alluvial pebble (APPM Isolated Find 2, DECC #52-5-290). These artefacts were located within the Shoalhaven Paper Mill located on the northern side of Shoalhaven River. Both artefacts have been interpreted as reflecting the low archaeological sensitivity of the area and the potential use of the elevated river banks as an access corridor.

Kuskie (2008)

An Aboriginal Heritage Impact Assessment was undertaken by Kuskie (2008) for an Ethanol Plant Upgrade at Shoalhaven Starches at Bomaderry. The report provided in-depth investigations into previous archaeological surveys within the region. Surveys in the low-lying coastal plain east of Nowra by Kuskie (1995) and Paton (1990) did not identify any Aboriginal artefacts. The absence of artefacts was explained as a result of low intensity of use within the area. This interpretation goes against the discovery of a small artefact scatter and isolated artefact by Corkill (1986) on the margins of Brundee Swamp. Lyrebird Park, East Nowra was investigated in 2007 and no Aboriginal artefacts were found. Kuskie and Ingram (2007) concluded that the absence of finds could be attributed to geomorphological history within the area. For the entire Holocene the area would have been inundated with water and the only Aboriginal use of the area would have been through the exploitation of subsistence resources later in the Holocene. Within the Nowra Bomaderry locality previous investigations discovered two minor artefact deposits at Tapitallee Creek (Barber and Williams 1995), a small artefact scatter on the route of the Eastern Gas Pipeline (Kuskie et al. 1995), two rock shelters with deposits were located by Navin (1991) on the elevated terrain between North Nowra and Bomaderry, and a rock shelter with a shallow deposit on Bomaderry Creek (Lampert 1971). Bindon (1976) Officer (1991) also

recorded and extensively documented numerous rock shelters within the region. A low archaeological area is reinforced by Kuskie (2008) investigations which did not identify any Aboriginal sites within the project area.

Feary and Moorcroft (2011)

This report investigated the presence of Indigenous material within the Bundanon Trust Properties, which would allow a future Indigenous Cultural heritage Management Plan to be developed. There were no previously recorded Aboriginal sites within the study area. Results from this investigation uncovered two sets of axe grinding grooves, a possible stone axe blank, and a possible core, both of which turned out to be not artefactual. The absence of sites in an area deemed as a high potential location demonstrates that further archaeological investigation is required.

Artefact Heritage (2012)

Commissioned by Parson Brinkerhoff, this archaeological assessment was undertaken due to a proposed expansion and refurbishment of the existing Nowra 33kV feeder line. The study area which was investigated was a 7.1 km corridor which passed through north Nowra, across the Shoalhaven River and south toward west Nowra. Located within an area of high cultural significance, there were 78 previously recorded Aboriginal sites within the vicinity. Among these, four sites were located within 50m from the proposed work location (AHIMS #52-5-0544 located within the transmission line; AHIMS #52-5-0390; AHIMS #52-5-0542; AHIMS #52-5-0262). The survey carried by Artefact Heritage (2012) did not result in the identification of any additional Aboriginal sites or objects. Though no new sites were recorded, the survey reidentified site #52-5-0544, an isolated find consisting of a red fine-grained siliceous core with one flake scare, and an artefact scatter (#52-5-0390). Both sites were unable to be relocated and as such it was recommended that this location be cordoned off to prevent secondary impact during the project.

Artefact Heritage (2018)

This Aboriginal Cultural Assessment investigated an area over the Shoalhaven River at Nowra where the construction of a new bridge on the A1 Prince Highway was proposed. The area analysed was situated 120 km south of Sydney and 30 km south west of Kiama, comprising a total area of 61 hectares centred on the Princes Highway and located at around 13-14 km from the coastline. This area is situated between two different geomorphological and botanical zones. These topographical characteristics seem to suggest that there might be a high density of Aboriginal sites resulting in activities such as camping. However, ground surface disturbance and vegetation clearance has occurred across the area which may have impacted on the preservation of Aboriginal cultural heritage. The archaeological survey (2018) identified five Aboriginal sites and five areas with PADs. Test excavations identified five additional Aboriginal sites in the area of the project. The test excavation also registered a high disturbance in all sites within the study area, supporting the idea that this area and the preservation of sites has been impacted on. An additional archaeological survey was performed during the test excavation to support some changes in the study area and this revealed the presence of a new Aboriginal site.

3.1.2 Previous archaeological assessments within the local area

The following Aboriginal Heritage assessments provide more insight into the archaeology present within the Kangaroo Valley. These reports provide information on the site types and the location of archaeological sites within the vicinity of the project area.

Navin Officer (2002)

Navin Officer (2002) performed a heritage survey which investigated 8 km of the pipeline road between Bendeela pondage and Fitzroy Falls reservoir, 3.6 km of road around Bendeela pondage, and 3.5 km along the Lake Yarrunga. This survey identified four Aboriginal sites located on the access road on north side of Lake Yarrunga. Two of the sites were found on the lower slopes of south-facing spurs, one about 400m north of the Kangaroo River and one approximately 250 m west of the Kangaroo River. Another site was located on a lower slope about 20m west of the Kangaroo River and the final site was found on a basal slope situated approximately 25 m north of the Kangaroo River (Navin Officer 2002). The recorded sites were all considered low density scatters, located in disturbed contexts and ranged in size from a single artefact up to 13 artefacts. From these site locations, a model was developed which indicates that sites may occur particularly on the spurs in the valley floor and within at least 400 m of the Kangaroo River.

Navin Officer (2005)

Commissioned by CH2MHill, this report was developed with the aim of identifying any Aboriginal heritage that may be impacted by the proposed development of a sewerage scheme for the Kangaroo Valley. A sewerage strategy study was performed to develop options for improving the water waste management within the region. The study area was located within the Kangaroo Valley and corresponds directly to the project area of the Shoalhaven Hydro Expansion project. Examination into previous archaeological investigations revealed there was no previously recorded sites directly associated with the project area. An isolated artefact within 5 km of the study area and three grinding grooves sites within a 180 km^2 area within the valley were present. However, this site data was affected by the lack of prior systematic survey and thus, may not be a true reflection of site numbers and location.

Part of the report provided an investigation into the few archaeological surveys which had been conducted within the Kangaroo Valley. One such survey was conducted Silcox (1991). Silcox (1991) surveyed a linear transect located immediately to the east of Bendeela Pondage and a pipeline route extending eastwards to the Nowra Road. No Aboriginal sites were located as a result of the survey and for this reason it was assessed a low archaeological potential for this area. However, the absence of Aboriginal sites appears to have been due to low visibility at the time. In 1994, Peter Kuskie surveyed the northern side of the Kangaroo Valley and recorded an isolated find, however the report was not catalogued as the DEC Hurstville Office and cannot be located. This isolated find was located during the Navin Officer (2005) survey. Following this, a survey was conducted by Oakley (1997), in relation to a bridge construction project at Nugents Creek. No Aboriginal sites were recorded, however similarly to Silcox (1991), the visibility was low.

The survey conducted to develop this report recorded two Aboriginal sites (KVIF1, a single artefact and KVAS1 which comprised of 11 artefacts within an area 50m x 30m) and nine areas with archaeological potential (KVPAD1, KVPA2, KVPA3, KVPA4, KVPA5, KVPA6, KVPA7, KVPA8, KVPA9). A full survey of the pipeline routes from and though Kangaroo River, however, was not conducted. During the survey it was also noted that there were subsurface archaeological deposits and, thus, there is potential for additional information which is likely to be undisturbed and in situ. The report concludes that the lack of previous archaeological research within the Kangaroo Valley means that prediction about the nature and extent of subsurface deposits can only be uncertain.

Harper et al. (2012)

The test investigations by Harper et al. (2012) investigated any Aboriginal heritage that may have been impacted by the proposed development of a sewerage scheme for the Kangaroo Valley. The construction of the Kangaroo Valley Sewerage Scheme would include impacts at one of the previous recorded sites (KVIF1/AHIM#52-5-0432) and an area of a PAD (KVPAD1/AHIM#52-5-0644). For this reason, an Aboriginal subsurface test excavation and a surface artefact salvage program were initiated for AHIMS sites #52-5-0432 and #52-5-0644. The archaeological surface collection was to recover the artefacts that were previously recorded and may have been impacted on by the construction of project. A total of three Aboriginal stone artefacts, were collected during the surface collection, two artefacts were collected from the ground surface of the previously recorded site KVIF1 (AHIMS#52-5-0432) and the other one was found and collected in the vicinity of Pit 35 At KVPAD1 (AHIMS #52-5-0644).

3.1.3 Summary

The review of existing archaeological assessments within the region indicates that the Shoalhaven and specifically the Shoalhaven River are of high cultural significance and will contain varying densities of archaeological deposits. Previous archaeological investigations within the region, such as by Harper et al. (2012); Navin Officer (2002; 2005) indicate that within the specific project area archaeological deposits occur on low/ medium density levels. Site types found are typically isolated sites, artefact scatter, or PADs.

A possible explanation for the low potential of sites found may correlate with the low number of archaeological assessments which have happened in the region. As such an examination of the local environment and the various cultural factors in the region will add to this existing knowledge and enable the creations of a predictive model that will assist in locating more Aboriginal sites.

3.2 AHIMS search results

A search of the AHIMS database was undertaken on 11 February 2022 for an area of land at datum GDA, zone 56, eastings 264974 – 273849, northings 6150178 – 6162300 with a buffer of 0 meters. The search area extends 2 km beyond the maximum extent study area in all directions to gain information on the archaeological context of the local area (Figure 3-1). No registered AHIMS sites are located within the study area. The full results of the revised AHIMS searches are presented in **Appendix A**.

A total of nine previously recorded Aboriginal sites were identified by the extensive AHIMS search. The nature of and location of the registered sites reflects past Aboriginal occupation from which they derive, but is also influenced by historical land-use, and the nature and extent of previous archaeological investigations. Although Aboriginal occupation covered the whole of the landscape, the availability of fresh water, and associated resources, was a significant factor in repeated and long-term occupation of specific areas within the landscape. AHIMS lists 20 standard site features that can be used to describe a site registered with AHIMS, and more than one feature can be used for each site. The frequency of recorded site types is summarised in **Table 3-1**.

Table 3-1. Frequency of site features from AHIMS data

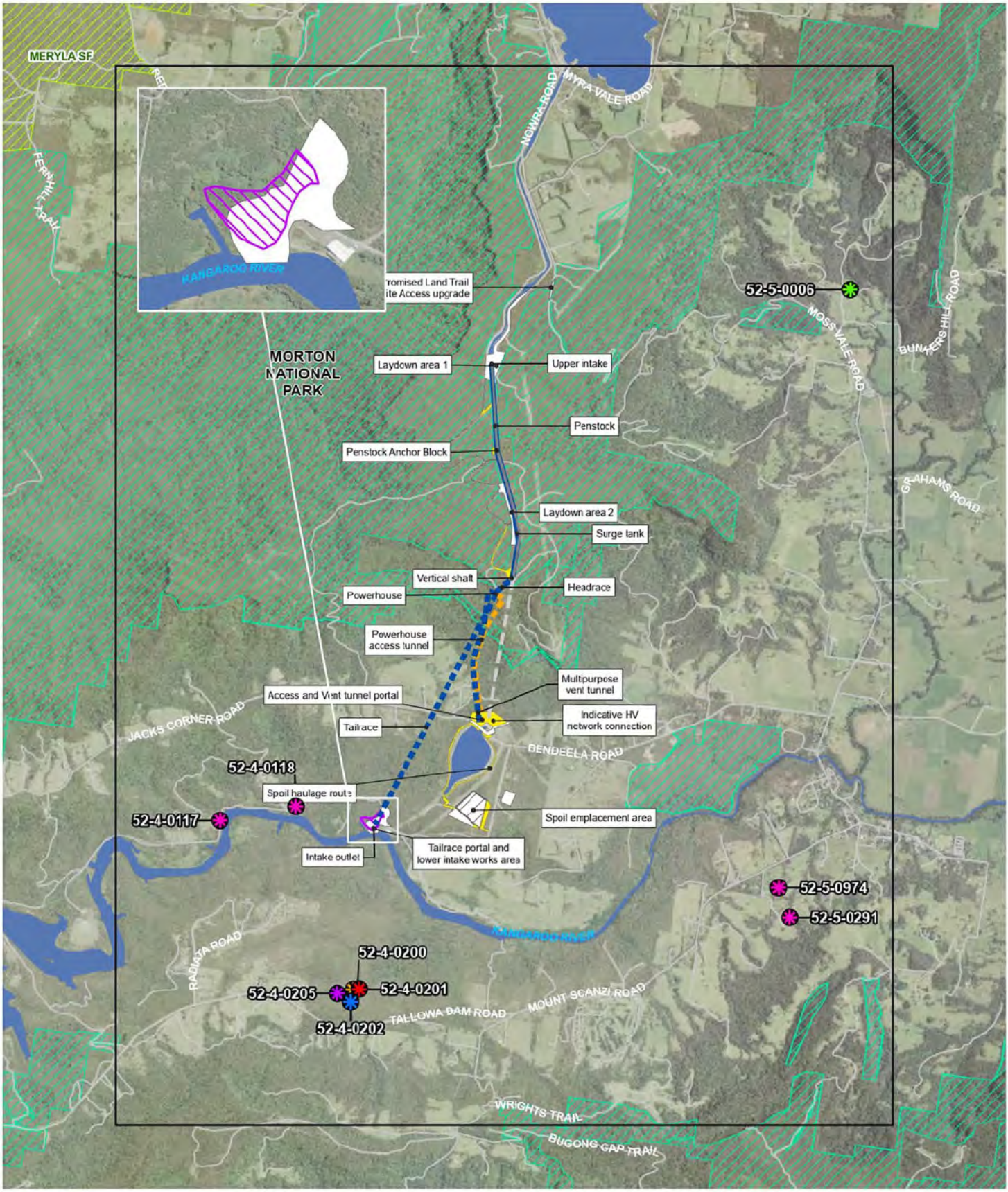
Site Feature	Frequency	Percentage (%)
Artefact	4	44.44
Grinding Groove	1	11.11
Art (Pigment or Engraved), Artefact, Potential Archaeological Deposit (PAD)	1	11.11
Art (Pigment or Engraved), Artefact, Potential Archaeological Deposit (PAD), Grinding Groove	1	11.11
Art (Pigment or Engraved), Ochre Quarry, Water Hole	1	11.11
Art (Pigment or Engraved), Grinding Groove, Potential Archaeological Deposit (PAD)	1	11.11
Total	9	100

Certain site types, such as culturally modified trees, are particularly vulnerable to destruction through historical occupation, while others, such as stone artefacts, are more resilient. The majority of sites comprise mixed 'Art' and 'PAD' sites, including isolated and low-density artefact scatters that is partially indicative of the level of historic disturbance present in the Kangaroo Valley. The lack of recorded scarred trees can be considered both a result of disturbance of the valley floors and lack of surveys / data for the escarpment. The distribution of the recorded sites within the AHIMS search area is shown in Figure 3-1. The results of the AHIMS search are appended in **Appendix A**.

The majority of the registered AHIMS sites are located to the south, southwest and southeast of the project area and were likely identified during the heritage assessments prepared for the development of the land on the Kangaroo Valley floor. Therefore, additional archaeological resources may be present but have not been identified due to lack of previous archaeological investigations, particularly on the sandstone escarpment.

Eight of the nine Aboriginal sites have been recorded utilizing the Australian Geodetic Datum (AGD), indicating older / earlier sites on the AHIMS or former National Parks register. Despite conversion of the sites to modern GDA 1994 coordinates, it can be considered that the AGD sites are likely to varying degrees inaccurate. Four of the sites have been recorded in association with Tallowa Dam Road. Two additional sites are located in proximity to Lake Yarrunga, likely in association with the Boot (2002) PhD study for the South Coast hinterland.

The closest site to the project area is Lake Yarrunga 4 (#52-4-0118) and is located approximately 1 km west of the Bendeela Power Station. No previously identified sites will be impacted by the project.



Legend

- Existing KV tunnel alignment
- Existing scheme pipeline
- Indicative above ground pipeline
- Indicative tunnel alignment
- Indicative access tunnel
- Disturbance area
- Spoil site
- Additional areas since 2019
- Art (Pigment or Engraved), Artefact, Potential Archaeological Deposit (PAD)
- Art (Pigment or Engraved), Artefact, Potential Archaeological Deposit (PAD), Grinding Groove
- Art (Pigment or Engraved), Grinding Groove, Potential Archaeological Deposit (PAD)
- Art (Pigment or Engraved), Ochre Quarry, Water Hole
- Artefact
- Grinding Groove
- Potential archaeological sensitivity
- AHIMS search extent
- State Forest
- NPWS Reserve
- Road
- Waterway
- Waterbody

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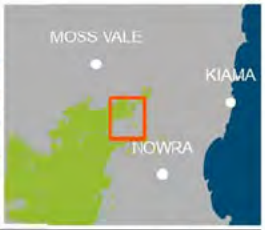
1 60,000 at A4

GDA2020 MGA Zone 56



Data sources

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Figure 4-1 AHIMS search results

3.3 Summary of the landscape context

3.3.1 Climate

The meteorological data of Shoalhaven region, shows that there is an average annual rainfall of 825 millimetres (mm), with highest rainfall in summer (November to February), and typical temperatures from 11.4 degrees Celsius to 22.2 degrees Celsius (Endeavour Energy 2012:29).

3.3.2 Geomorphology and hydrology

The project area is located in the south end of the Sydney Basin, a geological feature located within NSW. Lying between the New England and the Lachlan Fold Belt, the Sydney Basin was formed roughly 300 million years ago as an effect of the river delta replacement of oceans (Rose 1996).

Shoalhaven is dominated by Permian age sandstones and siltstone (Branagan and Packham 2000). Within the project area Early Permian layers consist of the Shoalhaven Group which includes Nowra Sandstone, and the Berry Formation. Overlaying the Shoalhaven Group is the Illawarra Coal Measures, before being overlain with the Hawkesbury Sandstone. There are small pockets of Quaternary alluvium in the west of the project area. The composition of all the Permian, Triassic and Quaternary deposits can be viewed in **Table 3-2**.

Table 3-2. Geological units underlying project area

Unit	Age	Description
Qal	Quaternary	Alluvium, gravel, swamp deposits and sand dunes.
Rh	Triassic	Hawkesbury Sandstone. Quartz sandstone with some shale.
Pi	Permian	Illawarra Coal Measures. Shale, sandstone, conglomerate, tuff, chert, coal, and tobanite.
Psd	Permian	Berry Formation which belongs to the Shoalhaven Group. Sandstone and tuffaceous sandstone.
Psb	Permian	Berry Formation which belongs to the Shoalhaven Group. Siltstone, shale, sandstone.
Psn	Permian	Nowra Sandstone which belongs to the Shoalhaven Group. Quartz sandstone.
Psw	Permian	Nowra Sandstone which belongs to the Shoalhaven Group. Siltstone, silty sandstone, pebbly in part.

The soils present within Shoalhaven are a part of a fluvial landscape containing active flood plains with levees and backwater swamps on alluvium (Artefact Heritage 2012:4). The levees present within the soul are made up of brownish black fine sandy loam which overlays brown sandy clay loam also known as Prairie Soils.

The soils of the Shoalhaven region fluctuate between moderately to strongly acidic, with a higher risk of acid sulphate soils on the lower floodplains of the Shoalhaven River (Endeavour Energy 2012:30).

The closest water sources include Fitzroy Falls Reservoir to the North of the project area, Bendeela Pondage and Lake Yarrunga to the South of the project area, Yarrunga Creek to the West and Miller Creek to the East.

3.3.3 Vegetation

In 1805 it was recorded by James Meehan that the area was compressed of grasslands, freshwater swamps, as well has areas covered by 'rainforest, brush cedar, softwoods, coachwood, blackbutt, sassafras, flametrees, brushes, palms, ferns, vines, orchids, eucalyptus, and casuarinas' (as cited in Bayley 1975:18).

Since European settlement, much of the original vegetation has been cleared for pastoral practices. Original vegetation would have been largely in the form of the Shoalhaven Sandstone Forest, which is an open Eucalypt forest or woodland. The area would have had abundant sclerophyll shrub stratum and a groundcover dominated by sedges (Artefact Heritage 2018:20). The current project area has four main vegetation classes as can been seen in **Table 3-3**.

Table 3-3. Vegetation types within the project area (SEED 2015)

Vegetation Class	Types of Species	Location
Sydney Coastal Dry Sclerophyll Forests	Red Bloodwood, Hard-leaved Scribbly Gum, Silvertop Ash	Healthy open forest on sandstone plateaux of the lower Shoalhaven Valley
Sydney Coastal Dry Sclerophyll Forests	Silvertop Ash, Red Bloodwood, Sydney Peppermint	Heathy open forest on moist sandstone plateaux
Coastal Valley Grassy Woodlands	Forest Red Gum, Thin-leaved Stringybark	Grassy woodland on coastal lowlands
North Coast Wet Sclerophyll Forests	Sydney Blue Gum and Bangalay, Lilly Pilly	Moist forest in gullies and on sheltered slopes
North Coast Wet Sclerophyll Forests	Blackbutt, Turpentine, Bangalay	Moist open forest on sheltered slopes and gullies
Subtropical Rainforests	Lilly Pilly, Sassafras, Stinging Tree	Subtropical/warm temperate rainforest on moist fertile lowlands

3.4 Former Historical Land Use

For the purposes of this assessment, this section relates to historic land use that may have impacted the survivability of Aboriginal objects.

Aerial imagery indicates the project area currently encompasses predominantly National Parkland with some residential and agricultural properties. The original landscape within the project area has changed since the arrival of Europeans. Though patches of original vegetation remain, such as Eucalypt woodland, much of the original vegetation has been cleared to make room for pastural practices. Dairy farming is the primary industry in the region which has meant, areas of land are fenced off and ploughed.

3.5 Summary of the local and regional character of Aboriginal land use and material traces

The chronological period of Aboriginal occupation of Australia is still a debatable topic. Madjedbebe rock shelter, located in northern Australia has provided dates for initial human colonisation of Australia ranging between 50- 60,000 years before present (BP) (Clarkson et al. 2017). Artefacts at Madjedbebe included a distinctive stone tool assemblage made of grinding stone, ground ochres, reflective additives, and ground-edge hatchet head (Clarkson et al. 2017). The oldest human remains in Australia have been found at Lake Mungo, Western NSW (Bowler et al. 2003). A series of optical ages showed that burials at Lake Mungo occurred at 40,000±2,000 years BP and that humans existed at Lake Mungo by 50- 46,000 years BP (Bowler et al. 2003). Consequently, it is possible that the occupation of this area occurred synchronously or soon after the initial occupation of the Northern Territory.

Archaeological evidence shows that between 50,000 and 40,000 years BP there were variations in the weather conditions with period of lake-full and phases of drier conditions (Bowler et al. 2003). These events were followed by a period of sustained aridity which occurred between 40,000 to 30,000 years BP. Mulvaney and Kamminga (1999:144) demonstrate that by around 35,000 years BP, the main environmental zones in Australia were occupied, including the periglacial environments of Tasmania. During the Last Glacial Maximum, between 25,000 and 12,000 years BP, Australia experienced dry and either intensely hot or cold temperatures (Mulvaney and Kamminga 1999:144). At that time, the lower temperatures were between 6-10 Celsius. Then at about 24- 22,000 years BP, the sea level fell to about 130m below the present level and the continent had a larger extension. At the end of the glacial conditions, due to the rise of temperature, the continent experienced a rise of the sea level. By approximately 6,000 years BP, sea levels had stabilised to their current location. During the Holocene, Aboriginal people had to deal with reduced landmass and changes in the hydrological and vegetation systems. Human occupation of south-eastern NSW dates from at least 20,000 years BP, as evidenced by dated occupation sites in Burrill Lake (Lampert 1971), Cloggs Cave

(Flood 1980), New Guinea 2 Cave (Ossa et al. 1995), and Namadgi rock shelters which have been dated to 21,000 years BP (Theden-Ringl 2016).

Around 20,000 years BP, when the Late Glacial Maximum was coming to an end, the Shoalhaven coastline was proximately 20 km and further east than its current location. In this time period the region was already inhabited by local Aboriginal groups, but the rise of sea level has destroyed much of the archaeological evidence. The sea level reached the present level approximately 6000 years BP.

Within the Illawarra key resources included water, stone, clay, plant, and animals. Resources would have been both marine and terrestrial. Marine resources would have included a range of fish and shellfish (evident from shell middens on the eastern coast). Terrestrial resources would have been utilised not only for food but also for medicine and raw materials to aid in making cultural objects such as baskets. The names of certain plants in their Dharawal and Wodi Wodi names first appear in early records by William Macarthur, who was told these names in the mid-1850s by an Aboriginal man known as Doctor Ellis (Wesson 2004). Other native foods would have included berries, leaves, tubers, flowers, seeds, nectars and delicious insect larvae, such as grubs.

Implements created from wood would have made up a large part of the material culture present within the Shoalhaven area. Artefacts such as spears (karmai), woomeras (womra), boomerangs (bumarin), shields (hilamin), and canoes (maduri) would have been made from timbers, gums and resins (Wesson 2004).

A dominant material which remains preserved in the archaeological record is stone such as silcrete, chert, indurated mudstone, quartz, and quartzite. In archaeological sites these raw materials are used to craft stone artefacts. The stone technologies present within the south coast of NSW are typically categorised into the Eastern Regional Sequence. This sequence is characterised by four main periods, these are:

- The Pre-Bondaian (previously known as the Capertian): Artefacts are mostly large and heavy. They include unifocal pebble tools, scrapers, core tools, denticulate saws and hammerstones. Some bipolar tools and burins also occur. The Pre-Bondaian is present up to around 8000 years BP
- The Early Bondaian: Characteristics of the Pre-Bondaian continue however smaller artefacts (backed artefacts) are introduced. Backed artefacts were uncommon until the later stages of this phase, bipolar flaking occurs widely although relatively rarely at individual sites. Unifacial and bifacial flaking were the dominant technique. The Early Bondaian has been identified in deposits dating between around 8000 and around 4000 years BP
- The Middle Bondaian: There is an increase in Bondi points (a type of backed artefact). Edge ground artefacts are present in higher proportions, as are quartz artefacts. Smaller cores and tools, bipolar flaking increases, ground stone artefacts appear infrequently (at less than half of the dated sites). Backed artefacts or Elouera are rare. This phase dates from around 4000 to as late as 1000 years BP
- The Late Bondaian: This phase is characterised by quartz becoming the predominant material. Bondi points and most types of backed blades become rare or are no longer found, with Eloueras, bipolar artefacts and edge ground hatchets becoming predominant (Hiscock and Attenbrow 2005).

These stone technologies are present within assemblages and demonstrate its use or certain tools for hunting and gathering, as well as for crafting weaponry such as spears and woomeras.

3.6 Predictive model

The desktop assessment indicates that certain landscape contexts within the project area have a higher likelihood to contain archaeological sites and deposits than others. Predictive modelling was used to determine the archaeological sensitivity for Aboriginal cultural heritage of particular landforms within the proposed project area. Within the project area differing degrees of ground disturbance and development has resulted in areas of disturbed archaeological integrity. These disturbances are mainly the result of alluvial, colluvial, agricultural and decreased preservation processes.

Based on the search of the AHIMS and Australian Heritage database and review of previous archaeological reports pertaining to the broader project area, the following site types, characteristics and potential location of Aboriginal places within the project area are proposed:

- Artefact scatters, grinding grooves, areas of potential archaeological deposit (PAD), scarred trees and rock shelters are likely to be associated with primary resources zones along major rivers and also evident along higher order creek flats, slopes and terraces

- Grinding grooves and rock shelters are likely to occur in the broader area. Rock shelters are likely to occur in steep drainage depressions or spur crest units or sloping terrain. Grinding grooves are likely to occur on homogenous stone outcrops such as sandstone close to water sources
- Artefacts scatters and isolated artefacts are likely to occur. These are likely to be located along alluvial floodplains and are likely to include surface and subsurface deposits
- Areas of PAD are likely to occur where intact deposits are retained
- Surface scatters are likely to indicate the potential for sub-surface deposit to be present
- Scarred trees are a less likely site type to encounter in the valley. They are less abundant and are likely to occur on mature vegetation and in the vicinity of or in association with other cultural and archaeological material. If scarred trees are located within or in proximity to the project area, it is likely they will be encountered within vegetation on the escarpment at Promised Land Trail and Morton National Park.

3.6.1 Expected site types

The predictive model developed for the region indicates that certain site types are more likely to be prevalent in the landscape than others. The degree of preservation of each site will be dependent on historical and current land use practices, as well as the nature of the site.

Isolated artefacts

An isolated find is a single artefact which occurs without any associated evidence of Aboriginal occupation. Isolated finds can be indications of random loss or deliberate discard, a remnant of an artefact scatter, or evidence of an obscured sub-surface artefact scatter. Within Kangaroo Valley isolated finds can be found on any landform.

Artefact scatters (Open campsites)

These are sites which have most likely to have survived in the archaeological record. They are scatters of stone artefacts with little associated food residue such as shell and bone. An artefact scatter is typically defined as either the presence of two or more stone artefacts within 50 m/ 100 m of each other, or a concentration of artefacts at a higher density than surrounding low density background scatters. These sites can occur in any topographical landscape and can represent evidence of:

Campsites, where activities such as tool manufacture, preparation of food, and storage of food and tools may have occurred

Hunting or gathering events

Tool production

Transitory movement through the landscape.

Potential Archaeological Deposits (PADs)

A PAD is defined as any location where the potential for subsurface archaeological material is present. A boundary of a PAD is generally defined by the extent of a particular landform.

Scarred/ Carved Trees

Scarred or carved trees are trees which have had a part of their bark removed or been modified for a variety of purposes. Bark would have been removed from a section of a tree in order to create carious tools and tools such as canoes, water containers, shields, or roofing material. Carved trees, similarly, have been modified to contains a symbol which may indicate a specific totem, burial location, or ceremonial ground.

Grinding Grooves

Grinding grooves are the by-product of the manufacture of ground edge tools. The most common matrial is stone however bone and shell can also be ground to fine points. Grinding groove sites may contain from one groove to multiple grooves arranged in a group. They typically occur on sandstone platforms in creek beds.

Ceremonial Sites

Ceremonial sites are locations where religious/ spiritual events and ceremonies took place. Ceremonial sites can be associated with Bora (Bunan) grounds which are associated with initiation ceremonies. Bora grounds are typically made up of two circular depressions in the earth. It is unclear whether any ceremonial sites are present within the Kangaroo Valley as they do not usually contain an archaeological footprint.

Rock Shelters

Rock shelters are habitation sites typified by rocky overhangs providing a natural shelter for occupation. Rock shelters have the potential to contain rock art such as ochre paintings and rock engravings in addition to isolated artefacts, artefact scatters including knapping floors buried under deep deposits of soil beneath the shelter.

4. Archaeological survey

4.1 Previous Surveys

The preliminary site inspection was undertaken in accordance with the Due Diligence Code of Practice on the 3 December 2018. Andrew Costello (Senior Archaeologist, Jacobs) undertook the inspection with Thomas Muddle, Jorja Vernon, Mike Luger and Ajay Arcot (Environmental Services, Jacobs), and Tony Schinkel (Origin Energy).

An additional site inspection of six proposed geotechnical borehole drilling locations was undertaken on 24 January 2019. Andrew Costello (Senior Archaeologist, Jacobs) undertook the inspection with [redacted] (CEO, Illawarra Local Aboriginal Land Council).

A further site inspection was undertaken on 10 June 2022 by Ryan Taddeucci (Senior Archaeologist, Jacobs) and Pauline Ramsey (Project Archaeologist, Jacobs) of an additional seventh borehole drilling location on Promised Land Trail.

4.2 Methodology for archaeological survey

4.2.1 Aims

A preliminary site inspection was conducted within the project area in order to gauge where impacts would occur, and to identify where whether or not Aboriginal objects are, or are likely to be, present, and whether or not the project is likely to harm Aboriginal objects. The site inspection had the following objectives:

- Inspect areas of higher visibility and soil exposures
- Inspect elevated areas near waterways, water bodies and creek lines
- Inspect all rock shelters within the project area
- Inspect all mature trees in the project area for cultural modification or scarring.

The aim of the archaeological survey was to visit all areas where impacts are proposed within the project area to identify whether or not Aboriginal objects are, or are likely to be, present, and whether or not the project is likely to harm Aboriginal objects. The archaeological survey was undertaken in consultation with the RAPs to confirm areas of potential archaeological sensitivity (PAS) and potential archaeological deposit (PAD) to be subject to archaeological test excavation and incorporated the same objectives as the initial site inspection.

4.2.2 Survey personnel

The archaeological survey was undertaken on the 27th and 28th of June 2022. The personnel in attendance for the survey are listed in **Table 4-1**.

Table 4-1. Test excavation attendance

Group	Role	Name	Date/s
Jacobs	Senior Archaeologist	Ryan Taddeucci	27 / 28 June 2022
Jacobs	Project Archaeologist	Matt Finlayson	27 / 28 June 2022
Murra Bidgee Mullangari Aboriginal Corporation	Sites Officer	[redacted]	27 / 28 June 2022
Woronora Plateau Gundangara Elders Council	Sites Officer	[redacted]	27 / 28 June 2022
Yurrandaali Pty Ltd	Sites Officer	[redacted]	27 / 28 June 2022
DNC	Sites Officer	[redacted]	27 / 28 June 2022
Freeman & Marx Pty Ltd	Sites Officer	[redacted]	27 June 2022

Group	Role	Name	Date/s
Freeman & Marx Pty Ltd	Sites Officer	[redacted]	28 June 2022

4.2.3 Survey strategy and procedure

The survey was carried out on foot by a team of archaeologists and Aboriginal representatives, in accordance with the Code of Practice. Only the newly defined portions of the study area were subject to archaeological survey during this round of the assessment. The overall strategy was to complete a full coverage survey, where possible. All identified surface exposures were inspected for the presence of Aboriginal objects.

A handheld Global Positioning System (GPS) was used to track the path of the survey team and record the coordinates of identified features and disturbances. Detailed aerial maps marked with grid coordinates for the survey unit was carried by the survey team. The coordinate system projection used for all data recording was GDA94 MGA 56.

A photographic record was kept during the survey. Photographs were taken to record aspects of each survey unit including disturbance and recorded Aboriginal sites. Scales were used for photographs where appropriate.

Where archaeological sites or areas of PAD were encountered, the following attributes were recorded:

- Site location (single point for isolated artefacts, or as a boundary drawn around larger sites such as artefact clusters or middens)
- Site type
- Landform context
- Vegetation type
- Land use
- Categories of features and artefacts present on the site
- Orientation/aspect of the site
- Observations on individual cultural features
- Observations on modified trees: living status of tree; condition of tree; condition of scar; tree species; length and width of scar; height above ground; presence of regrowth; depth of scar (height of regrowth); shape of scar; orientation of scar; presence/absence of axe marks
- Observations of other specific site types (burials, ceremonial sites) following the requirements of Heritage NSW site recording forms
- Photographs of the site and individual site features/artefacts will be taken as judged necessary by the field team
- Any other comments or information as judged relevant by the field team.

Where sites or places in the landscape were found to be associated with intangible cultural heritage, the information provided by RAPs in the field was recorded.

When an Aboriginal object was found within the project area, the area was then recorded. Aboriginal Site Recording Forms for these sites are in the process of being completed by Jacobs and will be lodged with AHIMS as soon as is practicable.

During the survey, RAPs were given the opportunity to provide Jacobs with any relevant information on the project area and the surrounding region, including information on cultural heritage values. It should be noted that RAPs have the opportunity to provide any information relating to the cultural significance of the study area at any point during the cultural heritage assessment process prior to the finalisation of the ACHAR.

4.2.4 Site definitions and recording

An Aboriginal site is generally defined as an Aboriginal object or place. An Aboriginal object is the material evidence of Aboriginal land use, such as stone tools, scarred trees or rock art. Some sites, or Aboriginal places can also be intangible and although they might not be visible, these places have cultural significance to Aboriginal people.

Requirement 6 of the Code of Practice states that one or more of the following criteria must be used when recording material traces of Aboriginal land use:

- The spatial extent of the visible objects, or direct evidence of their location
- Obvious physical boundaries where present, e.g., mound site and middens (if visibility is good), a ceremonial ground
- Identification by the Aboriginal community on the basis of cultural information.

For the purposes of this assessment, sites and feature extents were defined by recording the spatial extent of visible traces or the direct evidence of their location.

4.3 Survey results

4.3.1 Description of Survey Units

4.3.1.1 Survey Unit 1

Survey Unit 1 is located in the northern portion of the project area, due south of Fitzroy Falls on the Promised Land Trail segment which intersects the Fitzroy Canal and WaterNSW pipeline. The area comprises the Promised Land Trail segment on the eastern side of Fitzroy Canal, extending south to the eastern side of the WaterNSW pipeline (**Figure 4-1** and **Figure 4-2**).

The area has been subject to significant bulk earthworks associated with the construction of the Fitzroy Canal, cut and fill earthworks for the pipeline and construction and consistent remediation of the Promised Land Trail, which has altered the surrounding topography. The landform of the area generally comprises a slope with a southerly / south easterly aspect.

Vegetation in the area comprises juvenile regrowth of open woodland, which has reduced the potential for scarred trees to be located in the immediate area. The open woodland also comprises low-lying scrub with bush wattle that impacted GSV and survey access (**Figure 4-3**).

Exposures generally comprised sandstone outcrops and exposed soils on the vehicle tracks. GSV was generally 90% with 40% exposures (**Figure 4-4** and **Figure 4-5**). Soils generally comprised eroding yellowish brown sands consistent with the local geology and use of local fill for road base. The survey was however limited by excessive slope on the eastern side of the Promised Land Trail which limited the ability of the survey team to have safe access.

No Aboriginal objects or PADs were identified in Survey Unit 1.

Figure 4-1. Survey Unit 1, Promised Land Trail facing west towards Fitzroy Canal

Figure 4-2. WaterNSW pipeline as seen from Survey Unit 1, facing south

Figure 4-3. Overgrown vehicle track on eastern side of WaterNSW pipeline, facing north

Figure 4-4. GSV conditions, eastern overgrown track of Survey Unit 1, facing west

Figure 4-5. Survey Unit 1, Promised Land Trail facing south

4.3.1.2 Survey Unit 2

Survey Unit 2 comprises a section of the pre-existing WaterNSW alignment to the south of Survey Unit 1. This area is accessed via Promised Land Trail. The area has been subject to historic cut and fill disturbance associated with the construction of the pipeline. Bulk earthworks have been undertaken to cut into the underlying geology, with the pipeline positioned at the base of the cut (**Figure 4-6**).

The adjacent vehicle track comprises a sandy roadbase fill containing metal fragments and fractured sandstone. Concrete drains and box culverts have also been cut into the alignment to facilitate drainage downslope to the south (**Figure 4-7**). GSV is at 90% with 40% visibility and 70% exposure due to stripping of vegetation and erosion / removal of topsoils (**Figure 4-8**).

Surrounding vegetation comprises juvenile regrowth and has likely been impacted both by historic forestry practices and construction of the pipeline. As such there is a low potential for scarred trees to be located nearby Survey Unit 2.

No Aboriginal objects or PADs were identified in Survey Unit 2.

Figure 4-6. Survey Unit 2 within the pipeline cutting, facing north

Figure 4-7. Survey Unit 2 box culvert and concrete drainage, facing north

Figure 4-8. Survey Unit 2 GSV, facing north

4.3.1.3 Survey Unit 3

Survey Unit 3 is located on the Promised Land Trail and WaterNSW pipeline vehicle easement, due south of Survey Unit 2. The section of pipeline within Survey Unit 3 is located over a low-lying creek. The vehicle easement along the pipeline has been built up above the natural ground surface with large amounts of fill, including soil bunds and drainage (**Figure 4-9**).

Two areas on the western and eastern sides respectively of the existing easement were inspected for potential expansion of the footprint. The eastern side area comprises a low-lying, narrow bench on the south side of the creek in open juvenile woodland. The stratigraphic profile on this eastern side is inferred to be intact, however the exact impacts of forestry and construction of the pipeline on the profile is not known (**Figure 4-10**). The western side additionally comprises a gentle sloped area with a northern aspect towards the creek, containing clear signs of historic forestry and soil bunds resulting from construction of the pipeline (**Figure 4-11**). A sub-surface fibre optic cable was also identified in this western area perpendicular to the pipeline.

Low GSV in the surrounds of the pipeline alignment hampered survey. In general, visibility was approximately 30% with approximately 20% exposure confined to the vehicle easement and Promised Land Trail track in areas of natural erosion and subsidence.

No areas of PAD were identified. However, it is noted that the eastern portion of Survey Unit 3 at the creek crossing has the potential to contain an intact soil profile which may have potential to contain Aboriginal objects.

One potential chalcedony flake was noted on the Promised Land Trail at the eastern boundary of the survey unit. However, it was determined the object was a result of heat fracture due to temperature change / splintering rock due to the concave nature of the dorsal side of the object (**Figure 4-12**).

One previously unidentified Aboriginal site, being Promised Land Trail ST01 (Scarred Tree) was identified within Survey Unit 3 at the intersection of Promised Land Trail and McPhails Fire Trail. Please see **Section 5.3.3** for further details.

Figure 4-9. Survey Unit 3 facing north along pipeline easement

Figure 4-10. East side of Survey Unit 3, facing west

Figure 4-11. West side of Survey Unit 3, facing north downslope towards the creek

Figure 4-12. Promised Land Trail IF01 dorsal surface

4.3.1.4 Survey Unit 4

Survey Unit 4 is located south of Survey Unit 3, due east of the Promised Land Trail within the WaterNSW pipeline alignment and vehicle easement. This area is generally north of the southern surge tower on the escarpment within a rolling hills landform which has been significantly disturbed by bulk earthworks associated with the cut and fill construction methodology for the pipeline alignment (**Figure 4-13**).

Topsoils within the easement have been predominantly cleared down to the natural clay / sandstone outcroppings, with residual sandy topsoil patches remaining in thin layers over the surface (**Figure 4-14**). Vegetation in the area comprises juvenile regrowth of < 50 years old due to historic forestry practices and construction of the pipeline (**Figure 4-15**).

GSV in the entire area was approximately 20% and was limited by thick scrub adjacent to the pipeline easement with 50% exposures due to the pipeline cutting exposing residual topsoils, where present.

No Aboriginal objects or PADs were identified in Survey Unit 4.

Figure 4-13. South facing view of Survey Unit 4 towards surge tower

Figure 4-14. North facing view of ground surface and sandstone outcropping of Survey Unit 4

Figure 4-15. West facing view of Promised Land Trail and juvenile vegetation adjacent to Survey Unit 4

4.3.1.5 Survey Unit 5

Survey Unit 5 is located at the southern end of the sandstone escarpment, adjacent north of the Kangaroo Valley Power Station shaft on the Promised Land Trail. The area has been subject to cut and fill disturbance consistent with establishment of the vehicle track. Additional disturbance includes construction of amenities, power station buildings, introduction of imported gravel, historic vegetation clearance and installation of sub-surface amenities such as sewerage and electrical cables (**Figure 4-16**).

While vegetation in the vicinity is dense, it comprises historic regrowth of < 50 years as a result of forestry practice and construction of the water pipeline **(Figure 4-17**). Soils in the area are generally sandy and likely comprise disturbed / introduced fill deposits of eroded escarpment sands. Some outcropping was additionally observed within the trail alignment. Visibility was generally 80% with 40% exposures due to erosion of the track (**Figure 4-18**).

No Aboriginal objects or PADs were identified in Survey Unit 5.

Figure 4-16. Survey Unit 5 facing east

Figure 4-17. Regrowth surrounding Promised Land Trail at Survey Unit 5, facing north

Figure 4-18. Typical ground surface of Survey Unit 5 within Promised Land Trail, facing north

4.3.1.6 Survey Unit 6

Survey Unit 6 comprises the Kangaroo Valley Power Station, including the surrounding cleared terracing, carpark, pondage bridge and a thin track around the northern boundary fence of the station. The existing power station has been constructed through a cut and fill methodology into the underlying bedrock of the hill formation which has removed a significant amount of topsoil from the area. The hill has a generally southern aspect and the existing power station is located at the base of the cut (**Figure 4-19, Figure 4-20**).

Vegetation has been cleared from the area and what surrounding vegetation was observable adjacent to the northern fence of the power station was noted to comprise juvenile regrowth. No larger mature trees with a potential to contain cultural scars were observed during the inspection of Survey Unit 6 (**Figure 4-21, Figure 4-22**).

GSV was generally low due to grass cover, asphalt roads and the power station carpark in addition to ground foliage present at the northern end of Survey Unit 6. Exposures, where present were noted to be due to Wombat burrowing, excavated drainage, power poles and vehicle tracks (**Figure 4-23**, **Figure 4-24**).

A small, dried and ephemeral creek line was observed outside the northwest boundary of the fence line, with a generally east to west orientation. This creek would have provided seasonal freshwater and likely would have been secondary to nearby permanent sources of fresh water (**Figure 4-25**).

No Aboriginal objects or PADs were identified in Survey Unit 6.

Figure 4-19. Survey Unit 6, view south towards Bendeela Pondage

Figure 4-20. Survey Unit 6, north facing view of the Kangaroo Valley Power Station cut

Figure 4-21. Survey Unit 6, northern fence line of power station facing south depicting regrowth vegetation

Figure 4-22. Survey Unit 6 at Kangaroo Valley Power Station, facing north towards terracing

Figure 4-23. Survey Unit 6 drainage / erosion exposure, facing west

Figure 4-24. Wombat burrowing within Survey Unit 6, facing north

Figure 4-25. Survey Unit 6, north facing view of the ephemeral creek

4.3.1.7 Survey Unit 7

Survey Unit 7 comprises a significantly disturbed council soil laydown area on the eastern side of Bendeela Pondage, south of Jacks Corner Road and Bendeela Road. The area has been cleared of vegetation and the soil profile predominantly excavated down to clay. Thin deposits of disturbed alluvial sand are present on the southern edge of the area and contain broken rock fragments. The area has been significantly disturbed by bulk earthworks for local road remediation (**Figure 4-26**, **Figure 4-27**). GSV and exposure was approximately 90%.

Kayla Williamson made note of the former Aboriginal camp at the State Heritage listed Hill 60 at Port Kembla and the connection of the Aboriginal families that had resided at Hill 60 pre-World War II to Kangaroo Valley. It was noted during World War II (1942) that the Aboriginal families at Hill 60 were evicted for military use of the area and their homes burned down (Heritage NSW 2022). Kayla noted that some members of those families were displaced to a 'nearby farm' to pick berries and may have lived on a nearby mission.

No Aboriginal objects or PADs were identified in Survey Unit 7.

Figure 4-26. Survey Unit 7 laydown, facing west

Figure 4-27. Ground surface typical of Survey Unit 7, facing north

4.3.1.8 Survey Unit 8

Survey Unit 8 is located to the southeast of Bendeela Pondage between the pondage and access road to Bendeela Power Station. The area comprises open woodland adjacent north of a 4WD vehicle track to the

pondage and a power easement situated on a flat plain adjacent west of the wooded area (**Figure 4-28**, **Figure 4-29** and **Figure 4-30**).

The open woodland area comprises regrowth trees of likely < 50 years age, comprising a mix of Eucalypt spp. and Blackbutt vegetation. However, a few matures were noted to have survived historic logging and construction of the pondage in the area and were noted to be Eucalypts (**Figure 4-29**).

Rusted metal fragments were noted throughout the woodland area mostly being drum fragments. It was suspected these fragments were related to construction of the pondage. Further disturbance associated with the pondage included soil bunds present in the northwest area of woodland nearby to the power easement.

The area is interspersed with minor, ephemeral creeks and natural drainage lines which only would have provided seasonal water. GSV was generally low due to the vegetation cover and foliage. Visibility was generally 30% with 30% exposures including the vehicle tracks and alluvial erosion creating exposed areas of soils in the northwest of the woodland area (**Figure 4-31**).

One potential scarred tree was noted by Michelle Bennett, being a mature Eucalyptus spp. with a low-lying scar on the trunk. It was the opinion of Jacobs personnel that due to the uneven shape, the low height of the scar from the surface and the shape being consistent with fire scarring of trees, that this particular tree is not culturally scarred (**Figure 4-32**).

No Aboriginal objects or PADs were identified in Survey Unit 8.

Figure 4-28. Survey Unit 8, facing north

Figure 4-29. Survey Unit 8, facing east along 4WD track

Figure 4-30. Survey Unit 8 facing south, depicting power line and easement

Figure 4-31. Survey Unit 8, facing south showing exposures

Figure 4-32. Survey Unit 8, northwest facing view of natural scar

4.3.1.9 Survey Unit 9

Survey Unit 9 comprises the immediate loop road surrounding the Bendeela Pondage, located adjacent to the south of the Kangaroo Valley Power Station (Survey Unit 6). This area is significantly disturbed from bulk earthworks and vegetation clearing associated with the raising of the pondage and installation of surface and sub-surface infrastructure, amenities and drainage (**Figure 4-33**)

Spoon drains and concrete box culverts and have been constructed perpendicular to the pondage walls to assist in drainage (**Figure 4-34**). What soils were visible generally comprise a soft sandy alluvium which has been significantly disturbed and reworked with imported gravel in association with construction of the pondage to create an elevated vehicle track (**Figure 4-35**). Visibility was generally 40% with 50% exposures where erosion and subsidence were observable. Surrounding vegetation comprised juvenile regrowth due to historic forestry and clearing for the hydro plant and pondage (**Figure 4-36)**.

No Aboriginal objects or PADs were identified in Survey Unit 9.

Figure 4-33. Survey Unit 9, facing north

Figure 4-34. Survey Unit 9, southeast view of culvert and drain

Figure 4-35. Survey Unit 9 ground surface of track, facing north

Figure 4-36. Survey Unit 9, facing east towards regrowth vegetation

4.3.1.10 Survey Unit 10

Survey Unit 10 is located on the western boundary of the Bendeela Power Station, to the south of Survey Unit 9. Survey Unit 10 comprises a PAD previously identified and excavated by Jacobs in 2019, situated on an elevated hilltop on the north side of Kangaroo River.

The area is highly vegetated with thick head-high scrub that has likely regrown after the 2019 / 2020 bushfire season. Survey was limited by this thick scrub, as well as dense grass and a lack of exposures. Where exposures were identified, soils were generally determined to be a dark sandy loam (**Figure 4-37**).

Visibility and exposure were both determined to be at 10% owing to thick low-lying vegetation and lack of observable exposures or erosion (**Figure 4-38**).

No Aboriginal objects were identified as a result of the inspection of Survey Unit 10. However, the PAD identified in 2019 by Jacobs was reidentified prior to excavation.

Figure 4-37. North facing view of Survey Unit 10, undergrowth and foliage

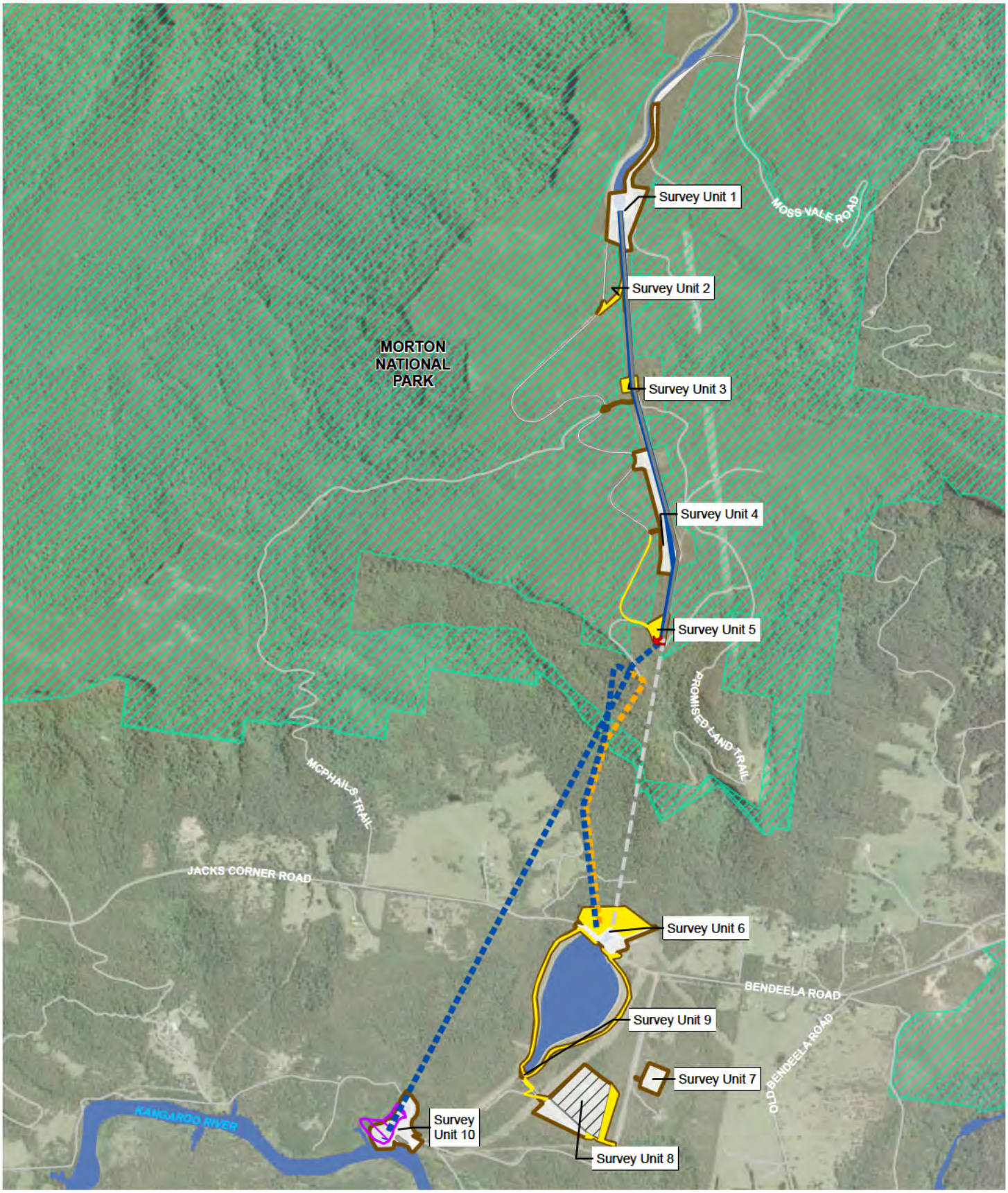
Figure 4-38. South facing view of Survey Unit 10 towards Kangaroo River

4.3.2 Survey coverage

The below table provides a summary of survey coverage in accordance with the Code of Practice (DECCW 2010b) (see **Table 4-2** and **Figure 4-39** below).

Table 4-2. Survey coverage summary

Survey Unit	Landform	Survey Unit Area (Sqm)	Visibility (%)	Exposure (%)	Effective Coverage Area (Sqm)	Effective Coverage (%)
Survey Unit 1	Slope	72165	10	40	2886	4
Survey Unit 2	Slope	10637	40	70	2978	28
Survey Unit 3	Rolling Hills	9723	30	20	583	6
Survey Unit 4	Rolling Hills	58325	20	50	5832	10
Survey Unit 5	Slope	13180	80	40	4217	32
Survey Unit 6	Slope	76249	30	20	4574	6
Survey Unit 7	Flat Plain	18612	90	90	15075	81
Survey Unit 8	Flat Plain	121875	30	30	10968	9
Survey Unit 9	Slope	22171	40	50	4434	20
Survey Unit 10	Hill Top	54920	20	10	1098	2



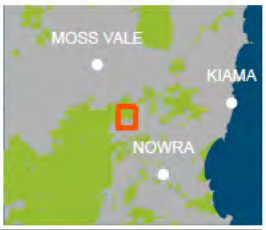
Legend

- Existing KV tunnel alignment
- Existing scheme pipeline
- Indicative above ground pipeline
- Indicative tunnel alignment
- Indicative access tunnel
- Disturbance area
- Spoil site
- Additional areas since 2019
- Potential archaeological sensitivity
- BH 9 investigation area
- Survey units
- NPWS Reserve
- Road
- Waterway
- Waterbody

0 1 2 km

1:30,000 at A4

GDA2020 MGA Zone 56



Data sources

Jacobs 2022
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Figure 4-39 Survey units

Date: 14/07/2022 Path: \\ausyd0vs01\GIS\Proj\NSW_IS332600_ShoalhavenEIS\Apps\IS332600_Heritage.aprx
Created by: JB | QA by: CC

4.3.3 Aboriginal sites

4.3.3.1 Promised Land Trail ST01

AHIMS ID / Name: (52-4-0730) Promised Land Trail ST01

[redacted]

[redacted]

Species: Eucalyptus spp.

Tree Circumference: 4.08 m

No. of Scars: 1

Orientation: West facing

Length of Scar: 1270 mm

Width of Scar: 190 mm

Depth of Scar: 50 mm

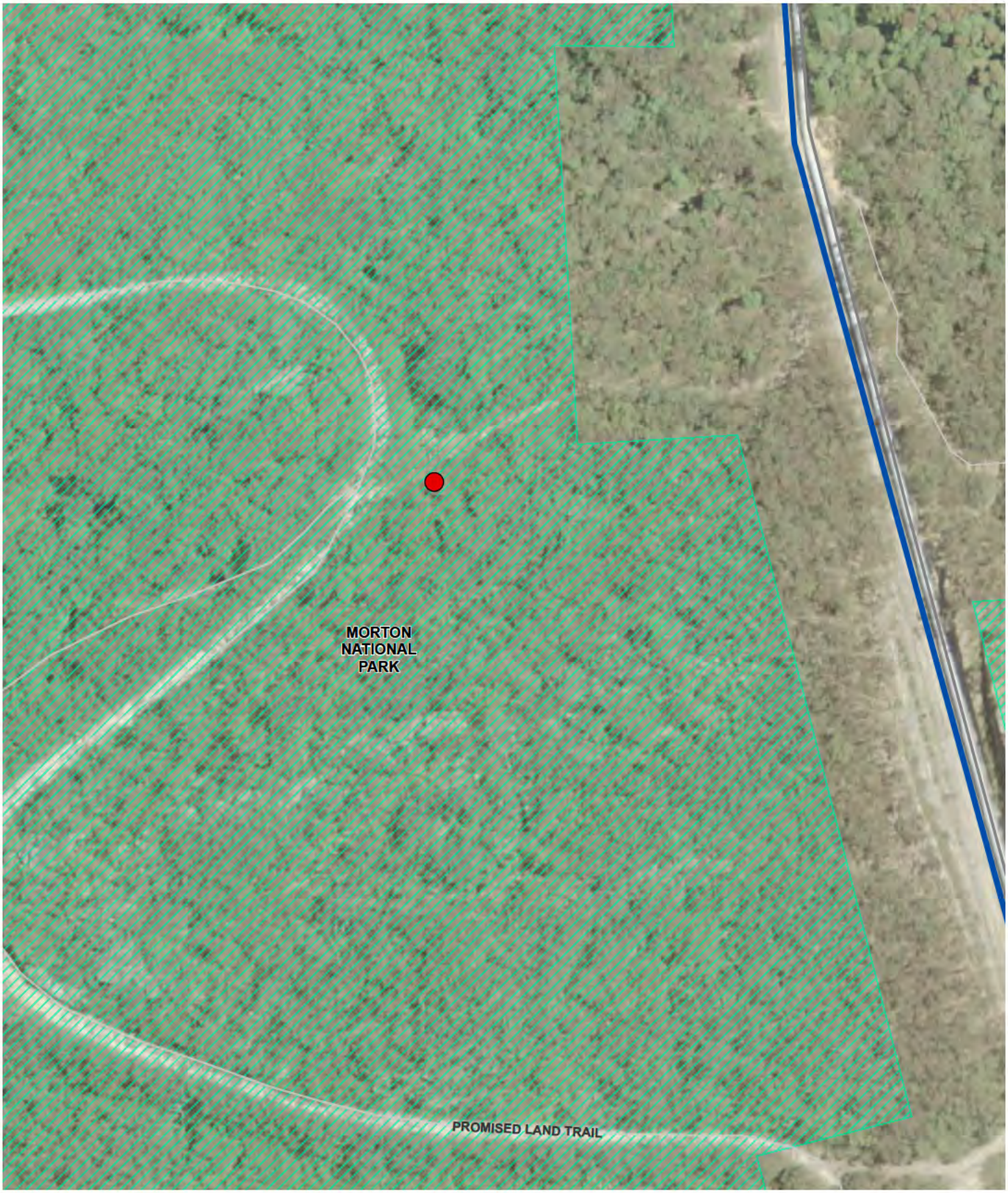
Shape: Oval (Irregular)

Landform: Rolling hills

Notes: Promised Land Trail ST01 is located at the intersection of McPhails Firetrail and Promised Land Trail within Survey Unit 3, refer to **Figure 4-41**. Tree scar has been burned but is significantly regrown (**Figure 4-40**). It is unlikely to have been machine damaged from historic forestry. The tree has no axe marks however there is sign of chipping adjacent to the scar. The chipping however appears to be modern in origin. While the shape of the scar is irregular, it is suspected the irregular shape is due to overgrowth impacting the top of the scar.

RAP Comments: [redacted] commented that the tree type appears consistent with local / regional scarred trees and that it could possibly be a shield tree.

Figure 4-40. Photo of Promised Land Trail ST01 scar, facing east



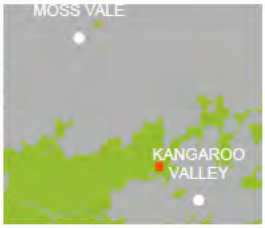
Legend

- Existing scheme pipeline
- Indicative above ground pipeline
- Promised Land Trail ST01
- NPWS Reserve
- Road

0 50 100 Meters

1 2,000 at A4

GDA2020 MGA Zone 56



Data sources

Jacobs 2022
Department of Planning and Environment 2022
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Figure 4-41 Promised Land Trail ST01

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Created by: JB | QA by: CC

5. Archaeological test excavation

5.1 Previous test excavation

A test excavation program was completed in accordance with the Code of Practice from 16 – 18 April 2019. The excavation was completed by Andrew Costello (Senior Archaeologist, Jacobs), Jorja Vernon (Graduate, Jacobs) with [redacted] representing the RAPs. The excavation program included six test pits, which yielded a total of three Aboriginal objects. Due to constraints to the GPS unit, the exact location of the test pits could not be accurately recorded. In 2022 an additional test excavation program was completed to ensure enough data was gathered to adequately assess the significance of the site in accordance with the Code of Practice. The methodology and results of the 2022 test excavation program are documented below.

5.2 Methodology for archaeological test excavation

The sub-surface testing methodology is described in Requirements 15 and 16 of the Code of Practice (DECCW 2010b). The methodology designed for this project adheres to those requirements.

5.2.1 Aims

Sub-surface testing is required to determine the presence of sub-surface archaeological deposits in areas where it is known or likely that Aboriginal objects are present and harm to them cannot be avoided as a result of the project. Testing therein aims to identify the nature, depth and extent of archaeological deposits – if present.

The program also aimed to reconfirm the findings of the 2019 excavations at the Bendeela Power Station which identified three sub-surface Aboriginal objects.

5.2.2 Timing and personnel

Archaeological test excavations were undertaken over two days on 29 June and 30 June 2022 at the Bendeela Power Station PAD. The Jacobs staff and RAP Sites Officers in attendance under the supervision of Origin Project Manager Tony Schinkel are provided in **Table 5-1**.

Table 5-1. Test excavation attendance

Group	Role	Name	Date/s
Jacobs	Senior Archaeologist	Ryan Taddeucci	29 / 30 June 2022
Jacobs	Project Archaeologist	Matt Finlayson	29 / 30 June 2022
Murra Bidgee Mullangari Aboriginal Corporation	Sites Officer	[redacted]	29 / 30 June 2022
Woronora Plateau Gundangara Elders Council	Sites Officer	[redacted]	29 / 30 June 2022
Yurrandaali Pty Ltd	Sites Officer	[redacted]	29 / 30 June 2022
DNC	Sites Officer	[redacted]	29 / 30 June 2022
Freeman & Marx Pty Ltd	Sites Officer	[redacted]	29 / 30 June 2022

5.2.3 Sample Strategy

After inspection of Survey Unit 10 (PAD) and in accordance with the Code of Practice (DECCW 2010b) and Section 3.2.2 of the Jacobs (2022) Fieldwork Methodology, the following strategy was decided in the field:

- Test pit locations were identified within the PAD where vegetation opened to facilitate for excavation amidst the thick scrub surrounding Bendeela Power Station
- Five test pits were determined to be adequate to achieve the aims to determine the nature of archaeological deposits within the PAD and to confirm the findings of the 2019 excavations.

5.2.4 Excavation procedure

In accordance with the Code of Practice (DECCW 2010b) and Section 3.2.2 of the Jacobs (2022) Fieldwork Methodology, the following procedures were implemented for test excavations in the field:

- The first excavated test pit, being Test Pit 4 was excavated in 50 mm vertical spits to provide preliminary observations on the nature of deposits within the PAD
- Subsequent test pits (Test Pit 1 – 3 and 5) were excavated in 100 mm spits after establishment of the stratigraphy of the area in Test Pit 4
- All material excavated from the test pits were dry sieved using 5 mm aperture hand sieves. This was due to the nature of the deposits which comprised a more balanced loam over the natural clay. As such, it was determined that wet sieving was unlikely to provide a more complete record of any cultural deposits encountered within the PAD
- Photographic and to-scale, drawn records of the stratigraphy/soil profile, feature, and informative Aboriginal objects were completed for each test pit. This included recording of the stratigraphy of each distinct landform sampled, and of each test pit in which an archaeological feature and/or Aboriginal object was identified
- Soil colour, type, texture and stratification was recorded to increase understanding of the subsurface conditions of the PADs and how they may relate to site formation processes – influencing the presence and condition of subsurface archaeological deposits
- Geomorphological data was gathered where possible, in order to allow a geomorphological assessment to be undertaken
- Test pits were backfilled upon completion of recording
- The location of each test pit was recorded using a mobile GIS unit. This allowed for the spatial datasets collected in the field to be post-processed to sub-metre level accuracy once the GPS co-ordinates had been differentially corrected.

Samples of organic material suitable for radiometric dating (charcoal) were collected for the dating of archaeological deposits from Test Pit 5 comprising two samples. The number of samples sent for dating will be determined on the suitability of the sample and the significance of the site. Samples were collected as follows:

- Samples placed in clean, plastic, sample bags
- Samples are to be removed to the relevant temporary keeping place and dried to avoid fungal growth during transport
- Samples are to be packaged within hard plastic cases for transport to a radiocarbon dating laboratory, if required.

5.2.5 Aboriginal objects

The following procedures applied for Aboriginal objects:

- All artefacts retrieved during test excavations were double-bagged and labelled with appropriate cultural information
- A secure storage location at the Jacobs Artarmon Office has been identified for artefacts until such time as they can be returned to site or managed in any other way that has been determined by the RAPs
- The long-term management arrangements for any recovered artefacts will be determined in consultation and with the agreement of the RAPs and in accordance with Requirement 26 of the Code of Practice if appropriate.

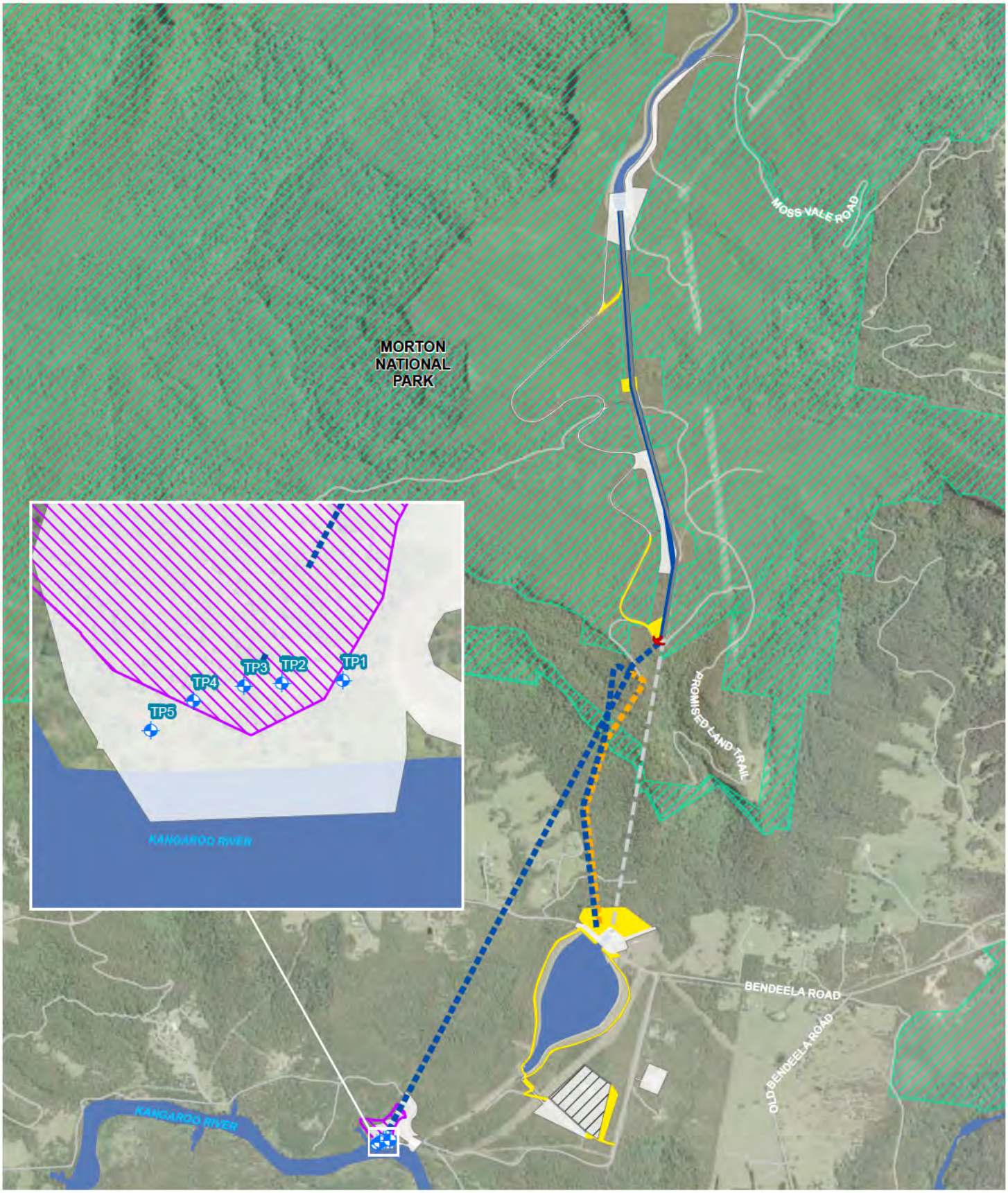

Figure 5.1 Location of test pits

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5.3 Results of test excavation program

5.3.1 Test Pits

Table 5-2 summarises the test excavation program undertaken at the Bendeela Power Station PAD. The locations of Test Pits are shown in **Figure 5-1**.

Table 5-2. Test Pit locations

Test Pit	Dimensions (mm)	Zone	Easting	Northing
Test Pit 1	500 x 500 mm	56	[redacted]	[redacted]
Test Pit 2	500 x 500 mm	56	[redacted]	[redacted]
Test Pit 3	500 x 500 mm	56	[redacted]	[redacted]
Test Pit 4	500 x 500 mm	56	[redacted]	[redacted]
Test Pit 5	500 x 500 mm	56	[redacted]	[redacted]

5.3.1.1 Test Pit 1

Test Pit 1 was located 20 m to the west of the western boundary fence of Bendeela Power Station. The Test Pit was excavated in 100 mm spits. The soil profile was generally consistent with the results from nearby test pits, with notable inclusions of gravel through all excavation units down to the natural clay.

Natural clay was identified at 500 mm depth and as such excavation of the test pit was subsequently terminated (**Figure 5-2** and **Figure 5-3**). Aboriginal objects were identified in Spits 2 and 5 (**Table 5-3**).

Table 5-3. Test Pit 1 Summary

Spit	Depth (mm)	Notes	No. Artefacts
1	0 – 100	Dark (Black) sandy loam, humic deposit with a lop layer of grass. Frequent rooty bioturbation is present and the deposit is fine grained.	3
2	100 – 200	Light brown sandy loam, but similar to Spit 1. Frequent gravel inclusions are present with less rooty bioturbation.	4
3	200 - 300	Same as Spit 2. Light brown sandy loam with frequent gravel inclusions are present with less rooty bioturbation.	0
4	300 - 400	Same as Spit 2 and 3. Light brown sandy loam with frequent gravel inclusions are present with some rooty bioturbation.	0
5	400 - 500	Same as Spit 2, 3 and 4. Light brown sandy loam with frequent gravel inclusions are present with less rooty bioturbation. This layer is at the interface with a red / orange clay at 500 mm depth at northern side of test pit and 450 mm at southern end. Termination of test pit.	1

Figure 5-2. Test Pit 1 termination, vantage point north

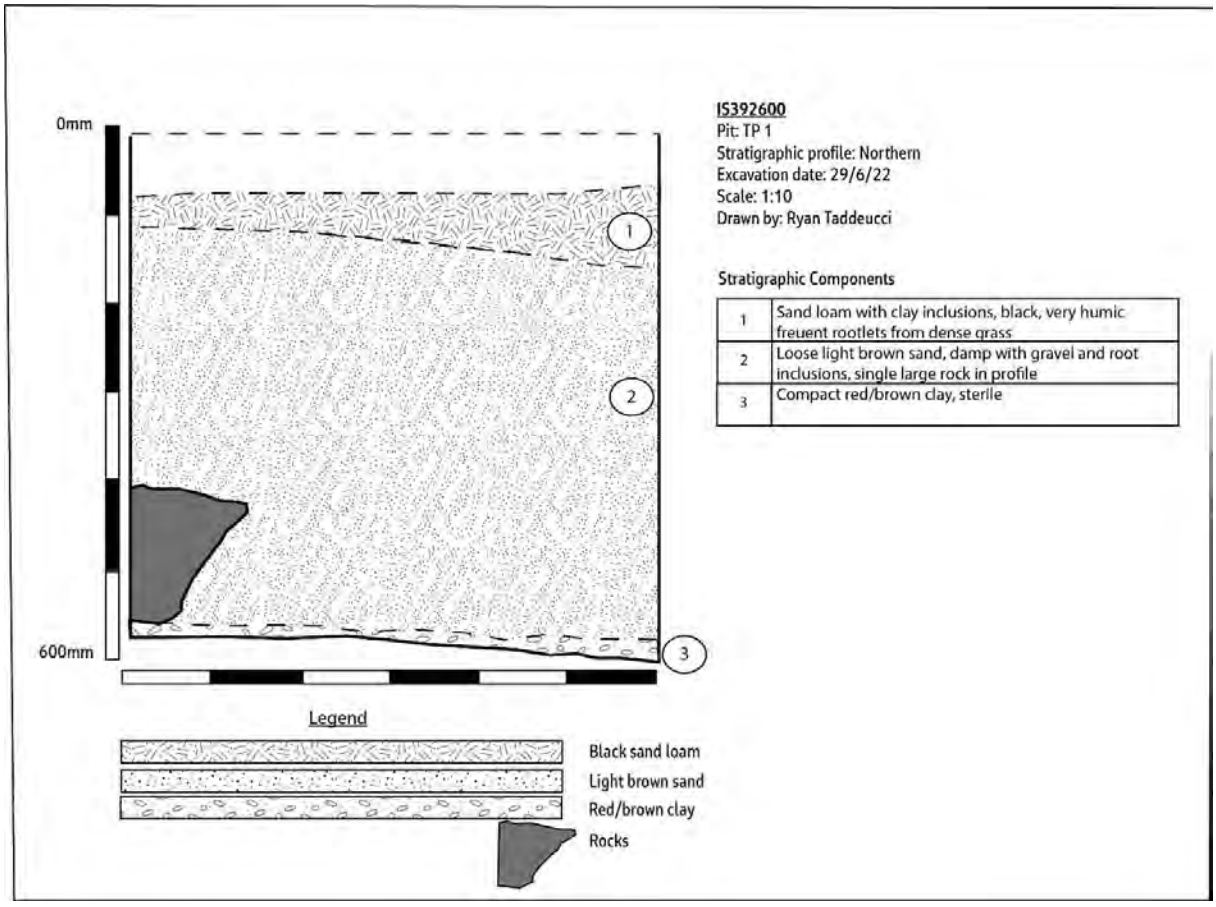


Figure 5-3. North Section of Test Pit 1

5.3.1.2 Test Pit 2

Test Pit 2 was located 25 m to the west of Test Pit 1 and was excavated in 100 mm spits. The stratigraphic profile was generally consistent with the results from neighbouring pits, displaying a thin dark sandy loam topsoil overlying a dark brown / dark yellowish brown sandy loam of approximately 500 mm depth. Gravel inclusions were more infrequent in Test Pit 2 in comparison to Test Pit 1. Natural clay was identified at 600 mm depth and as such excavation of the test pit was subsequently terminated (**Figure 5-4**, **Figure 5-5**). Aboriginal objects were identified in Spits 1 and 2 (**Table 5-4**).

Table 5-4. Test Pit 2 Summary

Spit	Depth (mm)	Notes	No. Artefacts
1	0 – 100	Dark (Black) sandy loam, humic deposit with a top layer of grass. Rooty bioturbation is present.	1
2	100 – 200	Dark brown sandy loam, slightly lighter than the previous humic layer. Fewer root inclusions are present with some gravel.	6
3	200 - 300	Same as Spit 2. Dark brown sandy loam. Root inclusions are present with some gravel.	0
4	300 - 400	Same as Spit 2 and 3. Dark brown sandy loam. Root inclusions are present with some gravel.	0
5	400 - 500	Same as Spit 2, 3 and 4. Dark brown sandy loam. Root inclusions are present with some gravel.	0
6	500 - 600	Same as Spit 2, 3 and 4, 5. Dark brown sandy loam. Root inclusions are present with some gravel. Lower layer of the deposit at the interface of the red / orange clay which was encountered at 600 mm. Termination of Test Pit.	0

Figure 5-4. Test Pit 2 termination, vantage point north

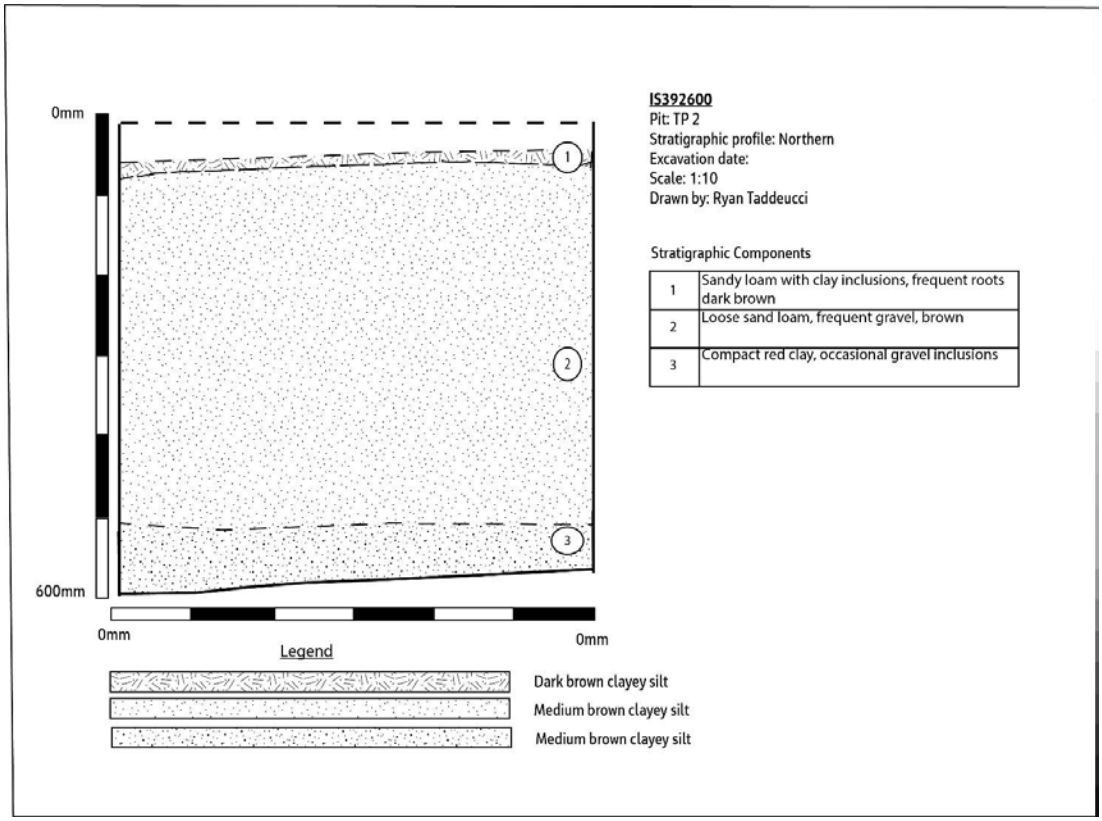


Figure 5-5. North Section of Test Pit 2

5.3.1.3 Test Pit 3

Test Pit 3 was located 15 m to the west of Test Pit 2 and was excavated in 100 mm spits. The stratigraphic profile of Test Pit 3 was consistent with the results of neighbouring pits, displaying a thin, dark and humic topsoil overlying a dark brown / dark yellowish brown sandy loam of approximately 500 mm depth. Few gravel inclusions were noted in this test pit.

Natural clay was identified at 600 mm depth and as such excavation of the test pit was subsequently terminated (**Figure 5-6**, **Figure 5-7**). Aboriginal objects were identified in Spits 1, 2, and 3 (**Table 5-5**).

Table 5-5. Test Pit 3 Summary

Spit	Depth (mm)	Notes	No. Artefacts
1	0 – 100	Dark brown sandy loam, very humic deposit with a top layer of thick grass. Rooty bioturbation is present as well as clay inclusions.	3
2	100 – 200	As per Spit 1, Dark brown sandy loam, very humic deposit. Rooty bioturbation is present, however there are no clay inclusions.	4
3	200 - 300	Same as Spit 2. Dark brown sandy loam. Root inclusions are present with some gravel.	1
4	300 - 400	Same as Spit 2 and 3. Dark brown sandy loam. Root inclusions are present with some gravel.	0
5	400 - 500	Same as Spit 2, 3 and 4. Dark brown sandy loam. Root inclusions are present with some gravel.	0
6	500 - 600	Same as Spit 2, 3 and 4, 5. Dark brown sandy loam. Comprises the lower layer of the deposit at the interface of the compacted red / orange clay which was encountered at 600 mm. Termination of Test Pit.	0

Figure 5-6. Test Pit 3 termination, vantage point north

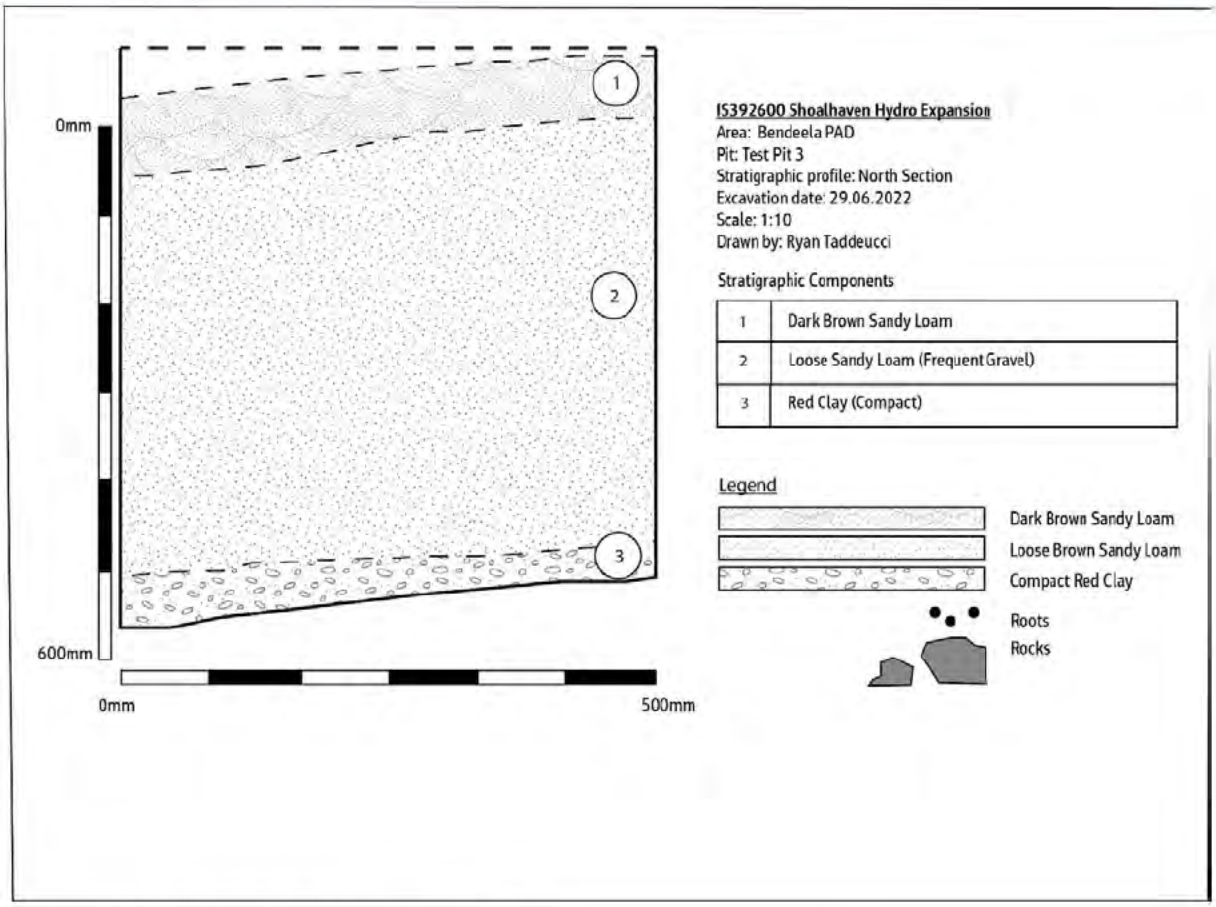


Figure 5-7. North section drawing of Test Pit 3

5.3.1.4 Test Pit 4

Test Pit 4 was located 20 m to the west of Test Pit 3. The pit was excavated in 50 mm spits as per the Code of Practice and Jacobs 2022 methodology to provide preliminary insights as to the stratigraphy of the PAD. The stratigraphic profile of Test Pit 4 was generally consistent with neighbouring test pits, with a thin, dark, humic topsoil overlying a brown sandy loam of approximately 500 mm depth. Charcoal flecks were however noted within Spits 1, 2 and 3. This is likely due to modern fire activity as recently as 2019.

Natural clay was identified at 650 mm depth and as such excavation of the test pit was subsequently terminated (**Figure 5-8**, **Figure 5-9**). Aboriginal objects were identified in Spits 1 – 3, 5, 8, 9, 12, and 13 (**Table 5-6**).

Table 5-6. Test Pit 4 Summary

Spit	Depth (mm)	Notes	No. Artefacts
1	0 – 50	Dark greyish brown sandy loam, very humic / charcoal deposit with a top layer of thick grass. Rooty bioturbation is present.	4
2	50 - 100	Dark greyish brown sandy loam, very humic / charcoal deposit with a top layer of thick grass. Rooty bioturbation is present.	2
3	100 - 150	Dark yellowish brown, firm sandy loam with increased yellow clay content and some charcoal. Less rooty than Spit 1 and 2.	5

Spit	Depth (mm)	Notes	No. Artefacts
4	150 - 200	Consistent with Spit 3. Dark yellowish brown, firm sandy loam with increased yellow clay content.	0
5	200 - 250	Consistent with Spit 3 and 4. Dark yellowish brown, firm sandy loam with increased yellow clay content.	1
6	250 - 300	Consistent with Spit 3, 4 and 5. Dark yellowish brown, firm sandy loam with increased yellow clay content.	0
7	300 – 350	Consistent with Spit 3, 4, 5 and 6. Dark yellowish brown, firm sandy loam with increasing yellow clay content. Soil characteristics were becoming similar to clayish sand with depth.	0
8	350 - 400	Consistent with Spit 3, 4, 5, 6 and 7. Dark yellowish brown, firm sandy loam with increasing yellow clay content. Soil characteristics were becoming similar to clayish sand with depth.	1
9	400 - 450	Consistent with Spit 8. Dark yellowish brown, firm sandy loam with increasing yellow clay content. Soil characteristics were becoming similar to clayish sand with depth.	1
10	450 – 500	Firm, clayish sand at the interface with the natural clay. Root and charcoal inclusions present with amounts of quartz and chert pebbles (< 30 mm)	0
11	500 – 550	Same as Spit 10. Charcoal and quartz pebble inclusions. The deposit is significantly rockier but with consistent soils as Spit 10.	0
12	550 - 600	Same as Spit 10. Charcoal and quartz pebble inclusions. The deposit is significantly rockier but with consistent soils as Spit 10.	1
13	600 – 650	Natural clay, light yellowish brown. Some imprinted charcoal from overlying topsoil, likely from burned roots. Termination of Test Pit 4.	1

Figure 5-8. Test Pit 4 termination, vantage point north

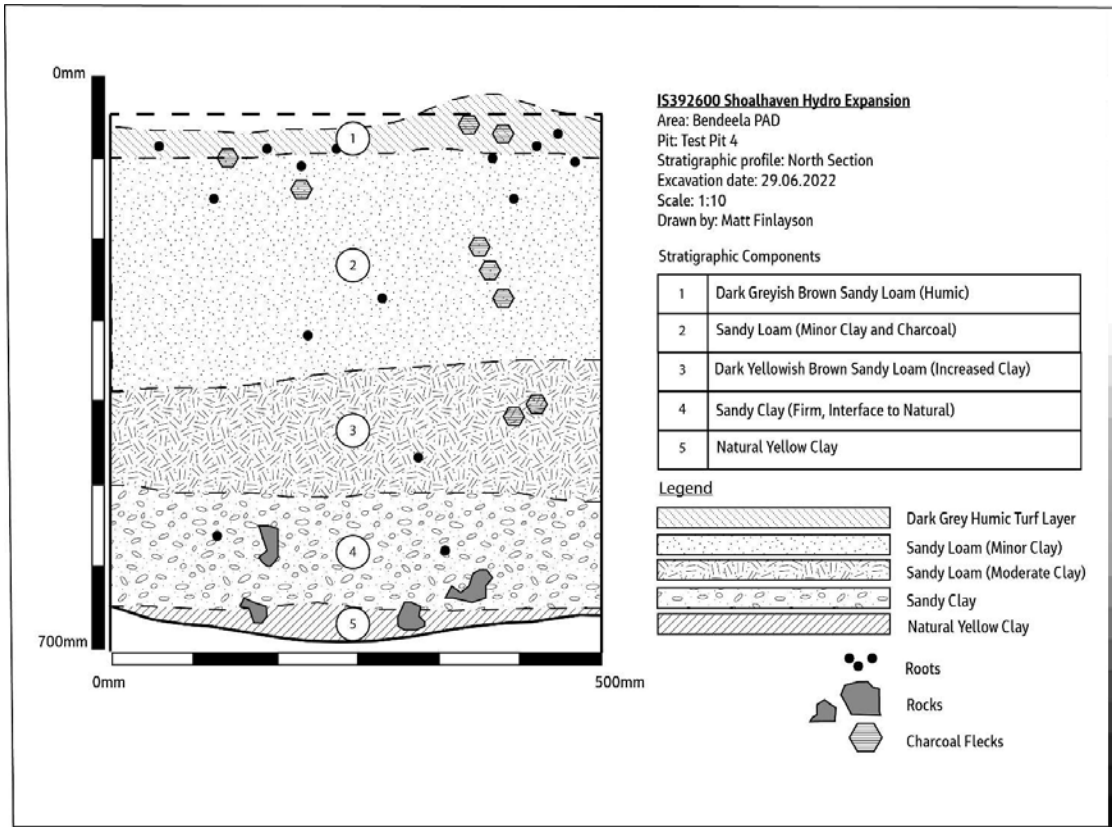


Figure 5-9. North section drawing of Test Pit 4

5.3.1.5 Test Pit 5

Test Pit 5 was located 20 m to the southwest of Test Pit 4. This pit was placed closer to the northern bank of the Kangaroo River so as to provide a sample of the lower slope / eroding bank. The soil characteristics of the pit were generally consistent with the thin, dark humic layer overlying a brownish sandy loam as seen in Test Pits 1 to 4.

However, Spits 4 to 8 (250 – 750 mm) were characterised by an increase in rock content which was not exhibited in Test Pits 1 to 4, increasing with each subsequent spit. Where Spit 4 generally contained pebble sized quartz and ironstone, Spit 8 contained a poorly sorted mix of pebbles (< 30 mm) to larger cobble sized rocks, generally of ironstone near the interface of the clay.

Natural clay was identified at 750 mm depth and as such excavation of the test pit was subsequently terminated (**Figure 5-10**, **Figure 5-11**). Aboriginal objects were identified in Spits 2, 3, and 6. (**Table 5-7**)

Table 5-7. Test Pit 5 Summary

Spit	Depth (mm)	Notes	No. Artefacts
1	0 – 50	Dark greyish brown sandy loam, very humic / charcoal deposit with a top layer of thick grass. Rooty bioturbation is present.	0
2	50 - 150	Dark yellowish brown sandy loam with charcoal, root bioturbation and quartz inclusions. Layer has been alluvially impacted by downslope erosion.	1
3	150 - 250	Same as Spit 2. Dark yellowish brown sandy loam with charcoal, root bioturbation and quartz inclusions. Layer has been alluvially impacted by downslope erosion. Fine deposit.	5
4	250 - 350	Dark yellowish brown sandy loam. Rocky layer of ironstone, quartz and sandstone fragments. 30 % inclusions, however the soils are consistent with Layer 2.	0
5	350 - 450	Same as Spit 4. Increasing rock content.	0
6	450 - 550	Same as Spit 4, increasing rock content.	1
7	550 - 650	Same as Spit 4 – 6. Charcoal and burned roots intermixed. Charcoal sample taken (Sample #1).	0
8	650 – 750	Same as Spit 4 – 7. Charcoal and burned roots intermixed. Larger cobbles intermixed compared to Spit 4 to 7. Large charcoal patch located on south side of test pit imprinted on natural clay surface. Charcoal sample taken (Sample #2) Terminated at Clay (750 mm)	0

Figure 5-10. Test Pit 5 termination photo, vantage point north

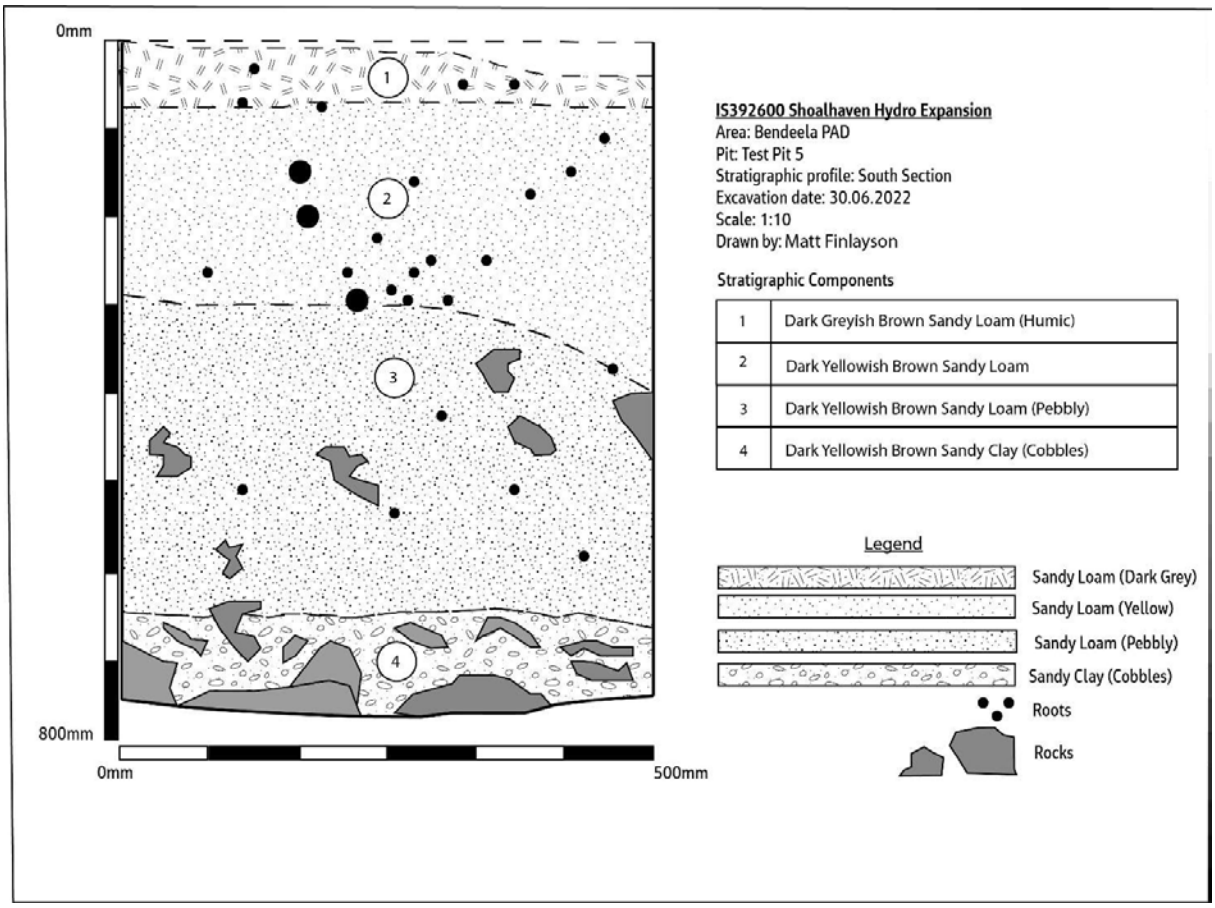


Figure 5-11. South section drawing of Test Pit 5

5.3.2 Soils, disturbances and deposit features

The soil profile within the Bendeela PAD area, as ascertained through the test excavation results generally comprises a thin, dark and humic A-Horizon layer of 30 mm to 50 mm overlying a dark greyish / yellowish brown sandy loam that ranged between 500 – 700 mm depth.

Natural clay was consistently identified at 600 – 750 mm depth, with variation of depth likely due to the sloped landform and depositional processes of natural alluvial run off from the north. Charcoal was consistently identified in all test pits, with a discernible increase of charcoal inclusions in Spit 8 of Test Pit 5 within the rocky / cobble layer of 650 – 750 mm depth at the interface of the natural clay. Charcoal samples were extracted from Spit 7 and 8 of Test Pit 5 for potential further testing, such as Radiocarbon (C14) dating (Sample No. #1, #2).

Disturbance was generally consistent through the testing program. Rooty bioturbation was prevalent in all test pits down to the natural clay. No faunal bioturbation such as ant or worm burrowing was noted. Burned root remains were noted in some pits as a result of natural bushfire activity.

No 'deposit features' were identified in the five test pits as a result of the archaeological testing.

5.3.3 Summary of recovered artefacts

The 2022 test excavation program retrieved a total of 46 artefacts from the 1.25 m² that was excavated across the site, resulting in an artefact density of 36.8 artefacts per m². The highest concentration of artefacts was retrieved from Test Pit 4, which yielded a total of 16 artefacts, 34.8% of the total site assemblage. As a result, Test Pit 4 is considered to be an artefact concentration, with a density of 64 artefacts/m². See **Table 5-8** for a summary of artefact counts and **Figure 5-12** for the spatial distribution. The full artefact catalogue has been included as **Appendix C**.

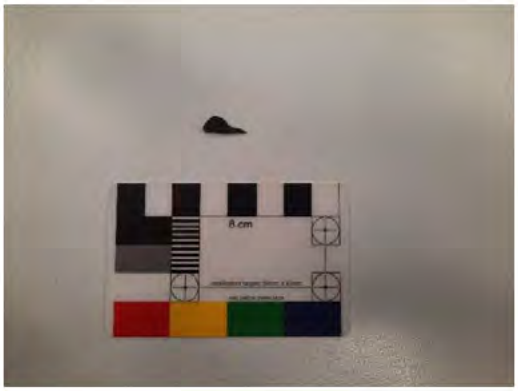
Excavations completed in 2019 resulted in the recovery of three Aboriginal objects from six test pits. Due to GPS inaccuracy the exact locations of the test pits cannot be determined and the 2019 data must be excluded from an assessment of artefact density across the extent of the site.

Table 5-8. Summary of artefacts per excavation unit

Excavation program	Test pit number	Count	Photos
2019	1 (1m x 1m pit)	1	
	2	0	-

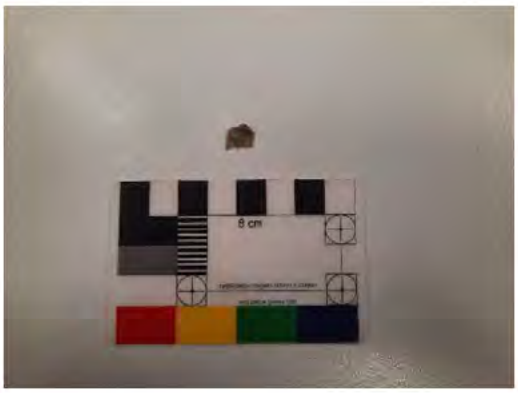
Excavation program	Test pit number	Count	Photos
	3	1	
	4	1	
	5	0	
	6	0	
2022	1	8	

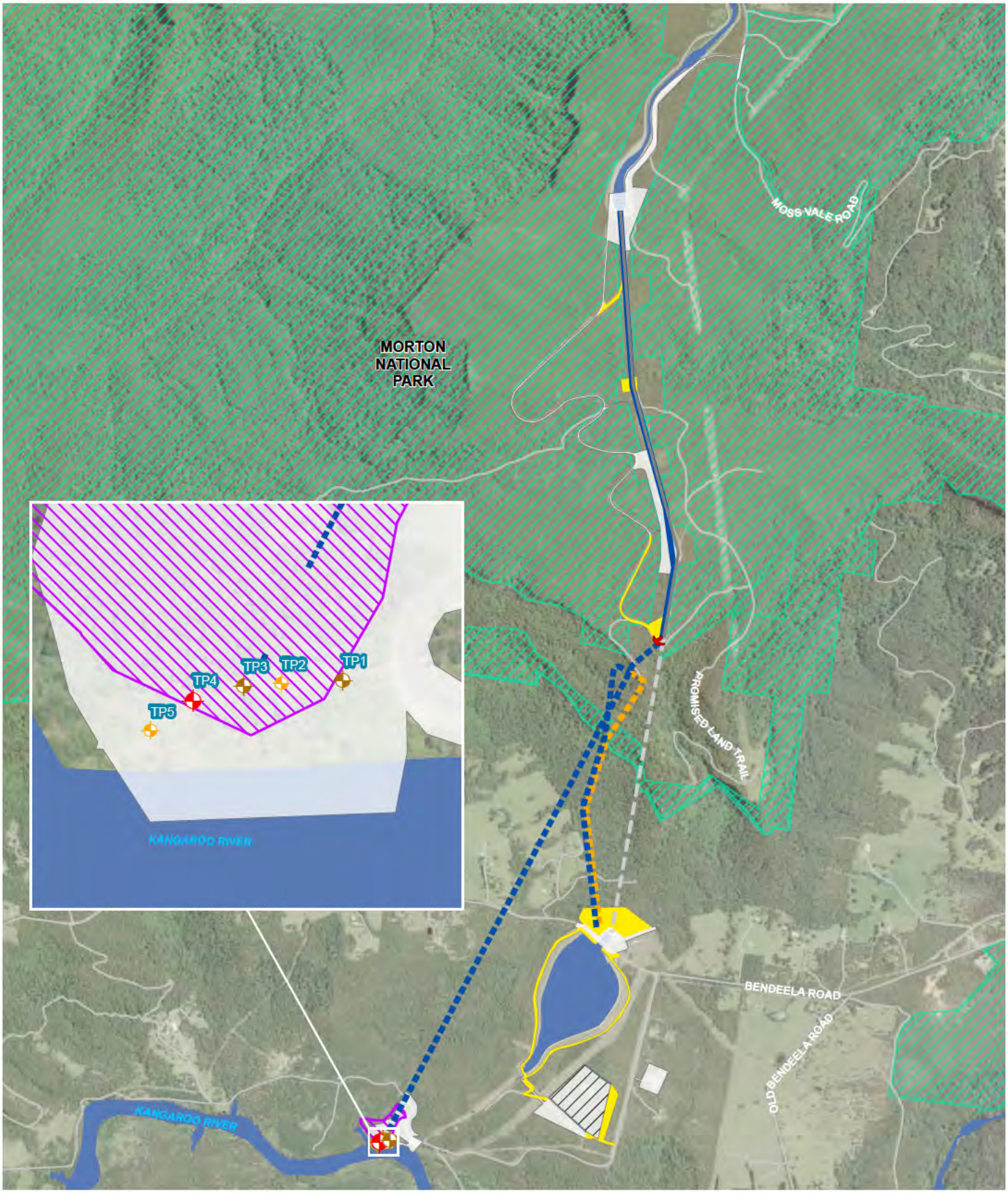
Excavation program	Test pit number	Count	Photos
			 
	2	7	 

Excavation program	Test pit number	Count	Photos
	3	8	  
	4	16	

Excavation program	Test pit number	Count	Photos
			   

Excavation program	Test pit number	Count	Photos
			  
	5	7	

Excavation program	Test pit number	Count	Photos
			 
Total		49	



Legend

- Existing KV tunnel alignment
- Existing scheme pipeline
- Indicative above ground pipeline
- Indicative tunnel alignment
- Indicative access tunnel
- Disturbance area
- Spoil site
- Additional areas since 2019

Test Pits

Number of Arctefacts

- 7
- 8
- 16

- Potential archaeological sensitivity
- BH 9 investigation area
- NPWS Reserve
- Road

0 1 2 km

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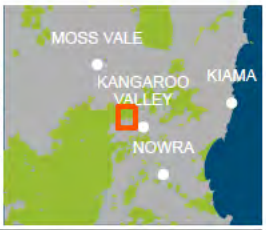

Data sources

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Figure 5-12 Artefact density across test pits

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5.3.4 Proposed update to AHIMS site extent

The results of the test excavation program have confirmed the presence of subsurface artefacts across the area of PAD. The test excavation program included excavations beyond the mapped extent of the area of PAD, which has resulted in the modification of the extent of the site (**Figure 5-13**).

AHIMS ID / Name: (52-4-0729) Bendeela Hydro AS01

[redacted]

[redacted]

Site type: Artefact scatter

Total number of features: 49

Length of site: 250 m

Width of site: 250 m

Maximum depth of site: 750 mm

Landform: Elevated hilltop, terrace

Notes: Bendeela Hydro AS01 was located on a densely vegetated hilltop, sloping down to Kangaroo River in the south. The site is bordered to the west by Kings Creek and a road associated with the Bendeela Hydroelectric pumping plant to the north and east. The test excavation programs resulted in the recovery of 49 Aboriginal objects.

The subsurface assemblage was primarily comprised of sediment stone (chert and mudstone) (n=21, 42.86%) with lesser numbers of quartzite, basalt, quartz, and silica (silcrete and chalcedony) (**Table 5-9**). These lithologies are considered common within the local and regional context. One piece of flaked ceramic was identified and may be indicative of post-contact occupation of the site, this will be discussed further in **Section 6**.

The assemblage was predominantly comprised of complete flakes (n=24, 48.98%) and flake fragments (n=14, 28.57)(**Table 5-10**). The relatively high presence of flake fragments is indicative of site disturbances that have damaged the artefact deposit, this will be further discussed in **Section 6**. The assemblage also included a single platform core (SPC), four core fragments and six pieces of debris. These are the by-products of stone tool manufacturing, and it is possible that tool manufacturing occurred within the site.

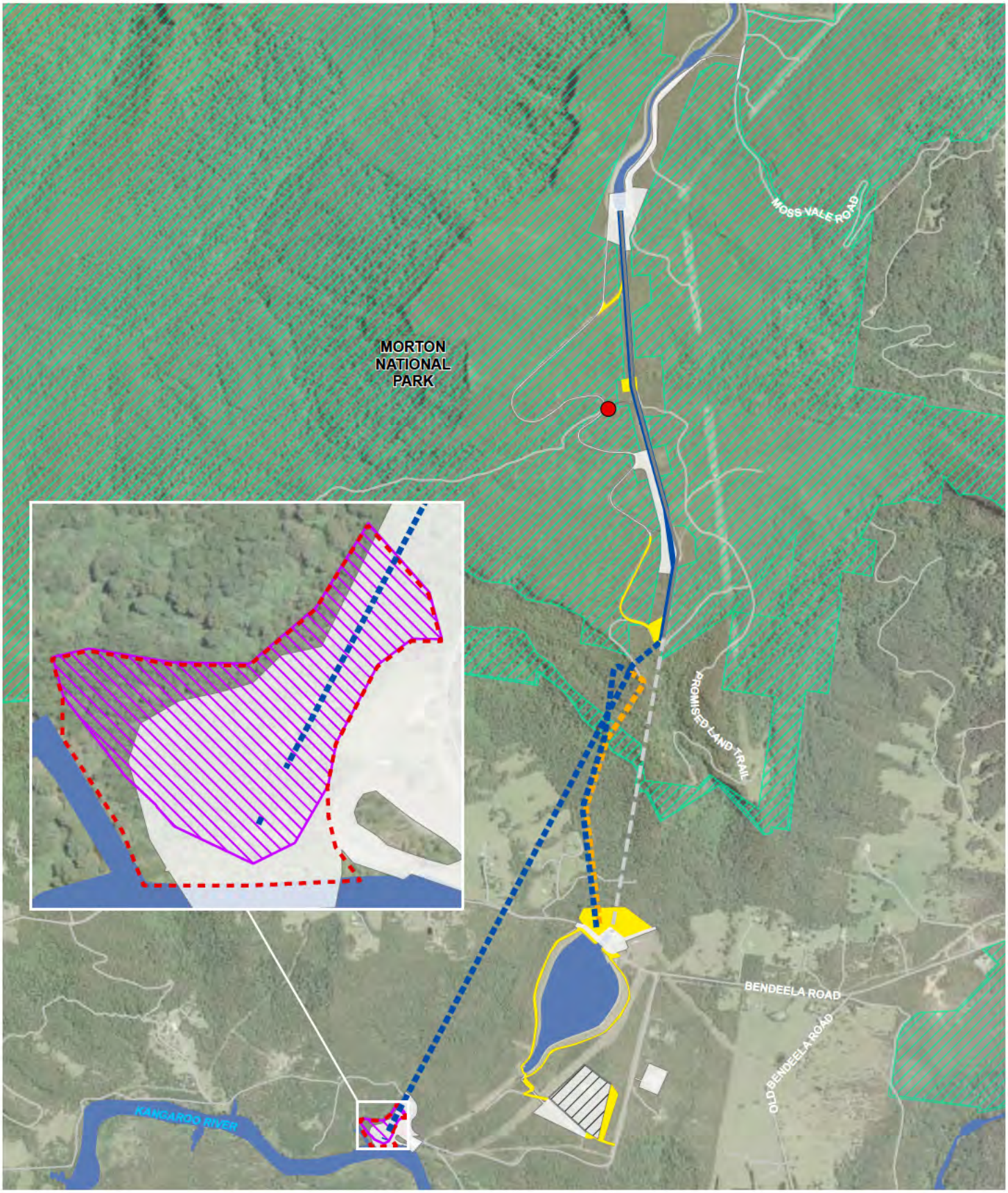
Table 5-9. Summary of subsurface lithologies

Lithology	Count	Percentage (%)
Basalt	5	10.20
Chalcedony	9	18.37
Chert	13	26.53
Mudstone	8	16.33
Quartz	7	14.29
Quartzite	4	8.16
Silcrete	2	4.08
Other - ceramic	1	2.04
Total	49	100.00

Table 5-10. Summary of subsurface artefact types

Type	Count	Percentage (%)
Debris	6	12.24
Complete Flake	24	48.98
Flake Fragment Proximal	6	12.24
Flake Fragment Marginal	2	4.08
Longitudinally broken left	3	6.12
Longitudinally broken right	3	6.12
Core - MPC	1	2.04
Core Fragment	4	8.16
Total	49	100.00

RAP Comments: [redacted] commented that the portions of the site closest to Kangaroo River would have been a place where Aboriginal people would be camped. Kangaroo River is considered of particular significance to contemporary Aboriginal people for its connection with the ancestors.



Legend

- Existing KV tunnel alignment
- Existing scheme pipeline
- Indicative above ground pipeline
- Indicative tunnel alignment
- Indicative access tunnel
- Disturbance area
- Spoil site
- Additional areas since 2019
- Potential archaeological sensitivity
- Promised Land Trail ST01
- Bendeela Hydro AS01
- NPWS Reserve
- Road
- Waterway
- Waterbody

0 1 2 km

1:30,000 at A4

GDA2020 MGA Zone 56

Data sources

Jacobs 2022
Department of Planning and Environment 2022
© Department of Customer Service 2020

Figure 5-13 Locations of newly identified sites

Date: 15/07/2022 Path: \\ausyd0vs01\GIS\Proj\NSW_IS\339200_ShoalhavenEIS\Apps\3392900_Heritage.aprx
Created by: JB | QA by: CC

6. Analysis and discussion

6.1 Artefact analysis and discussion of site integrity

Interpretations of artefact assemblages are closely linked to the archaeological integrity of the deposit in which they are identified. Where significant taphonomic processes have disturbed an archaeological deposit, artefacts may have been displaced, removed, or added to the assemblage, altering the composition of the assemblage and the interpretation of past activities within the site. To mitigate against potential misinterpretations of human activity, it is necessary to assess the archaeological integrity of the deposits within the test area.

Analysis of the vertical distribution of the artefacts, artefact breakage and the presence of conjoins can also reveal high or low integrity of the assemblage. Vertical distribution analysis can reveal the influence of post-depositional disturbances such as bioturbation, ploughing activities and erosion. on the assemblage, potentially highlighting the movement or conflation of artefacts vertically. This analysis is also useful in identifying the chronology of the artefacts, as peaks in densities may reflect peaks in occupation.

The movement of water and wind across the site is more likely to remove smaller artefacts than larger artefacts. Artefact weight analysis enables an examination of the artefact size by depth to understand the movement of the artefacts post-deposition. It is important to note that the sieve employed did not capture artefacts <5mm, therefore artefacts between 1-5mm, even if present were not recovered.

Assessing the size of the artefacts vertically (**Table 6-1**) does not reveal any major size sorting. However, the heaviest artefacts were located towards the base on the deposit and a post-depositional event may have removed smaller artefacts. It is important to note that the small size of the assemblage limits the interpretation of the results.

Table 6-1. Average artefact weight by spit

Spit / depth	Count	Average weight
1 / 0-100 mm	13	2.24
2 / 100-200 mm	20	1.39
3 / 300-300 mm	7	0.33
4 / 300-400 mm	1	1.12
5 / 400-500 mm	2	0.41
6 / 500-600 mm	2	8.79
7 / 600-700 mm	1	0.43
Total	46	1.72

Specific types of breakage can occur during knapping and post-deposition. Transverse and longitudinal splits only occur during knapping (Holdaway and Stern, 2004), therefore acting as indicators of on-site manufacture. Marginal and medial breaks can occur due to post-depositional disturbance such as trampling and ploughing. The rate at which the artefacts were covered by sediment and the softness of the raw material also affects the breakage patterns. High rates of medial and marginal breaks reflect higher rates of post-depositional disturbance. No medial or marginal fragments were identified within the assemblage, indicating breakage due to artefact manufacture rather than post-depositional disturbance.

Overall, the assemblage displays some possible indicators of post-depositional disturbance, with few small artefacts, several broken flakes and no conjoins present. However, it is important to note that the assemblage is small, and therefore analysis will not yield statistically meaningful results. Disturbance was visible across the study are, likely impacting the archaeological integrity of the study area.

6.2 Potential evidence of contact archaeology

Several isolated historical artefacts were recovered during sieving. They were not associated with any historical sites or structures and were likely the result of alluvial activities flood deposition or ground disturbances associated with recent construction activities. These were bagged, and two glass artefacts pieces were considered for potential working by Aboriginal people.

Goward (2011) proposed a classification scheme of glass artefacts in Australia, which includes primary and secondary categories. Goward's scheme requires that either 100%of the primary criteria, or 50% of each the primary and secondary criteria must be satisfied in order to confidently identify a glass Aboriginal artefact (Goward 2011, 50–65). Goward's criteria has been adapted to assess a potential ceramic Aboriginal object recovered from Test Pit 1 (**Table 6-2**).

The ceramic object does not meet 100% of the primary criteria or 50% of the primary criteria and 50% of the secondary criteria. As a result, the ceramic object is not considered to be an Aboriginal object.

Table 6-2. Assessment of ceramic object

Spit / depth	Discussion
Primary: material dateable to 18th or 19th century manufacture	No – insufficient amount of material to verify date of manufacture
Primary: Presence of macroscopic edge damage or residue	No evidence of edge damage – residue analysis not completed but likely not applicable due to artefact cleaning
Primary: Presence of 'convincing' retouch	No evidence of retouch present
Primary: Presence of technological attributes related to stone artefact manufacturing techniques	Yes, clear features present, including an eraillure scar immediately below the bulb and platform.
Secondary: Absence of attributes related to unintentional artefact damage	Yes, no clear attributes that would indicate unintentional artefact damage.
Secondary: Absence of taphonomic processes related to incidental flaking	Yes, site context indicates that it is unlikely that artefacts have been damaged by post-depositional processes.
Secondary: Evidence of a reduction sequence	No clear negative flake scars or other flaked pieces of the same material within the assemblage.
Secondary: Presence of associated contemporary material culture	Yes, glass and three additional unworked pieces of ceramic present.
Secondary: Availability of associated historical or ethnographic evidence	Yes, Kayla Williamson noted that Aboriginal people were present in the area post-contact at Hill 60 near Port Kembla. Aboriginal people were relocated from Port Kembla during WW2 to a farm near the study area. An official mission may also be located near the study area.
Secondary: Presence of thick material	No, material is relatively thin, >5mm in thickness.

6.3 Settlement history

The assemblage included silcrete, chert, mudstone, quartz, and quartzite. As a result, the nature of the assemblage is consistent with the established local and regional character outlined in **Section 3.5**. The assemblage identified within Bendeela Hydro AS01 features high lithological diversity, which is indicative of long-term site occupation by groups of people travelling greater distances to retrieve diverse raw materials for on-site tool manufacture. Based on the presence of quartz artefacts and small cores, the assemblage is likely to date to the Middle Bondaian phase (4000 – 1000 years BP).

7. Assessment of scientific values

7.1 Assessment criteria

In accordance with the Code of Practice, an assessment of the scientific value of an Aboriginal object or place is required in order to form the basis of its management. The Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW (the Guide) (Office of Environment and Heritage [OEH] 2011) provides the following criteria for the assessment of scientific value:

Research potential – does the evidence suggest any potential to contribute to an understanding of the area and/or region and/or state's natural and cultural history?

Representativeness – how much variability (outside and/or inside the subject area) exists, what is already conserved, how much connectivity is there?

Rarity – is the subject area important in demonstrating a distinctive way of life, custom, process, land-use, function or design no longer practised? Is it in danger of being lost or of exceptional interest?

Education potential – does the subject area contain teaching sites or sites that might have teaching potential?

It is important to note that heritage significance is a dynamic value.

7.2 Scientific value

7.2.1 Promised Land Trail ST01

No previously recorded scarred trees were identified within the local area during the AHIMS search, and a scarred tree is therefore considered rare in the local context. The scarred tree was found to be in good condition and featured diagnostic characteristics. Therefore, Promised Land Trail ST01 is considered to be of moderate educational and representative value. Dendrochronological analysis could be completed on the tree to determine the age of tree and provide further insight into the occupational and utilisation of the study area by Aboriginal people. As a result, Promised Land Trail ST01 is considered to be of moderate research value. Overall, Promised Land Trail ST01 is of moderate scientific value.

7.2.2 Bendeela Hydro AS01

Based on the results of the AHIMS search, artefact scatters are relatively rare within the local context. Bendeela Hydro AS01 features diagnostic stone artefacts that are representative of Aboriginal occupation and artefact manufacturing processes. Therefore, the site is considered to be of moderate educational and representative value. Charcoal samples were exacted during the test excavation program, and there is potential to further investigate the date of the site through Radiocarbon (C14) dating. The nature of the assemblage has indicated that it likely dates to the Middle Bondaian phase (4000 – 1000 years BP). C14 dating may challenge or support this interpretation.

7.2.3 Summary

A summary of scientific significance for the study area is provided in **Table 7-1**.

Table 7-1. Summary of scientific values

Site name (AHIMS ID)	Research potential	Representativeness	Rarity	Education potential	Overall significance assessment
Promised Land Trail ST01 (#52-4-0730)	Moderate	Moderate	Moderate	Moderate	Moderate
Bendeela Hydro AS01 (#52-4-0729)	Moderate	Moderate	Moderate	Moderate	Moderate

8. Impact assessment

8.1 Description of likely impacts

An indicative project layout based on the current reference design is provided in **Figure 1-2** and consists of the construction and operation of:

- A surface pipeline from the existing Fitzroy Falls Canal control structure to a surge tank
- Vertical shaft and headrace tunnel to an underground power station
- An underground power station cavern housing a reversible generator and pump capable of supplying approximately 235 MW of hydroelectric power, including associated access tunnel and ventilation shaft, transformer and high voltage cable route to the existing Kangaroo Valley Power Station substation
- A tailrace tunnel and intake /outlet structure in the vicinity of the existing Bendeela Power Station on Lake Yarrunga
- A vehicular access tunnel to the underground power station from the vicinity of the existing Kangaroo Valley Power Station
- Ancillary works which may include the carrying out of works to upgrade or construct access roads, spoil disposal sites, utilities infrastructure, construction compounds and construction power supply.

8.2 Potential impacts to Aboriginal objects

Based on the current design plans, Promised Land Trail ST01 will not be impacted by any works and will not be harmed. Ground disturbing works are planned to take place within the extent of Bendeela Hydro AS01 that will result in partial harm and a partial loss of value.

A summary of the assessed impacts in accordance with the Code of Practice is included in **Table 8-1**.

Table 8-1. Summary of potential impacts

Site name (AHIMS ID)	Type of harm	Degree of harm	Consequence of harm
Promised Land Trail ST01 (#52-4-0730)	None	None	None
Bendeela Hydro AS01 (#52-4-0729)	Direct	Partial	Partial loss of value

9. Management and mitigation measures

9.1 Guiding principles

The overall guiding principle for cultural heritage management is that where possible Aboriginal sites would be conserved. If conservation is not practical, measures would be taken to mitigate against impacts to Aboriginal sites.

Where unavoidable impacts occur then measures to mitigate and manage impacts are proposed. Mitigation measures primarily concern preserving the heritage values of sites beyond the physical existence of the site. The most common methods involve detailed recording of Aboriginal objects, archaeological salvage excavations, artefact analysis and, where appropriate, reburial of Aboriginal objects in a location determined by the RAPs.

Mitigation measures vary depending on the assessment of archaeological significance of a particular Aboriginal site and are based on its research potential, rarity, representatives and educational value. In general, the significance of a site would influence the choice of preferred conservation outcomes and appropriate mitigation measures, usually on the following basis:

- **Low scientific value** - Conservation where possible, but usually no mitigation required if impacts are unavoidable
- **Moderate scientific value** - Conservation where possible. If conservation is not practicable, salvage excavations or similar mechanisms determined in consultation with the Aboriginal community may be necessary
- **High scientific value** - Conservation as a priority. Only if all practicable alternatives have been exhausted would impacts be considered justified. Comprehensive salvage excavations may be necessary.

Promised Land Trail ST01 will not be impacted by the project. However due to the close proximity of the site to an access road it is recommended that exclusion fencing is established to ensure that the site is not impacted.

Bendeela Hydro AS01 moderate significance. Therefore, where conservation is not practicable, mitigation measures, such as salvage excavations may be required. Salvage works would require the Minister's Conditions of Approval as authorisation.

9.2 Salvage excavation

Bendeela Hydro AS01 has been assessed as being of moderate archaeological significance. Therefore, it is recommended that a salvage excavation program to record the full extent of the intact artefact concentration occur.

The aim of salvage excavations would be to mitigate impacts by further investigating the areas of high density identified during test excavation. Targeted salvage would be an appropriate mitigation measure based on the lack of integrity identified across the wider site extent and the lack of ability to reduce proposed impacts associated with future use.

9.3 Long term management of test excavation artefact assemblage

It is proposed that Aboriginal objects recovered from the test excavation are reburied on site in an area that will not be subject to future impacts. Further information on the long-term care and management of the retrieved artefact assemblages is included in the ACHAR.

9.4 Ongoing consultation with Aboriginal stakeholder groups

Consultation with the registered Aboriginal stakeholders would continue throughout the life of the project, as necessary. Ongoing consultation with registered Aboriginal stakeholders will take place throughout all facets of the project, including salvage excavations, surface collection, reburial of retrieved artefacts and in the event of any unexpected Aboriginal objects being identified during works.

10. Conclusions and recommendations

10.1 Conclusion

The following points summarise the assessment that has been undertaken for this project:

- A search of the AHIMS database was undertaken on 11 February 2022 for an area of land at datum GDA, zone 56, eastings 264974 – 273849, northings 6150178 – 6162300 with a buffer of 0 meters. No previously identified Aboriginal sites are located within the project area
- The archaeological survey was undertaken on the 27th and 28th of June 2022. The results of which are as follows:
  - No Aboriginal sites and / or objects were identified in Survey Units 1, 2, 4 – 10
  - One new site, being Promised Land Trail ST01 (#52-4-0730) was identified in Survey Unit 3 within the curtilage of Morton National Park
- Archaeological test excavations were undertaken over two days with RAP Sites Officers on 29 June and 30 June 2022 at the Bendeela Power Station PAD. The results of which are as follows:
  - A total of five test pits were excavated during the two day program
  - Aboriginal objects were retrieved from all five test pits excavated by Jacobs Archaeologists and RAP Sites Officers
  - Two charcoal samples were taken from Spit 7 and 8 of Test Pit 5, being Sample #1 and Sample #2 respectively

The following conclusions are made based on the assessment:

- Two Aboriginal objects were identified in the project area – Promised Land Trail ST01 and Bendeela Hydro AS01
- According to current design plans
  - Promised Land Train ST01 will not be harmed by the project
  - Bendeela Hydro AS01 will be subject to harm by the project. This harm will result in a partial loss of value.

10.2 Recommendations

The following recommendations are made a result of the findings of the assessment:

- An ACHAR should be prepared in compliance with the Aboriginal heritage requirements of SEARS application no. SSI-10033
- The ACHAR will include appropriate management measures for Aboriginal cultural heritage for this project, including avoidance of harm where possible, mitigations for harm where unavoidable and long term management for excavated Aboriginal objects
- The ACHAR should include a methodology for the targeted salvage excavation of the subsurface artefact concentration within Bendeela Hydro AS01
- To keep consultation current, the registered Aboriginal parties should be sent an update on the project everything six months, until project approval has been obtained.

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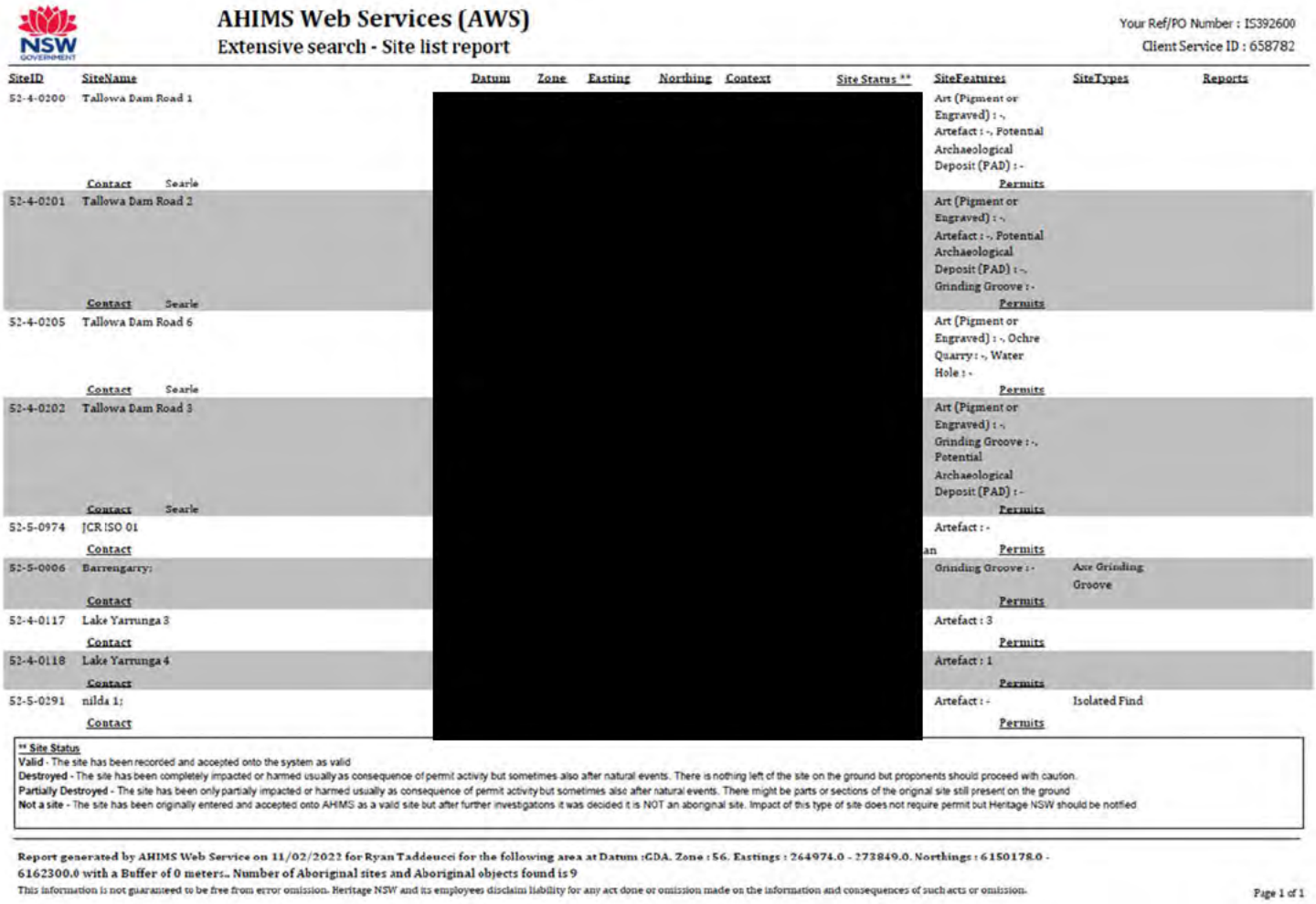
Appendix A AHIMS data



AHIMS Web Services (AWS)
Extensive search - Site list report

Your Ref/PO Number : IS392600
Client Service ID : 658782

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
52-4-0200	Tallowa Dam Road 1	[redacted]						Art (Pigment or Engraved) : -, Artefact : -, Potential Archaeological Deposit (PAD) : -		
	Contact Searle							Permits		
52-4-0201	Tallowa Dam Road 2							Art (Pigment or Engraved) : -, Artefact : -, Potential Archaeological Deposit (PAD) : -, Grinding Groove : -		
	Contact Searle							Permits		
52-4-0205	Tallowa Dam Road 6							Art (Pigment or Engraved) : -, Ochre Quarry : -, Water Hole : -		
	Contact Searle							Permits		
52-4-0202	Tallowa Dam Road 3							Art (Pigment or Engraved) : -, Grinding Groove : -, Potential Archaeological Deposit (PAD) : -		
	Contact Searle							Permits		
52-5-0974	JCR ISO 01							Artefact : -		
	Contact							an Permits		
52-5-0006	Barrengarry;							Grinding Groove : -	Axe Grinding Groove	
	Contact							Permits		
52-4-0117	Lake Yarrunga 3							Artefact : 3		
	Contact							Permits		
52-4-0118	Lake Yarrunga 4							Artefact : 1		
	Contact							Permits		
52-5-0291	nilda 1;							Artefact : -	Isolated Find	
	Contact							Permits		

** Site Status
Valid - The site has been recorded and accepted onto the system as valid
Destroyed - The site has been completely impacted or harmed usually as consequence of permit activity but sometimes also after natural events. There is nothing left of the site on the ground but proponents should proceed with caution.
Partially Destroyed - The site has been only partially impacted or harmed usually as consequence of permit activity but sometimes also after natural events. There might be parts or sections of the original site still present on the ground
Not a site - The site has been originally entered and accepted onto AHIMS as a valid site but after further investigations it was decided it is NOT an aboriginal site. Impact of this type of site does not require permit but Heritage NSW should be notified

Report generated by AHIMS Web Service on 11/02/2022 for Ryan Taddeucci for the following area at Datum :GDA, Zone : 56, Eastings : 264974.0 - 273849.0, Northings : 6150178.0 - 6162300.0 with a Buffer of 0 meters., Number of Aboriginal sites and Aboriginal objects found is 9

This information is not guaranteed to be free from error omission. Heritage NSW and its employees disclaim liability for any act done or omission made on the information and consequences of such acts or omission.

Page 1 of 1

Appendix B Excavation records

Job Title: [Insert project name and type of excavation]
Job No: [Insert project number]

Jacobs

Site Information

Site Name/Number: Shoalhaven Date: 30/6/22 Recorder: R. Tollhurst

Test Pit No: 1 Spit No: 1 Depth: 0-100mm

Square Dimensions: 500 x 500mm Layer:

Coordinates (GDA94) – MGA Zone: [redacted]

Excavation comments

Same as previous spit:	(N/A)	No	Yes	Yes+
Sediment composition:	Loam	Sand	(Sandy loam)	Other:
Sediment colour:				
Sediment compactness:	Loose	(Friable)	Firm	Compact
Sediment moisture content:	Dry	(Damp)	Moist	Wet
Inclusions:	(Roots) Gravel	Ants	Shell	Charcoal Other

Other Features/Comments:

Dark (Black) humic deposit with a top layer of grass. Frequent roots + bioturbation. Deposit is fine.

Cultural Material / Features

Total Artefact Number: Artefact Materials:

Comments on cultural material:

Job Title: [Insert project name and type of excavation]
Job No: [Insert project number]

Jacobs

Site Information

Site Name/Number: Shoalhaven Date: 30/6/22 Recorder: R. Faulkner

Test Pit No: 1 Spit No: 2 Depth: _____

Square Dimensions: 500×500mm Layer: _____

Coordinates (GDA94) – MGA Zone: [redacted]

Excavation comments

Same as previous spit:	(N/A)	No	Yes	(Yes+)
Sediment composition:	Loam	Sand	(Sandy loam)	Other:
Sediment colour:				
Sediment compactness:	Loose	(Friable)	Firm	Compact
Sediment moisture content:	Dry	(Damp)	Moist	Wet
Inclusions:	(Roots) (Gravel)	Ants	Shell	Charcoal Other

Other Features/Comments:

Similar to previous layer, less humic, lighter colour - light brown. Frequent gravel inclusions - less roots.

Cultural Material / Features

Total Artefact Number: _____ Artefact Materials: _____

Comments on cultural material:

Job Title: [Insert project name and type of excavation]
Job No: [Insert project number]

Jacobs

Site Information

Site Name/Number: Shoalhaven Date: 30/6/22 Recorder: R. Tallace

Test Pit No: 1 Spit No: 3 Depth: 200-300mm

Square Dimensions: 500 x 500mm Layer:

Coordinates (GDA94) – MGA Zone: [redacted]

Excavation comments

Same as previous spit:	N/A	No	Yes	Yes+		
Sediment composition:	Loam	Sand	Sandy loam	Other:		
Sediment colour:						
Sediment compactness:	Loose	Friable	Firm	Compact		
Sediment moisture content:	Dry	Damp	Moist	Wet		
Inclusions:	Roots	Gravel	Ants	Shell	Charcoal	Other

Other Features/Comments:

Same as previous

Cultural Material / Features

Total Artefact Number: Artefact Materials:

Comments on cultural material:

Job Title: [Insert project name and type of excavation]
Job No: [Insert project number]

Jacobs

Site Information
Site Name/Number: Shoalhaven Date: 30/6/22 Recorder: R. Tolliver

Test Pit No: 1 Spit No: 4 Depth: 300 - 400

Square Dimensions: 500 x 500mm Layer: _____

Coordinates (GDA94) – MGA Zone: [redacted]

Excavation comments

Same as previous spit:	N/A	No	Yes	Yes+
Sediment composition:	Loam	Sand	Sandy loam	Other:
Sediment colour:				
Sediment compactness:	Loose	Friable	Firm	Compact
Sediment moisture content:	Dry	Damp	Moist	Wet
Inclusions:	Roots Gravel	Ants	Shell	Charcoal Other

Other Features/Comments:

Same as previous.

Cultural Material / Features

Total Artefact Number: _____ Artefact Materials: _____

Comments on cultural material:

Job Title: [Insert project name and type of excavation]
Job No: [Insert project number]

Jacobs

Site Information

Site Name/Number: Shoalhaven Date: 30/6/22 Recorder: R. Taldwell

Test Pit No: 1 Spit No: 5 Depth: 400 - 500

Square Dimensions: 500 - 500 mm. Layer:

Coordinates (GDA94) – MGA Zone: [redacted]

Excavation comments

Same as previous spit:	N/A	No	Yes	(Yes+)
Sediment composition:	Loam	Sand	(Sandy loam)	Other:
Sediment colour:				
Sediment compactness:	Loose	(Friable)	Firm	Compact
Sediment moisture content:	Dry	(Damp)	Moist	Wet
Inclusions:	(Roots) (Gravel)	Ants	Shell	Charcoal Other

Other Features/Comments:

Same as previous - coming down on a red/orange clay
500mm end on northern end - 400mm on southern end.
End of pit.

Cultural Material / Features

Total Artefact Number: Artefact Materials:

Comments on cultural material:

Job Title: [Insert project name and type of excavation]
Job No: [Insert project number]

Jacobs

Site Information

Site Name/Number: Shoalhaven Date: 29/6/22 Recorder: R. Taddeucci

Test Pit No: 2 Spit No: 1 Depth: 0-100

Square Dimensions: 500x500mm Layer:

Coordinates (GDA94) – MGA Zone: [redacted]

Excavation comments

Same as previous spit:	(N/A)	No	Yes	Yes+		
Sediment composition:	Loam	Sand	(Sandy loam)	Other:		
Sediment colour:						
Sediment compactness:	Loose	(Friable)	Firm	Compact		
Sediment moisture content:	Dry	(Damp)	Moist	Wet		
Inclusions:	(Roots)	Gravel	Ants	Shell	Charcoal	Other

Other Features/Comments:

Dark Brown Sediment - Root inclusion.

Cultural Material / Features

Total Artefact Number: Artefact Materials:

Comments on cultural material:

Job Title: [Insert project name and type of excavation]
Job No: [Insert project number]

Jacobs

Site Information

Site Name/Number: Shoalhaven Date: 29/6/22 Recorder: R Tollhurst

Test Pit No: 2 Spit No: 2 Depth: 100-200

Square Dimensions: 500 x 500mm Layer: _____

Coordinates (GDA94) – MGA Zone: [redacted]

Excavation comments

Same as previous spit:	N/A	No	(Yes)	Yes+	
Sediment composition:	Loam	Sand	(Sandy loam)	Other:	
Sediment colour:					
Sediment compactness:	Loose	(Friable)	Firm	Compact	
Sediment moisture content:	Dry	(Damp)	Moist	Wet	
Inclusions:	(Roots)	(Gravel)	Ants	Shell	Charcoal	Other

Other Features/Comments:

Dark brown colour - slightly lighter than previous layer. Fewer root inclusions.

Cultural Material / Features

Total Artefact Number: _____ Artefact Materials: _____

Comments on cultural material:

Job Title: [Insert project name and type of excavation]
Job No: [Insert project number]

Jacobs

Site Information

Site Name/Number: Shoalhaven Date: 29/6/22 Recorder: R. Tuffnell

Test Pit No: S2 Spit No: 3 Depth: 200-300 mm

Square Dimensions: 500-500 mm Layer:

Coordinates (GDA94) – MGA Zone: [redacted]

Excavation comments

Same as previous spit:	N/A	No	Yes	Yes+		
Sediment composition:	Loam	Sand	Sandy loam	Other:		
Sediment colour:						
Sediment compactness:	Loose	Friable	Firm	Compact		
Sediment moisture content:	Dry	Damp	Moist	Wet		
Inclusions:	Roots	Gravel	Ants	Shell	Charcoal	Other

Other Features/Comments:

Same as previous

Cultural Material / Features

Total Artefact Number: Artefact Materials:

Comments on cultural material:

Job Title: [Insert project name and type of excavation]
Job No: [Insert project number]

Jacobs

Site Information

Site Name/Number: Shoalhaven Date: 29/6/22 Recorder: R. Tedmanson

Test Pit No: 2 Spit No: 4 Depth: 300 - 400mm

Square Dimensions: 500x500mm Layer:

Coordinates (GDA94) – MGA Zone: [redacted]

Excavation comments

Same as previous spit:	N/A	No	(Yes)	Yes+		
Sediment composition:	Loam	Sand	(Sandy loam)	Other:		
Sediment colour:						
Sediment compactness:	Loose	(Friable)	Firm	Compact		
Sediment moisture content:	Dry	(Damp)	Moist	Wet		
Inclusions:	(Roots)	(Gravel)	Ants	Shell	Charcoal	Other

Other Features/Comments:

Same as previous.

Cultural Material / Features

Total Artefact Number: Artefact Materials:

Comments on cultural material:

Job Title: [Insert project name and type of excavation]
Job No: [Insert project number]

Jacobs

Site Information

Site Name/Number: Shoalhaven Date: 29/6/22 Recorder: R. Taddeucci

Test Pit No: 2 Spit No: 5 Depth: 400 - 500 mm

Square Dimensions: 500 - 500mm Layer: _____

Coordinates (GDA94) – MGA Zone: [redacted]

Excavation comments

Same as previous spit:	N/A	No	(Yes)	Yes+	
Sediment composition:	Loam	Sand	(Sandy loam)	Other:	
Sediment colour:					
Sediment compactness:	Loose	(Friable)	Firm	Compact	
Sediment moisture content:	Dry	(Damp)	Moist	Wet	
Inclusions:	(Roots)	(Gravel)	Ants	Shell	Charcoal	Other

Other Features/Comments:

Same as previous.

Cultural Material / Features

Total Artefact Number: _____ Artefact Materials: _____

Comments on cultural material:

Job Title: [Insert project name and type of excavation]
Job No: [Insert project number]

Jacobs

Site Information

Site Name/Number: Shoalhaven Date: 29/6/22 Recorder: A. Tuddenham

Test Pit No: 2 Spit No: 6 Depth: 500-600

Square Dimensions: 500x500mm Layer:

Coordinates (GDA94) – MGA Zone: [redacted]

Excavation comments

Same as previous spit:	N/A	No	Yes	(Yes)
Sediment composition:	Loam	Sand	(Sandy loam)	Other:
Sediment colour:				
Sediment compactness:	Loose	(Friable)	Firm	Compact
Sediment moisture content:	Dry	(Damp)	Moist	Wet
Inclusions:	Roots (Gravel)	Ants	Shell	Charcoal Other

Other Features/Comments:

Same as previous - coming down on clay.
Clay - red / orange.
End of pit.

Cultural Material / Features

Total Artefact Number: Artefact Materials:

Comments on cultural material:

Job Title: [Insert project name and type of excavation]
Job No: [Insert project number]

Jacobs

Site Information

Site Name/Number: Shoalhaven Date: 29/6/22 Recorder: R. Tardiveau

Test Pit No: 3 Spit No: 1 Depth: 0-100 mm.

Square Dimensions: 500 mm x 450 mm Layer:

Coordinates (GDA94) – MGA Zone: [redacted]

Excavation comments

Same as previous spit:	(N/A)	No	Yes	Yes+	
Sediment composition:	Loam	Sand	(Sandy loam)	Other:	
Sediment colour:	Dark brown.				
Sediment compactness:	Loose	(Friable)	Firm	Compact	
Sediment moisture content:	Dry	Damp	(Moist)	Wet	
Inclusions:	(Roots)	Gravel	Ants	Shell	Charcoal	Other

Other Features/Comments:

Sediment was very humic. Surface was covered in dense grass. The deposit featured clay

Cultural Material / Features

Total Artefact Number: Artefact Materials:

Comments on cultural material:

Job Title: [Insert project name and type of excavation]
Job No: [Insert project number]

Jacobs

Site Information

Site Name/Number: Shoalhaven Date: 29/6/2022 Recorder: R. Tedeschi

Test Pit No: 3 Spit No: 2 Depth: 100-200 mm

Square Dimensions: 500mm x 500mm Layer:

Coordinates (GDA94) – MGA Zone: [redacted]

Excavation comments

Same as previous spit:	N/A	No	Yes	Yes+		
Sediment composition:	Loam	Sand	Sandy loam	Other:		
Sediment colour:						
Sediment compactness:	Loose	Friable	Firm	Compact		
Sediment moisture content:	Dry	Damp	Moist	Wet		
Inclusions:	Roots	Gravel	Ants	Shell	Charcoal	Other

Other Features/Comments:

As per previous - no clay present.

Cultural Material / Features

Total Artefact Number: Artefact Materials:

Comments on cultural material:

Job Title: [Insert project name and type of excavation]
Job No: [Insert project number]

Jacobs

Site Information

Site Name/Number: Shoalhaven Date: 29/6/22 Recorder: R. Taddeucci

Test Pit No: 3 Spit No: 3 Depth: 200-300

Square Dimensions: 500x500mm Layer:

Coordinates (GDA94) – MGA Zone [redacted]

Excavation comments

Same as previous spit:	N/A	No	Yes	Yes+	
Sediment composition:	Loam	Sand	Sandy loam	Other:	
Sediment colour:					
Sediment compactness:	Loose	Friable	Firm	Compact	
Sediment moisture content:	Dry	Damp	Moist	Wet	
Inclusions:	Roots	Gravel	Ants	Shell	Charcoal Other

Other Features/Comments:

Same as previous.

Cultural Material / Features

Total Artefact Number: Artefact Materials:

Comments on cultural material:

Job Title: [Insert project name and type of excavation]
Job No: [Insert project number]

Jacobs

Site Information

Site Name/Number: Shoalhaven Date: 29/6/22 Recorder: R. Tuddenham

Test Pit No: 3 Spit No: 4 Depth: 300 - 400

Square Dimensions: 500 x 500mm Layer: _____

Coordinates (GDA94) – MGA Zone: [redacted]

Excavation comments

Same as previous spit:	N/A	No	(Yes)	Yes+		
Sediment composition:	Loam	Sand	(Sandy loam)	Other:		
Sediment colour:						
Sediment compactness:	Loose	(Friable)	Firm	Compact		
Sediment moisture content:	Dry	Damp	(Moist)	Wet		
Inclusions:	(Roots) (Gravel)	Ants	Shell	Charcoal	Other	

Other Features/Comments:

Same as above.

Cultural Material / Features

Total Artefact Number: _____ Artefact Materials: _____

Comments on cultural material:

Job Title: [Insert project name and type of excavation]
Job No: [Insert project number]

Jacobs

Site Information

Site Name/Number: Shoalhaven Date: 29/6/22 Recorder: R. Tuldrace

Test Pit No: 3 Spit No: 5 Depth: 400-500

Square Dimensions: 500 x 500mm Layer: _____

Coordinates (GDA94) – MGA Zone: [redacted]

Excavation comments

Same as previous spit:	N/A	No	(Yes)		Yes+
Sediment composition:	Loam	Sand	(Sandy loam)		Other:
Sediment colour:					
Sediment compactness:	Loose	(Friable)	Firm		Compact
Sediment moisture content:	Dry	(Damp)	Moist		Wet
Inclusions:	(Roots) (Gravel)	Ants	Shell	Charcoal	Other

Other Features/Comments:

Same as previous.

Cultural Material / Features

Total Artefact Number: _____ Artefact Materials: _____

Comments on cultural material:

Job Title: [Insert project name and type of excavation]
Job No: [Insert project number]

Jacobs

Site Information

Site Name/Number: Shoalhaven Date: 29/6/22. Recorder: R. Tadlenucci

Test Pit No: 3 Spit No: 6 Depth: 500-600mm

Square Dimensions: 500mm x 500mm Layer: ____

Coordinates (GDA94) – MGA Zone: [redacted]

Excavation comments

Same as previous spit:	N/A	No	Yes	(Yes)
Sediment composition:	Loam	Sand	(Sandy loam)	Other:
Sediment colour:				
Sediment compactness:	Loose	(Friable)	Firm	Compact
Sediment moisture content:	Dry	(Damp)	Moist	Wet
Inclusions:	(Roots) (Gravel)	Ants	Shell	Charcoal Other

Other Features/Comments:

Same as previous - sandy loam on a compact clay (red-brown).

End of pit.

Cultural Material / Features

Total Artefact Number: ____ Artefact Materials: ____

Comments on cultural material:

Job Title: [Insert project name and type of excavation]
Job No: [Insert project number]

Jacobs

Site Information
Site Name/Number: SHOALHAVEN HYDRO Date: 29.6.22 Recorder: M.F

Test Pit No: H Spit No: 1 Depth: 0-30mm

Square Dimensions: 50cm x 50cm Layer: 1

Coordinates (GDA94) – MGA Zone: [redacted]

Excavation comments

Same as previous spit:	(N/A)	No	Yes	Yes+
Sediment composition:	Loam	Sand	(Sandy loam)	Other:
Sediment colour:	DARK GREYISH BROWN			
Sediment compactness:	Loose	(Friable)	Firm	Compact
Sediment moisture content:	Dry	(Damp)	Moist	Wet
Inclusions:	(Roots) Gravel	Ants	Shell	(Charcoal) Other

Other Features/Comments:

Turf layer comprising dark charcoal layer from likely c. 2019 bushfires. Minor root bioturbation

Cultural Material / Features

Total Artefact Number: Artefact Materials:

Comments on cultural material:

Lithics identified through spit 1

Job Title: [Insert project name and type of excavation]
Job No: [Insert project number]

Jacobs

Site Information

Site Name/Number: SHOALHAVEN HYDRO Date: 29.6.22 Recorder: M. F

Test Pit No: H Spit No: 1, 2 Depth: 30 - 100MM

Square Dimensions: 50cm x 60cm Layer: 2

Coordinates (GDA94) – MGA Zone: [redacted]

Excavation comments

Same as previous spit:	N/A	(No)	Yes	Yes+
Sediment composition:	Loam	Sand	(Sandy loam)	Other:
Sediment colour:	DARK YELLOWISH BROWN			
Sediment compactness:	Loose	(Friable)	Firm	Compact
Sediment moisture content:	Dry	(Damp)	Moist	Wet
Inclusions:	(Roots) Gravel	Ants	Shell	(Charcoal) Other

Other Features/Comments:

Lower A horizon, sandy loam. Minor charcoal
intermixed from Spit 2, LAYER 1.
Rooty bioturbation, minor. Surrounding area is open
juvenile forest

Cultural Material / Features

Total Artefact Number: Artefact Materials:

Comments on cultural material:

Lithics identified

Job Title: [Insert project name and type of excavation]
Job No: [Insert project number]

Jacobs

Site Information

Site Name/Number: SHOALHAVEN Date: 29.06.22 Recorder: M.F

Test Pit No: L1 Spit No: 3 Depth: 100 - 150

Square Dimensions: 50cm x 50cm Layer: 2

Coordinates (GDA94) – MGA Zone: [redacted]

Excavation comments

Same as previous spit:	N/A	No	(Yes)	Yes+
Sediment composition:	Loam	Sand	(Sandy loam)	Other:
Sediment colour:	DARK YELLOWISH BROWN			
Sediment compactness:	Loose	Friable	(Firm)	Compact
Sediment moisture content:	Dry	Damp	(Moist)	Wet
Inclusions:	(Roots) Gravel	Ants	Shell	Charcoal Other

Other Features/Comments:

FIRM SANDY LOAM ALLUVIUM WITH INCREASED YELLOW CLAY CONTENT
LESS ROOTS THAN SPIT 1 AND 2
EXCAVATED IN 50mm SPITS

Cultural Material / Features

Total Artefact Number: Artefact Materials:

Comments on cultural material:

LITHICS IDENTIFIED

Job Title: [Insert project name and type of excavation]
Job No: [Insert project number]

Jacobs

Site Information

Site Name/Number: SHOALHAVEN Date: 29.06.22 Recorder: M. F

Test Pit No: 4 Spit No: 4, 5, 6 Depth: 150-300

Square Dimensions: 50cm x 50cm Layer: 2

Coordinates (GDA94) – MGA Zone: 5 [redacted]

Excavation comments

Same as previous spit:	N/A	No	Yes		Yes+
Sediment composition:	Loam	Sand	Sandy loam		Other:
Sediment colour:	DARK YELLOWISH BROWN				
Sediment compactness:	Loose	Friable	Firm		Compact
Sediment moisture content:	Dry	Damp	Moist		Wet
Inclusions:	Roots	Gravel	Ants	Shell	Charcoal	Other

Other Features/Comments:

LAYER 2, SANDY LOAM WITH INCREASING CLAY CONTENT. Consistent with LAYER 2

EXCAVATED IN 50mm spits

Cultural Material / Features

Total Artefact Number: Artefact Materials:

Comments on cultural material:

Lithics identified - Spit 4 and 5, none in Spit 6

Job Title: [Insert project name and type of excavation]
Job No: [Insert project number]

Jacobs

Site Information

Site Name/Number: SHOALHAVEN Date: 29.06.22 Recorder: M. F

Test Pit No: H Spit No: 7, 8 Depth: 300 - 350
350 - 400

Square Dimensions: 50 cm x 50cm Layer: 3

Coordinates (GDA94) – MGA Zone: [redacted]

Excavation comments

Same as previous spit:	N/A	(No)	(Yes)	Yes+
Sediment composition:	Loam	Sand	Sandy loam	Other: SANDY CLAY
Sediment colour:	DARK YELLOWISH BROWN			
Sediment compactness:	Loose	Friable	(Firm)	Compact
Sediment moisture content:	Dry	Damp	(Moist)	Wet
Inclusions:	(Roots) Gravel	Ants	Shell	Charcoal (Other) CLAY

Other Features/Comments:

Higher clay content but overall a sandy clay/loam
bigger roots, but less numerous
YELLOW/ORANGE CLAY INCLUSIONS

Cultural Material / Features

Total Artefact Number: _____ Artefact Materials: _____

Comments on cultural material:

No LITHICS SPIT 7
NO LITHICS in Spit 8

Job Title: [Insert project name and type of excavation]
Job No: [Insert project number]

Jacobs

Site Information

Site Name/Number: SHOALHAVEN Date: 29.06.22 Recorder: M.F

Test Pit No: 4 Spit No: 9 Depth: 400 - 450 mm

Square Dimensions: 50cm x 50cm Layer: 3

Coordinates (GDA94) – MGA Zone [redacted]

Excavation comments

Same as previous spit:	N/A	No	(Yes)	Yes+
Sediment composition:	Loam	Sand	(Sandy loam)	(Other) SANDY WITH CLAY
Sediment colour:	DARK YELLOWISH BROWN			
Sediment compactness:	Loose	Friable	(Firm)	Compact
Sediment moisture content:	Dry	Damp	(Moist)	Wet
Inclusions:	(Roots) Gravel	Ants	Shell	Charcoal Other

Other Features/Comments:

SAME AS SPIT 7 AND 8
High clay content
Root bioturbation
Consistent with layer 3

Cultural Material / Features

Total Artefact Number: _____ Artefact Materials: _____

Comments on cultural material:

LITHICS IDENTIFIED

Job Title: [Insert project name and type of excavation]
Job No: [Insert project number]

Jacobs

Site Information

Site Name/Number: SHOALHAVEN Date: 29.06.22 Recorder: M.F

Test Pit No: 4 Spit No: 10 Depth: 450 - 500

Square Dimensions: 50cm x 50cm Layer: 4

Coordinates (GDA94) – MGA Zone: [redacted]

Excavation comments

Same as previous spit:	N/A	(No)	Yes	Yes+
Sediment composition:	Loam	Sand	Sandy loam	Other: SANDY CLAY
Sediment colour:				
Sediment compactness:	Loose	Friable	(Firm)	Compact
Sediment moisture content:	Dry	Damp	(Moist)	Wet
Inclusions:	(Roots) Gravel	Ants	Shell	(Charcoal) Other

Other Features/Comments:

FIRM SANDY CLAY, LIKELY NATURAL INTERFACE
ROOT AND CHARCOAL INCLUSIONS
QUARTZ AND CHERT PEBBLES (<30mm)

Cultural Material / Features

Total Artefact Number: _____ Artefact Materials: _____

Comments on cultural material:

NO LITHICS

Job Title: [Insert project name and type of excavation]
Job No: [Insert project number]

Jacobs

Site Information

Site Name/Number: SHOALHAVEN Date: 29.06.22 Recorder: M.F

Test Pit No: H Spit No: 4 Depth: 500 - 550 SPIT 11
550 - 600 SPIT 12

Square Dimensions: 50 cm x 50cm Layer: 4

Coordinates (GDA94) – MGA Zone: [redacted]

Excavation comments

Same as previous spit:	N/A	No	(Yes)	Yes+
Sediment composition:	Loam	Sand	Sandy loam	Other: SANDY CLAY
Sediment colour:	DARK YELLOWISH BROWN			
Sediment compactness:	Loose	Friable	(Firm)	Compact
Sediment moisture content:	Dry	Damp	(Moist)	Wet
Inclusions:	(Roots) Gravel	Ants	Shell	(Charcoal) Other

Other Features/Comments:

SANDY CLAY INTERFACE TO NATURAL
CHARCOAL = BURNED ROOTS
QUARTZ INCLUSIONS, MORE PEBBLY INCLUSIONS, ROCKIER DEPOSIT

Cultural Material / Features

Total Artefact Number: Artefact Materials:

Comments on cultural material:

NO LITHICS - Spit 11
LITHICS - Spit 12

Job Title: [Insert project name and type of excavation]
Job No: [Insert project number]

Jacobs

Site Information

Site Name/Number: SHOALHAVEN Date: 29.06.22 Recorder: M. E

Test Pit No: H Spit No: 13 Depth: 600 - ~~650~~ 650

Square Dimensions: 50cm x 50cm Layer: 5

Coordinates (GDA94) – MGA Zone: [redacted]

Excavation comments

Same as previous spit:	N/A	(No)	Yes	Yes+
Sediment composition:	Loam	Sand	Sandy loam	(Other:) CLAY
Sediment colour:	~~DK~~ LIGHT YELLOWISH BROWN			
Sediment compactness:	Loose	Friable	Firm	Compact
Sediment moisture content:	Dry	(Damp)	Moist	Wet
Inclusions:	Roots Gravel	Ants	Shell	(Charcoal) Other

Other Features/Comments:

N HORIZON CLAY, LIGHT YELLOWISH BROWN
CHARCOAL FROM BURNED ROOTS

TERMINATION OF PIT H

Cultural Material / Features

Total Artefact Number: ~~2~~ 1 Artefact Materials: ~~2~~ 1

Comments on cultural material:

~~2~~ LITHICS IDENTIFIED
STERILE NATURAL LAYER

Job Title: [Insert project name and type of excavation]
Job No: [Insert project number]

Jacobs

Site Information

Site Name/Number: SHOAL HAVEN Date: 20.06.22 Recorder: M. F

Test Pit No: 5 Spit No: 1 Depth: 0-50

Square Dimensions: 50cm x 50cm Layer: 1, 2

Coordinates (GDA94) – MGA Zone: [redacted]

Excavation comments

Same as previous spit:	(N/A)	No	Yes	Yes+
Sediment composition:	Loam	Sand	(Sandy loam)	Other:
Sediment colour:	LAYER 1 - DARK BROWNISH GREY / LAYER 2 - DARK ~~GREY~~ YELLOWISH BROWN			
Sediment compactness:	Loose	(Friable)	Firm	Compact
Sediment moisture content:	Dry	Damp	(Moist)	Wet
Inclusions:	(Roots) Gravel	Ants	Shell	(Charcoal) Other

Other Features/Comments:

LAYER 1 = 0-30MM (DARK GREY SANDY LOAM CHARCOAL LAYER)
LAYER 2 = 30MM - (SANDY LOAM, DARK ~~BROWN~~ YELLOWISH BROWN
ROOT CONTENT HIGH, LAYER 1 comprises charcoal layer from likely 2019 bushfires. QUARTZ INCLUSIONS

Cultural Material / Features

Total Artefact Number: Artefact Materials:

Comments on cultural material:

NO ARTEFACTS

Job Title: [Insert project name and type of excavation]
Job No: [Insert project number]

Jacobs

Site Information

Site Name/Number: SHOALHAVEN Date: 20.06.22 Recorder: M. F

Test Pit No: 5 Spit No: 2 Depth: 50-150

Square Dimensions: 50cm x 50cm Layer: 2

Coordinates (GDA94) – MGA Zone: [redacted]

Excavation comments

Same as previous spit:	N/A	No	(Yes)	Yes+
Sediment composition:	Loam	Sand	(Sandy loam)	Other:
Sediment colour:	DARK YELLOWISH BROWN			
Sediment compactness:	Loose	(Friable)	Firm	Compact
Sediment moisture content:	Dry	Damp	(Moist)	Wet
Inclusions:	(Roots) Gravel	Ants	Shell	(Charcoal) Other

Other Features/Comments:

SANDY LOAM. ROOTY WITH CHARCOAL AND QUARTZ INCLUSIONS
Alluvially impacted, downslope towards river
Southern aspect

Cultural Material / Features

Total Artefact Number: 1 Artefact Materials: QUARTZ

Comments on cultural material:

1 QUARTZ FLAKE

Job Title: [Insert project name and type of excavation]
Job No: [Insert project number]

Jacobs

Site Information

Site Name/Number: SHOALHAVEN Date: 30.06.22 Recorder: M.F

Test Pit No: 5 Spit No: 3 Depth: 150-250

Square Dimensions: 50cm x 50cm Layer: 2

Coordinates (GDA94) – MGA Zone: [redacted]

Excavation comments

Same as previous spit:	N/A	No	(Yes)	Yes+
Sediment composition:	Loam	Sand	(Sandy loam)	Other:
Sediment colour:	DARK YELLOWISH BROWN			
Sediment compactness	Loose	Friable	(Firm)	Compact
Sediment moisture content:	Dry	Damp	(Moist)	Wet
Inclusions:	(Roots) Gravel	Ants	Shell	(Charcoal) Other

Other Features/Comments:

CHARCOAL AND ROOT INCLUSIONS, SIGNIFICANT ROOTS OF <5cm thickness

WELL SORTED AND FINE SOILS WITH ORGANIC MATTER

Cultural Material / Features

Total Artefact Number: 6 Artefact Materials: VARIOUS

Comments on cultural material:

LITHICS IDENTIFIED

Job Title: [Insert project name and type of excavation]
Job No: [Insert project number]

Jacobs

Site Information

Site Name/Number: SHOALHAVEN Date: 30.06.22 Recorder: M. F

Test Pit No: 5 Spit No: 4, 5, 6 Depth: [redacted] 250-350 350-450 450-550

Square Dimensions: 50cm x 50cm Layer: 3

Coordinates (GDA94) – MGA Zone: [redacted]

Excavation comments

Same as previous spit:	N/A	(No)	Yes	Yes+	
Sediment composition:	Loam	Sand	(Sandy loam)	Other:	
Sediment colour:	DARK YELLOWISH BROWN				
Sediment compactness:	Loose	Friable	(Firm)	Compact	
Sediment moisture content:	Dry	Damp	(Moist)	Wet	
Inclusions:	(Roots)	Gravel	Ants	Shell	(Charcoal) (Other) ROCK

Other Features/Comments:

ROCKY LAYER OF ALLUVIALLY WASHED OUT ROCK (IRONSTONE, QUARTZ) FRAGMENTS, 30% INCLUSION SOIL SAME AS LAYER 2

[redacted]

Cultural Material / Features

Total Artefact Number: _____ Artefact Materials: _____

Comments on cultural material:

Spit 4 = NIL
Spit 5 = LITHICS IDENTIFIED
Spit 6 = LITHICS IDENTIFIED

Job Title: [Insert project name and type of excavation]
Job No: [Insert project number]

Jacobs

Site Information

Site Name/Number: SHOALHAVEN Date: 30.06.22 Recorder: M.F

Test Pit No: 5 Spit No: 7 Depth: 550 - 650

Square Dimensions: 50cm x 50cm Layer: 4

Coordinates (GDA94) – MGA Zone: [redacted]

Excavation comments

Same as previous spit:	N/A	(No)	[redacted]	Yes
Sediment composition:	Loam	Sand	Sandy loam	(Other) SANDY CLAY
Sediment colour:	DARK YELLOWISH BROWN			
Sediment compactness:	Loose	Friable	(Firm)	Compact
Sediment moisture content:	Dry	Damp	(Moist)	Wet
Inclusions:	(Roots) Gravel	Ants	Shell	(Charcoal) Other

Other Features/Comments:

LIKELY CLAY INTERFACE CONTAINING LARGER ALLUVIALLY IMPACTED STONES SETTLING TO BOTTOM OF DEPOSIT
CHARCOAL / BURNED ROOTS INTERMIXED

Cultural Material / Features

Total Artefact Number: Artefact Materials:

Comments on cultural material:

LITHICS IDENTIFIED
CHARCOAL SAMPLE TAKEN - SAMPLE 1

Job Title: [Insert project name and type of excavation]
Job No: [Insert project number]

Jacobs

Site Information

Site Name/Number: SHOALHAVEN Date: 20.06.22 Recorder: M.F

Test Pit No: 5 Spit No: 8 Depth: 650 - 750

Square Dimensions: 50cm x 50cm Layer: 4

Coordinates (GDA94) – MGA Zone: [redacted]

Excavation comments

Same as previous spit:	N/A	No	(Yes)	Yes+
Sediment composition:	Loam	Sand	Sandy loam	(Other) SANDY CLAY
Sediment colour:	DARK YELLOWISH BROWN			
Sediment compactness:	Loose	Friable	(Firm)	Compact
Sediment moisture content:	Dry	Damp	(Moist)	Wet
Inclusions:	(Roots) Gravel	Ants	Shell	(Charcoal) Other

Other Features/Comments:

CLAY INTERFACE WITH LARGE COBBLES, HIGH CLAY CONTENT

CHARCOAL DEPOSITS PRESENT, LARGE PATCH SETTLED ON CLAY ON SOUTH SIDE

TERMINATED AT CLAY - 750mm

Cultural Material / Features

Total Artefact Number: NIL Artefact Materials: NIL

Comments on cultural material:

NONE

CHARCOAL SAMPLE TAKEN (SAMPLE 2)

Jacobs

Photographic Catalogue Shoalhaven

Job Title: [Insert project name and type of excavation] **Job No:** [Insert project number]

Date	Photo No	Orientation	Test pit/ trench	Spit/ Depth	Description
29/6/22	101-0727	North	3	600mm	TP3 end - Profile.
"	101-0728	North	3	600mm	TP3 end - North wall
"	101-0729	East	3	600mm	TP3 end - East
"	101-0730	South	3	600mm	TP3 end - South
"	101-0731	West	3	600mm	TP3 end - West.
"	101-0732	North	2	600mm	TP2 end - Profile
"	101-0733	North	2	600mm	TP2 end - North wall
"	101-0734	East	2	600mm	TP2 end - East wall
"	101-0735	South	2	600mm	TP2 end - South wall
"	101-0736	West	2	600mm	TP2 end - West wall.
"	101-0737	North	4	650mm	TP4 end - Profile
"	101-0738	North	4	650mm	TP4 end - North wall
"	101-0739	East	4	650mm	TP4 end - East wall
"	101-0740	South	4	650mm	TP4 end - South wall
"	101-0741	West	4	650mm	TP4 end - West wall.
30/6/22	101-0742	N	1	500mm	TP1 end - Profile
"	101-0743	N	1	"	" " - North wall
"	101-0744	East	1	"	" " - East "
"	101-0745	South	1	"	" " - South "
"	101-0746	West	1	"	" " - West "
"	101-0747	North	5	750	TP5 end - Profile
"	101-0748	North	5	750	" " - North - Wall
"	101-0749	East	5	750	" " - East "
"	101-0750	South	5	750	" " - South "
"	101-0751	West	5	750	" " - West "

Appendix C Artefact catalogue

SITE NAME: Bandeela Hydro AS01

Sample Square		Grid Reference		Artefact Type															Lithology														Grain			Artefact Dimensions			Platform Dimension & Type								Retouched/Utilised						Other								Comments
Number	Size	Easting	Northing	Debris	Complete Flake	Flake Fragment Proximal	Flake Fragment Medial	Flake Fragment Distal	Flake Fragment Marginal	Longitudinally broken left	Longitudinally broken right	Core - MPC	Core - SPC	Core Fragment	Muller	Millstone	Manuport	Other	Banded Iron Formation	Basalt	Chalcedony	Chert	Crystal Quartz	Dolerite	Glass	Granite	Ironstone	Mudstone	Quartz	Quartzite	Silcrete	Other	Fine	Medium	Coarse	Length (mm)	Width (mm)	Thickness (mm)	Width (mm)	Thickness (mm)	Number of Platforms (core)	Cortical	Crushed	Faceted	Flat	Focalised	Left Lat Margin	Right Lat Margin	Proximal Margin	Distal Margin	Margin	Length (mm)	No of Scars	% of Cortex	River stone cortex	Terrestrial Cortex	Unknown Cortex	% of Heat Fracture Scars	No of Parallel Arris	Weight (g)	Comments
[illegible]	1				1																							1					1			28.7	13.4	8.56	7.02	6.25					1													100		4.9	
[illegible]	1				1																							1					1			17	10.7	4.18	5.6	1.8					1								2					80		1.4	
[illegible]	1													1							1												1			11.5	13.7	38.0															7							5.3	
1	1				1																	1											1			43.0	22.8	15.1	8.85	3.07					1									100		1				14	
1	1			1																		1											1			16	11	5.4																						0.9	
1	1				1																							1					1			19.6	11.5	8.41	11.1	5.81					1									100		1				2.1	
1	1									1																						1	1			17.4	10.3	4.84	15.7	3.82					1															1.0	amb - Features eraille scar
1	1													1								1											1			18.8	12.5	15															4							11	
1	1													1								1											1			18.7	20.1	0.54															2							2.0	Flaked core
1	2			1																		1											1			7.78	16.1	3.08																						0.4	
1	1									1												1											1			12.3	3.82	2.77	3.82	1.75					1															0.1	
2	1				1																	1											1			11.9	19.8	3.12	8.48	3.51					1								2							0.8	
2	1				1																	1											1			23	10.2	5.71	7.34	3.44					1								1	90		1				2.8	Double bulb
2	2			1																		1											1			12.6	7.43	4.58																						0.2	
2	2				1																1												1			7.6	10.7	2.54	5.83	2.58					1								3							0.2	
2	2									1																				1			1			8.61	8.80	2.53	5.62	2.88					1															0.2	
2	2								1																					1			1			10	8	2.35																						0.2	
2	2								1																			1					1			13.5	7.25	1.88																						0.2	
3	1			1																		1											1			28.4	10.8	6.88																						3.2	
2	1				1																											1	1			7.76	16.7	5.76	11.2	5.5					1								1							1	
3	1					1																1											1			4.97	7.2	1.87	6.35	1.42					1								4							0.1	
3	1													1							1												1			23.9	23.8	11															4							0.1	
3	2			1																	1												1			13.9	4.1	3.18																						0.1	
3	2				1																							1					1			8.8	8.5	2.87	3.73	1.78					1								3							0.2	
3	2					1																						1					1			4.71	10.2	3.17	4.37	2.30					1															0.2	
3	2										1									1													1			14.6	4.8	1.03	3.45	3.13		1											3							0.2	
3	2				1																	1											1			26.2	20.1	6.9	8.57	2.02				1									1							4.2	
4	1				1															1													1			9.85	26.3	2.82	7.96	2.35					1								2							0.7	
4	1				1																1												1			11.4	16.2	4.42	10.5	6.48					1									100		1				1	
4	1				1																									1			1			10.1	8.97	2.34	7.73	1.77					1															0.2	
4	3				1																								1				1			13.7	7.24	5.42	7.55	4.4					1															0.7	
4	3										1																		1				1			7.03	5.75	1.37	3.85	1.35					1															0.1	
4	3					1																							1				1			14.6	15.1	4.42	6.75	2.30					1															1	
4	1				1																									1			1			15.1	6.48	3.01	4.38	1.84					1															0.4	Double bulb
4	3				1																1												1			14.7	8.92	2.71	6.08	2.57					1								3							0.5	
4	3				1																								1				1			8.61	6.11	1.52	4.74	1.49					1															0.1	
4	3				1																								1				1			7.40	3.22	1.50	2.19	2.99					1															0	

Sample Square		Grid Reference		Artefact Type														
Number	Size	Easting	Northing	Debris	Complete Flake	Flake Fragment Proximal	Flake Fragment Medial	Flake Fragment Distal	Flake Fragment Marginal	Longitudinally broken left	Longitudinally broken right	Core - UPC	Core - BPC	Core Fragment	Muller	Millstone	Manuport	Other
[illegible]	[illegible]										1							
[illegible]	[illegible]				1													
[illegible]	[illegible]					1												
[illegible]	[illegible]											1						
[illegible]	[illegible]				1													
[illegible]	[illegible]					1												
[illegible]	[illegible]				1													
[illegible]	[illegible]				1													
[illegible]	[illegible]				1													
[illegible]	[illegible]			1														
[illegible]	[illegible]				1													
[illegible]	[illegible]					1												

Sample Square	Lithology														Grain		
Number	Banded Iron Formation	Basalt	Chalcedony	Chert	Crystal Quartz	Dolerite	Glass	Granite	Ironstone	Mudstone	Quartz	Quartzite	Silcrete	Other	Fine	Medium	Coarse
[illegible]										1					1		
[illegible]											1				1		
[illegible]			1												1		
[illegible]				1											1		
[illegible]											1				1		
[illegible]			1												1		
[illegible]													1		1		
[illegible]		1													1		
[illegible]		1													1		
[illegible]										1					1		
[illegible]		1													1		
[illegible]			1												1		

Sample Square	Artefact Dimensions			Platform Dimension & Type							
Number	Length (mm)	Width (mm)	Thickness (mm)	Width (mm)	Thickness (mm)	Number of Platforms (cores)	Cortical	Crushed	Faceted	Flat	Focalised
[illegible]	23	12	2.52	7.09	2.46					1	
[illegible]	17.8	13.4	3.83	9.11	3.57					1	
[illegible]	11	9.98	3.52	8.87	2.87					1	
[illegible]	26.7	29.8	14.7	16.3	9.43	3					
				7.1	6.84						
				4.37	9.01						
[illegible]	11.9	10	3.45	8.47	2.33					1	
[illegible]	10.8	9.58	1.77	6.74	1.38					1	
[illegible]	23.2	9.56	4.72	2.07	1.87					1	
[illegible]	7.29	5.49	3.9	4.65	1.53					1	
[illegible]	12.7	5.43	2.52	7.2	3.04					1	
[illegible]	10.1	6.11	2.63								
[illegible]	4.9	5.94	1.16	3.92	1.96					1	
[illegible]	9.27	7.57	1.56	8.23	1.82					1	

Sample Square	Retouched/Utilised						Other								
Number	Left Lat. Margin	Right Lat. Margin	Proximal Margin	Distal Margin	Margin	Length (mm)	No of Scars	% of Cortex	River stone cortex	Terrestrial Cortex	Unknown Cortex	% of Heat Fracture Scars	No of Parallel Arris	Weight (g)	Comments
[illegible]														0.5	
[illegible]														1.1	
[illegible]							2							0.7	
[illegible]							14							17	
[illegible]														0.4	
[illegible]														0.3	
[illegible]														0.8	
[illegible]														0.2	
[illegible]							3							0.3	
[illegible]														0.2	
[illegible]														0.1	
[illegible]														0.2	