1377 Hue Hue Road, Wyee: Archaeological Report

FINAL REPORT

Prepared for TOPA Property Pty Ltd

9 December 2022

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Biosis project no.:	37418
File name:	37418.Hue.Hue.Road.Wyee.AR.FIN01.20221209
Citation:	Biosis 2022. 1377 Hue Hue Road Wyee Archaeological Report. Report for TOPA Property Pty Ltd. Windram, N., Garabedian, C., Keevers-Eastman, A. Biosis Pty Ltd. Newcastle, NSW. 37418
LGA:	Lake Macquarie

Document control

Version	Internal reviewer	Date issued
Draft 01	Samantha Keats	10/11/2022
Draft 02	Maggie Butcher	11/11/2022
Final 01	To be confirmed	TBC

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Glossary

ACHA	Aboriginal Cultural Heritage Assessment
ADDA	Aboriginal Due Diligence Assessment
AHIMS	Aboriginal Heritage Information Management System
AHIP	Aboriginal Heritage Impact Permit
AR	Archaeological Report
BP	Before Present
Biosis	Biosis Pty Ltd
CBD	Central Business District
Consultation requirements	*Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010*
DA	Development Application
DECCW	Department of Environment, Climate Change and Water (now Heritage NSW)
DP	Deposited Plan
EP&A Act	*Environmental Planning and Assessment Act 1979*
GDA	Geocentric Datum of Australia
GPS	Global Positioning System
GSV	Ground Surface Visibility
Heritage NSW	Environment and Heritage Group in the Department of Planning and Environment
Heritage Act	*Heritage Act 1977*
ICOMOS	International Council on Monuments and Sites
LALC	Local Aboriginal Land Council
LEP	Local Environmental Plan
LGA	Local Government Area
MGA	Map Grid of Australia
NPW Act	*National Parks and Wildlife Act 1974*
NPWS	National Parks and Wildlife Service
NSW	New South Wales
PAD	Potential Archaeological Deposit
RAP	Registered Aboriginal Party

SEPP	State Environmental Planning Policy
Study area	1377 Hue Hue Road, Wyee (Lot 437 DP755242) New South Wales
the Code	*Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW*
TOPA	TOPA Property Pty Ltd

Summary

Biosis Pty Ltd (Biosis) was commissioned by TOPA Property Pty Ltd (TOPA) (the client) to undertake an Aboriginal Cultural Heritage Assessment (ACHA) for the proposed land rezoning of 1377 Hue Hue Road, Wyee (Lot 437 DP755242) New South Wales (NSW) (the study area). This Archaeological Report (AR) documents the findings of the archaeological investigations conducted as part of the ACHA. As required under Section 2.3 of the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (DECCW 2010a) (the Code), the AR provides evidence about the material traces of Aboriginal land use to support the conclusions and management recommendations in the ACHA.

Lake Macquarie Council is the determining authority and will assess the proposed development under Part 3 of the *Environmental Planning and Assessment Act 1979* (EP&A Act), to help them determine if the proposed development is likely to have a significant effect on the environment, including Aboriginal cultural heritage. The study area is located in a low density urban setting, approximately 1.7 kilometres south-west of Wyee and approximately 10 kilometres north of the Wyong central business district (CBD).

Background research included a search of the Aboriginal Heritage Information Management System (AHIMS) database and a review of relevant reports. The AHIMS search identified 110 Aboriginal cultural heritage sites registered with the AHIMS register, located within a 5 kilometre search area, centred on the study area. No sites exist within the study area.

The Aboriginal community was consulted regarding the heritage management of the project throughout its lifespan. Consultation has been undertaken as per the process outlined in the Department of Environment Climate Change and Water document (DECCW) document, *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (DECCW 2010b) (consultation requirements).

Biosis undertook a field investigation of the study area in 2021 as part of an Aboriginal Due Diligence Assessment (ADDA). While the survey did not identify Aboriginal heritage sites within the study area, three areas of moderate archaeological potential were identified within level, well-draining landforms. As part of the current assessment Biosis completed a program of test excavations within the three areas of moderate archaeological previously identified in 2021 on 31 August 2022, 28 September 2022, 31 October, and 3 November 2022. A total of 11 test pits were excavated across the three area of moderate potential. No Aboriginal sites or objects were identified during test. This assessment therefore concluded that PAD 1, PAD 2, and PAD 3 possess low archaeological potential. No further archaeological investigation is recommended within these areas.

Strategies have been developed based on the archaeological significance of cultural heritage relevant to the study area. The strategies also take into consideration:

- Predicted impacts to Aboriginal cultural heritage.
- The planning approvals framework.
- Current best conservation practice, widely considered to include:
  - The ethos of the Australia International Council on Monuments and Sites (ICOMOS) Burra Charter.
  - The Code.

The recommendations that resulted from the consultation process are provided below.

Management recommendations

Prior to any development impacts occurring within the study area, the following is recommended:

Recommendation 1: No further archaeological assessment is required

No further archaeological work is required in the study area due to the entire study area being assessed as having low archaeological potential. This recommendation is conditional upon Recommendations 4 to 6.

Recommendation 2: Continued consultation with the Registered Aboriginal Parties

As per the consultation requirements, it is recommended that a copy of this final report be provided to the Registered Aboriginal Parties (RAPs).

Recommendation 3: Heritage induction

Heritage inductions for all site workers and contractors should be undertaken in order to prevent any unintentional harm to unexpected Aboriginal objects or sites, or Aboriginal sites or objects located within proximity to the study area. The heritage induction should include the following items:

- Relevant legislation.
- Location of identified Aboriginal heritage sites, areas of archaeological potential, and areas of archaeological sensitivity.
- Basic identification skills for Aboriginal and non-Aboriginal artefacts and human remains.
- Procedure to follow in the event of an unexpected heritage item find during construction works.
- Procedure to follow in the event of the discovery of human remains during construction works.
- Penalties and non-compliance.

Recommendation 4: Discovery of unanticipated Aboriginal objects

All Aboriginal objects and Places are protected under the *National Parks and Wildlife Act 1974* (NPW Act). It is an offence to disturb an Aboriginal object without a consent permit issued by Heritage NSW, Department of Planning and Environment (Heritage NSW). Should any unanticipated Aboriginal objects be encountered during works associated with this proposal, works must cease in the vicinity and the find should not be moved until assessed by a qualified archaeologist. If the find is determined to be an Aboriginal object the archaeologist will provide further recommendations. These may include notifying Heritage NSW and RAPs.

Recommendation 5: Discovery of unanticipated historical relics

Relics are historical archaeological resources of local or State significance and are protected in NSW under the *Heritage Act 1977* (Heritage Act). Relics cannot be disturbed except with a permit or exception notification. Should unanticipated relics be discovered during the course of the project, work in the vicinity must cease and an archaeologist contacted to make a preliminary assessment of the find. Heritage NSW will require notification if the find is assessed as a relic.

Recommendation 6: Discovery of human remains

If any suspected human remains are discovered during any activity you must:

1. Immediately cease all work at that location and not further move or disturb the remains.
2. Notify NSW Police and the NSW Environmental Line on 131 555 as soon as practicable and provide details of the remains and their location.
3. Not recommence work at that location unless authorised in writing by NSW Police and/or Heritage NSW.

1 Introduction

1.1 Project background

Biosis was commissioned by TOPA to undertake an ACHA for the proposed land rezoning of 1377 Hue Hue Road, Wyee (Lot 437 DP755242) NSW (the study area) (Figure 1 and Figure 2). This AR documents the findings of the archaeological investigations conducted as part of the ACHA. The AR provides evidence about the material traces of Aboriginal land use to support the conclusions and management recommendations in the ACHA.

This investigation has been carried out under Part 4 of the NPW Act. It has been undertaken in accordance with the Code. The Code has been developed to support the process of investigating and assessing Aboriginal cultural heritage by specifying the minimum standards for archaeological investigation undertaken in NSW under the NPW Act. The archaeological investigation must be undertaken in accordance with the requirements of the Code.

It is stated in section 1.2 of the Code that where the ACHA report concludes that the proposed activity will result in harm to Aboriginal objects or declared Aboriginal Places, an application for an (Aboriginal Heritage Impact Permit (AHIP) will be required. This application must be supported by an ACHA report.

The EP&A Act includes provisions for local government authorities to consider environmental impacts in land-use planning and decision making. Each Local Government Area (LGA) is required to create and maintain a Local Environmental Plan (LEP) that includes Aboriginal and historical heritage items. Local Councils identify items that are of significance within their LGA, and these items are listed on heritage schedules in the local LEP and are protected under the EP&A Act and Heritage Act.

1.2 Study area

The study area is located approximately 1.7 kilometres south-west of Wyee and approximately 10 kilometres north of the Wyong CBD (Figure 1). It encompasses 4.6 hectares of private land and the adjacent road reserves.

The study area is within the:

- Lake Macquarie Local Government Area (LGA).
- Parish of Morisset.
- County of Northumberland (Figure 2).

The study area is bounded by Hue Hue Road to the north, private property to the east, and Digary Road to the west and south.

1.3 Planning approvals

The proposed development will be assessed against Part 3 of the EP&A Act. Other relevant legislation and planning instruments that will inform this assessment include:

- Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).
- NPW Act.

- NSW *National Parks and Wildlife Amendment Act 2010.*
- *State Environmental Planning Policy (Transport and Infrastructure) 2021* (SEPP).
- *Lake Macquarie Local Environmental Plan 2011* (LEP).
- *Lake Macquarie Development Control Plan 2014* (DCP).

1.4 Objectives of the investigation

The objectives of the investigation can be summarised as follows:

- To identify and consult with any registered Aboriginal stakeholders and the Biraban and Darkinjung Local Aboriginal Land Councils (LALC).
- To conduct additional background research in order to recognise any identifiable trends in site distribution and location.
- To search statutory and non-statutory registers and planning instruments to identify listed Aboriginal cultural heritage sites within the study area.
- To highlight environmental information considered relevant to past Aboriginal occupation of the locality and associated land use and the identification and integrity/preservation of Aboriginal sites.
- To summarise past Aboriginal occupation in the locality of the study area using ethnohistory and the archaeological record.
- To formulate a model to broadly predict the type and character of Aboriginal sites likely to exist throughout the study area, their location, frequency and integrity.
- To conduct a field survey of the study area to locate unrecorded or previously recorded Aboriginal sites and to further assess the archaeological potential of the study area.
- To assess the significance of any known Aboriginal sites in consultation with the Aboriginal community.
- To identify the impacts of the proposed development on any known or potential Aboriginal sites within the study area.
- To recommend strategies for the management of Aboriginal cultural heritage within the context of the proposed development.

1.5 Investigators and contributors

The roles, previous experience and qualifications of the Biosis project team involved in the preparation of this archaeological report are described below in Table 1.

Table 1 Investigators and contributors

Name and qualifications	Experience summary	Project role
Samantha Keats BA (Hons)	Samantha has over 7 years' experience in archaeological consulting and has successfully completed numerous projects throughout NSW. Samantha has extensive experience in undertaking Aboriginal archaeological assessments, archaeological surveys, and large-scale archaeological excavations	• Quality assurance. • Technical advice.

Name and qualifications	Experience summary	Project role
	across NSW. Samantha is accomplished in obtaining approvals under the NSW NPW Act 1974 and possesses high quality skills in technical advice and quality assurance.	
Ashleigh Keevers-Eastman BA (Hons)	Ashleigh is a Consultant Archaeologist with over five years' experience. Ashleigh has extensive experience in conducting Aboriginal heritage assessments, field surveys, archaeological test excavations and salvage works across NSW. Ashleigh's strengths are in consulting with the Aboriginal community to build strong relationships that assist in the assessment of Aboriginal cultural heritage. Ashleigh possesses skills in lithic identification, technical report writing and project management.	• Project management. • Technical advice. • Test excavations. • Reporting. • Aboriginal community consultation.
Charlotte Allen BA (Hons) Arch.	Charlotte has over five years archaeological consulting experience. Charlotte has crucial skills in background research, field surveys and excavation, report writing, artefact analysis, assessment of heritage values and impacts, project management and field team management. Charlotte has experience in both Aboriginal and non-Aboriginal heritage projects in NSW. Charlotte is responsible for multiple heritage projects, including State Significant Developments, ranging from ADDAs and Historical Heritage Assessments to larger and more complex ACHAs and Statements of Heritage Impact.	• Test excavations.
Anthea Vella B.Arch, M.AHM	Anthea is a Consultant Archaeologist with over four years' experience. As an archaeologist, Anthea has experience in project management, Aboriginal community consultation, field survey, test excavations, salvage excavations, heritage management plans, and archaeological report writing in the Sydney region, Central Coast and Hunter region, and the Illawarra region. Anthea also has geophysical skills in Ground Penetrating Radar data collection, processing, and interpretation.	• Archaeological survey.
Molly Crissell BA Arch.	Molly joined Biosis in the Newcastle office as an Archaeologist in the Heritage team in 2021. She completed her Bachelor of Archaeology, majoring in Geography in 2019. As part of her education, Molly attended the Irish Archaeological Field School in Wexford, Ireland, as a volunteer. Prior to joining Biosis, Molly has worked in Western Australia and NSW gaining experience in Aboriginal and historical excavations and surveys. Working as a Heritage Consultant in WA, Molly gained experience in reporting, community consultation, artefact analysis and project managing.	• Reporting. • Aboriginal community consultation. • Test excavations.
Crystal Garabedian BA Arch.(Hons) BSc Geology and Geophysics	Crystal is an archaeologist who joined Biosis in the Sydney office in 2021. She has experience in conducting archaeological surveys, test excavations, Aboriginal consultation and desktop assessments for a variety of projects throughout NSW. Crystal possesses specialist skills in the identification of marine zooarchaeological material, whilst also having experience in	• Background research. • Aboriginal community consultation. • Test excavations. • Reporting.

Name and qualifications	Experience summary	Project role
	artefact processing of historical artefacts, including ceramics, building materials and glass.	
Nathan Windram BA Arch. and Ancient History	Nathan is an archaeologist based out of the south-coast of New South Wales and has gained most of his professional experience within that region, with a focus on Aboriginal heritage. Academically trained with a hands-on approach, Nathan has worked on both salvage and test excavation sites and is experienced in surveying, background research, Aboriginal community consultation and reporting.	• Background research. • Aboriginal community consultation. • Reporting.

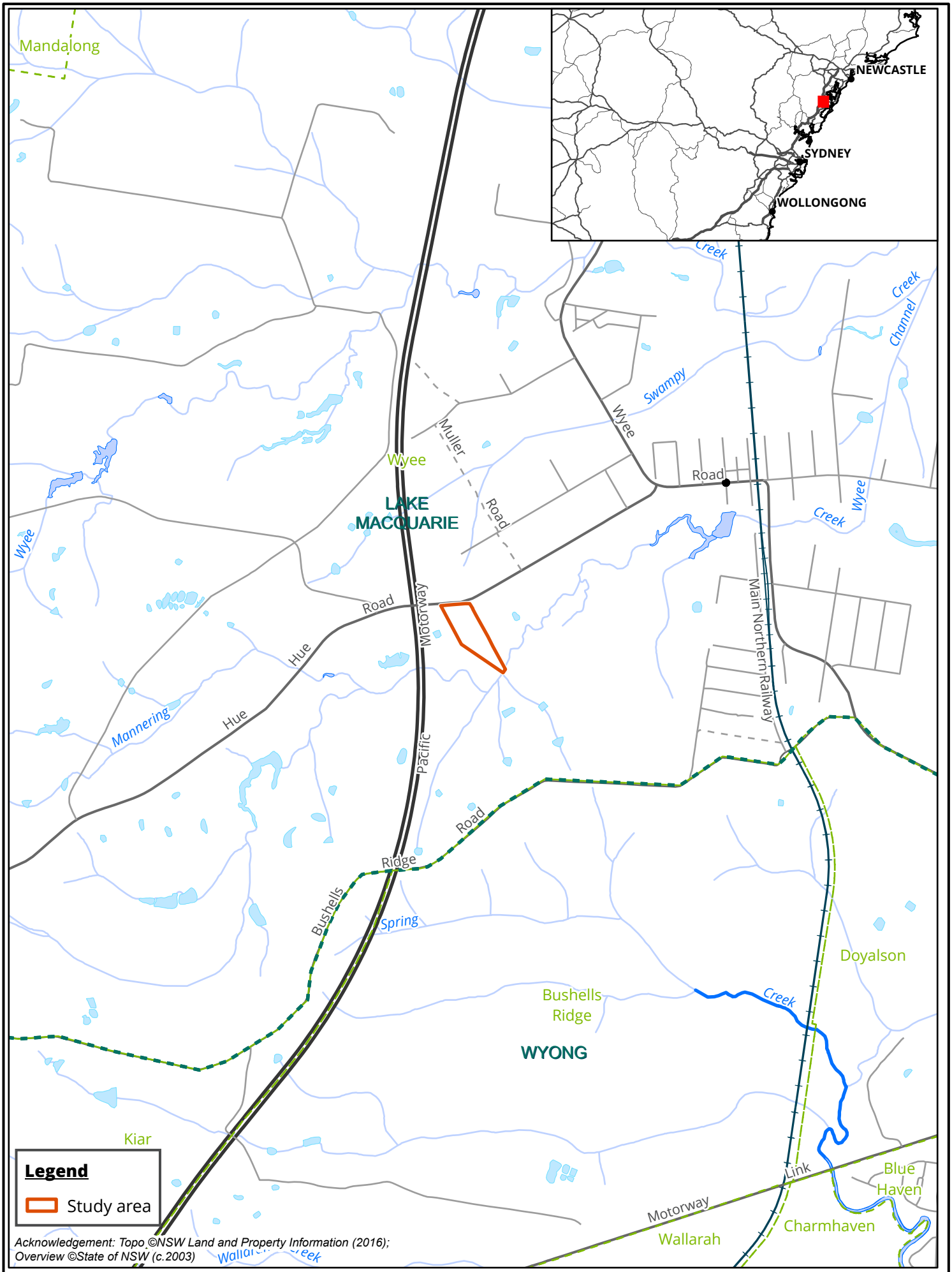

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Figure 1 Location of the study area

Matter: 37418
Date: 15 July 2022,
Drawn by: AM, Checked by: MEL, Last edited by: amackegard
Location:P:\37400s\37418\Mapping\37418_HueHueRd_ACHA_AR\
37418_HueHueRd_ACHA_AR, Layout: 37418_AR_F1_Locality

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Metres
Scale 1:25,000@ A4, GDA 1994 MGA Zone 56

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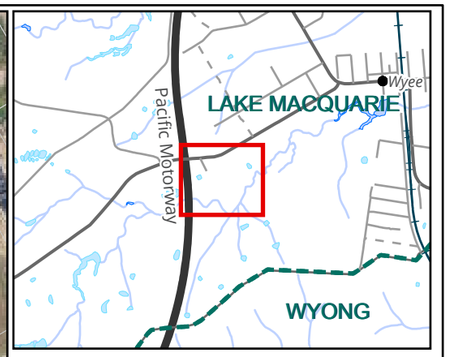

Legend

- Study area
- Lot

Figure 2 Study area detail

0 10 20 30 40 50

Metres

Scale: 1:2,000@ A3

Coordinate System:
GDA 1994 MGA Zone 56

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Matter: 37418, Date: 15 July 2022,
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37418_HueHueRd_ACHA_AR, Layout: 37418_AR_F2_StudyArea

2 Proposed development

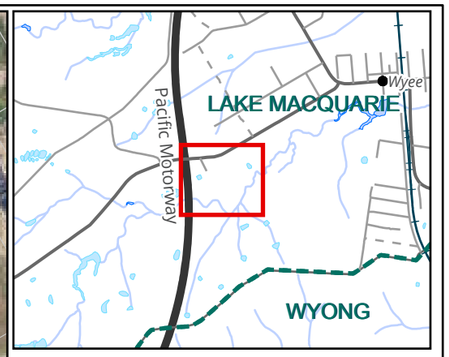
TOPA intends to commence a land rezoning at 1377 Hue Hue Road, Wyee (Lot 437 DP755242), NSW. This project involves:

- The rezoning of the land in the northern portion of the study area from RU2 – Rural Landscape to R2 – Low Density Residential.
- The zoning of the land in the southern portion of the study area will remain E2 – Environmental Conservation, retaining its existing environmental protection zoning.

Additionally, construction following the successful rezoning includes:

- The construction of a road 16 meters in width trending horizontally from Digary Road, through the study area.
- The construction of a road 16 meter in width extending from the southern end of Digary Road and curving to run vertically before forming a T intersection with the aforementioned new vertical road.
- The development of 20 housing lots, grouped in the northern portion of the study area.
- The development of 19 housing lots, grouped in a central-west portion of the study area.
- The development of 15 housing lots, grouped in a central-east portion of the study area.
- Drainage infrastructure and the planned vertical road between the E2 –Environmental Conservation zoned land and the newly rezoned R2 – Low density Residential land.

The detailed layout of the proposed development can be seen in Figure 3.



Legend

- Study area
- Lot

Figure 3 Proposed works

0 10 20 30 40 50

Metres

Scale: 1:2,000@ A3

Coordinate System:
GDA 1994 MGA Zone 56

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Matter: 37418, Date: 08 September 2022,
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37418_HueHueRd_ACHA_AR, Layout: 37418_AR_F3_ProposedWorks

3 Desktop assessment

The desktop assessment involves researching and reviewing existing archaeological studies and reports relevant to the study area and surrounding region. This information is combined to develop an Aboriginal site prediction model for the study area, and to identify known Aboriginal sites and/or places recorded in the study area. This desktop assessment has been prepared in accordance with requirements 1 to 4 of the Code.

3.1 Landscape context

It is important to consider the local environment of the study area any heritage assessment. The local environmental characteristics can influence human occupation and associated land use and consequently the distribution and character of cultural material. Environmental characteristics and geomorphological processes can affect the preservation of cultural heritage materials to varying degrees or even destroy them completely. Lastly landscape features can contribute to the cultural significance that places can have for people.

3.1.1 Topography and hydrology

The study area is located on the Central Coast Lowlands (Murphy 1993, p.2) along the coastal strip bounded by the Watagan Mountains to the east, Terrigal to the south and Munmorah State Recreation Area to the north (Murphy 1993, p.2). This area is characterised by low lying terrain with low rises, alluvial plains and dune fields along the coast, a series of coastal lakes, and is located on the Narrabeen Group. Geological units underlying the study area include the Tuggerah Formation and Alluvial Valley Deposits (Figure 4). The Tuggerah formation comprises of grey to green-grey laminate, to red-brown claystone and siltstone, and fine to medium grained green–grey sandstone. Alluvial Valley deposits are comprised of silt, clay, lithic to quartz lithic sand and gravel (Murphy 1993). The topographic features surrounding the study area includes undulating rises with local relief of 30 metres and slope gradients of less than 10%. Broad crests, ridges and long gently inclined slopes with broad drainage lines are common landform elements. Topographically the study area gradually slopes south, with a crest located to the north-west.

Stream order is recognised as a factor which aids in the development of predictive modelling in Aboriginal archaeology. Predictive models which have been developed tend to favour permanent water courses as the locations of complex sites that have been continuously occupied, as they would have been more likely to provide a stable source of water and by extension other resources which would have been used by Aboriginal groups.

The stream order system used for this assessment was originally developed by Strahler (1952). It functions by adding two streams of equal order at their confluence to form a higher order stream, as shown in Photo 1. As stream order increases, so does the likelihood that the stream would be a perennial source of water.

The study area is situated within a complex system of hydrology, surrounded by several watercourses (Figure 5). Hydrology within the study area includes a third-order, non-perennial creek line, Mannering Creek within the southernmost portion. Low-order tributaries confluence to the south of the study area. The confluences of creeks and other water sources can be associated with Aboriginal sites. Swampy Creek, a second-order, non-perennial water course is located approximately 741 metres north-east of the study area, with one of its first-order tributaries located approximately 195 metres north-east. Mannering Creek, a tributary of Mannering Lake, is a natural, perennial water body located approximately 2.5 kilometres east of the study area.

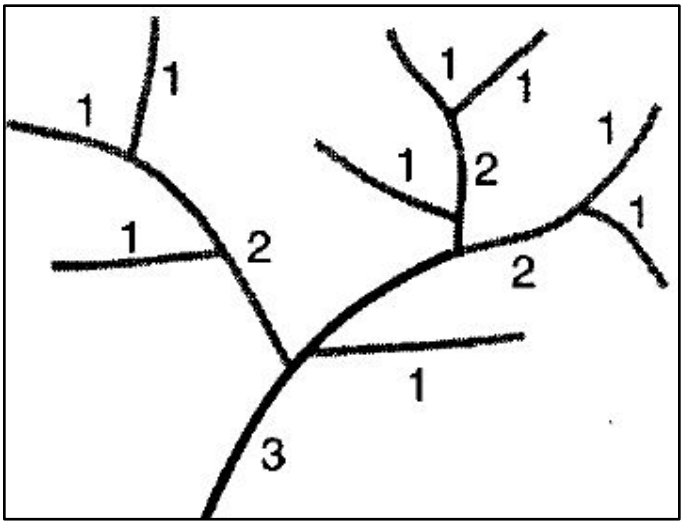


Photo 1 Diagram showing Strahler stream order (Ritter et al. 1995, p.151)

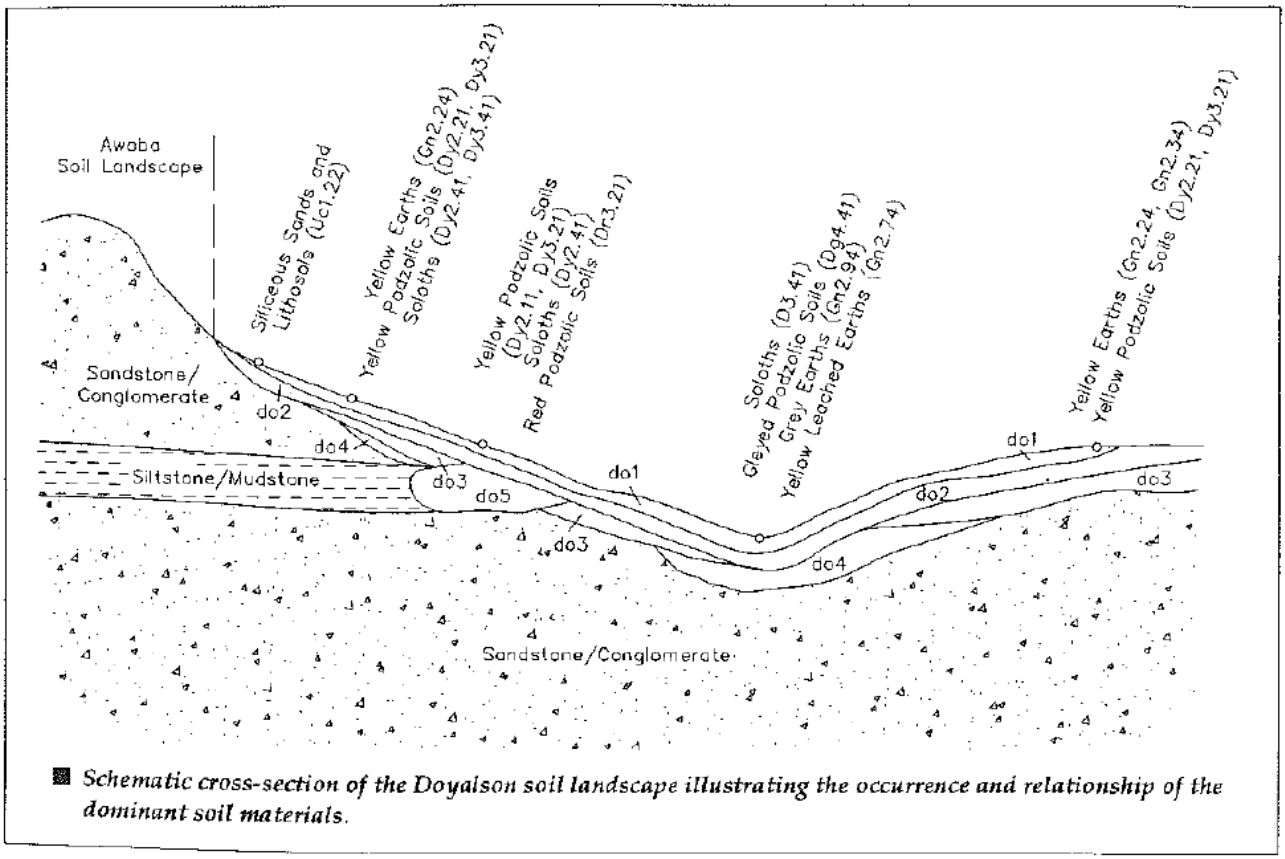
3.1.2 Soil landscapes

Two soil landscapes are present within the study area, Doyalson and Wyong soil landscapes (Figure 6). The Doyalson Soil Landscape is an erosional soil landscape characterised by gently undulating rises on Munmorah Conglomerate, with a local relief of up to 30 metres and a slope gradient of <10%. Major landforms units within this soil landscape include broad crests and ridges, long gently sloping inclines, and broad drainage lines. Rocky outcropping is not common within this landscape. The soils within the landscape are hard setting, stony soils, and strongly acidic with low fertility. Dominant soil materials in the Doyalson soil landscape are subject to seasonal waterlogging and present a very high erosion and foundation hazard. A description of the soil types within the Doyalson soil landscape are provided in Table 2 and Photo 2.

Table 2 Doyalson soil landscape characteristics (Murphy 1993)

Soil material	Description
Doyalson 1 (do1) – Brown loose loamy sand	0–20 cm of loose brown loamy sand, with coarse-grained texture and single-grained structure of sandy fabric that usually occurs as topsoil. When organic matter content is high, weak sub-angular structure with rough ped fabric is present within this soil material. Soil colour ranges from brownish black (10YR 3/1) to dull yellowish brown (10YR 5/3). Gravel-sized sandstone rock fragments, quartz and conglomerate pebbles are common inclusions, and roots and charcoal fragments are present within this soil context. pH ranges from 5.0–6.0.
Doyalson 2 (do2) – hardsetting bleached yellowish brown clayey sand	10–30 cm of hard setting bleached yellowish brown clayey sand, with sandy fabric. This soil material occurs as a shallow subsoil but is sometimes exposed as a surface deposit. This soil material is hard setting when dry. Soil colour ranges from dull yellowish brown (10YR 5/3) to yellow orange 910YR 7/3). When dry soil colours are often bleach (10YR 7/2 to 10YR 8/1). Pale orange mottles are present along root channels. Sandstone rock fragments, quartz and conglomerate pebbles are often present inclusions, and roots are common and charcoal fragments are few within this soil context. pH ranges from 4.5–5.5.
Doyalson 3 (do3) – earthy bright yellowish brown sandy clay loam	30–60 cm earthy bright yellowish brown light sandy clay loam to sandy clay loam soils with massive structure and porous earthy fabric, occurring as a subsoil. Occasionally soil texture reaches a clay with moderately developed blocky structure. Soils colours range from brown (10YR 4/4) to more commonly bright yellowish brown (10YR 6/6), Inclusion include orange

Soil material	Description
	mottles, and faunal casts which are present within the upper portions of this soil material. Sandstone rock fragments, quartz and conglomerate pebbles are often present, but roots are few and charcoal fragments are absent within this soil context. pH ranges from 4.5–5.5.
Doyalson 4 (do4) – earthy light grey clay	0–50 cm of earthy light grey sandy clay loam to medium clay with coarse sand grains, with massive structure and dense earthy fabric. Occurs as a deep subsoil overlying bedrock. Occasionally weak to moderate angular blocky structure present. Soil colours range from common light grey (2.5YR 8/1, 10YR 8/1) to dull yellow orange (10YR 7/2), 10YR 6/4). Red, yellow and orange mottles are common and sandstone rock fragments, quartz, and conglomerate pebbles are often present. Roots are few and no charcoal fragments are present within this soil material. pH ranges from 4.5–6.0.
Doyalson 5 (do5) – Strongly pedal clay	>100 cm of light to medium strongly pedal clays with strongly developed structure and smooth ped fabric. This soils material occurs as subsoil upon fine-grained bedrock. Ed sizes range from small polyhedral and sub-angular blocky to large prismatic or sub-angular blocky. This material has low wet bearing strength. Soil colour ranges from reddish brown (5YR 4/8) to dull yellow orange (10YR 7/2). Grey, orange and red mottles are present and increasing with depth. Inclusions include small rock fragments. Roots are few and charcoal fragments are rare if not absent from this soil material. pH ranges from 5.0–6.0.



Schematic cross-section of the Doyalson soil landscape illustrating the occurrence and relationship of the dominant soil materials.

Photo 2 Schematic cross section of the Doyalson soil landscape (Murphy 1993, pp. 51)

Generally, up to 10 centimetres of *do1* overlies 10 to 30 centimetres of *do2* and 30 to 60 centimetres of *do3*. *Do3* occasionally overlies up to 50 centimetres of *do4*. Occasionally *do1* has been eroded away and *do2* is exposed at the surface, and *do1* and *do2* can overlie bedrock. A total soil depth ranges between 50 to 150

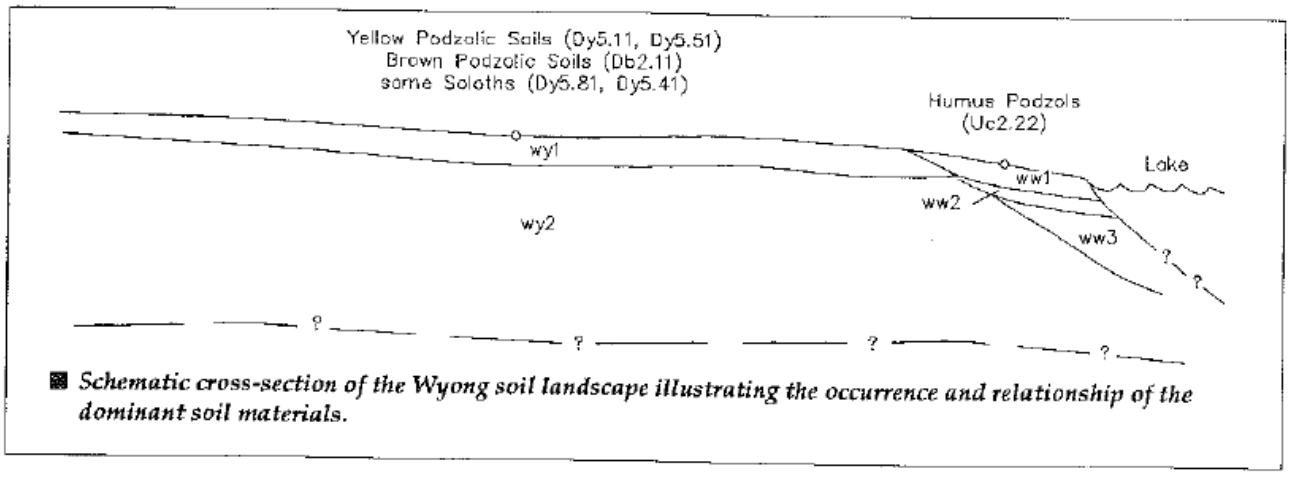
centimetres. Within drainage lines and foot slopes, up to 20 centimetres of *do1* overlies up to 30 centimetres of *do2*, which in turn overlies >100 centimetres of *do4*. This soil landscape is considered erosional and sediment is actively moved and replaced. This equates to a lower archaeological potential as surface artefacts are moved along with the sediment.

The Wyong soil landscape is characterised as an alluvial landform comprising of deep yellow podzolic soils, brown podzolic soils, and soloths with some humus podzols surrounding lakes. Flooding is common with seasonal waterlogging. Common landforms include poorly drained deltaic floodplains and alluvial flats. Low lying slightly elevated terraces are occasionally present (Murphy 1993, p.81). A description of the soil types within the Doyalson soil landscape are provided in Table 3 and Photo 3.

Erosional soil landscapes such as the Doyalson Soil Landscape and alluvial soil landscapes such as the Wyong Soil Landscape can have a lower archaeological potential due to active removal and replacement of sediments causing the movement of surface artefacts. This is caused by erosion or flooding events that transport and remove deposits. However, high points within alluvial landscapes can hold archaeological potential as they are usually unaffected by flood water movements. Previous studies within the Lake Macquarie area have identified that artefact scatters are the most common site type identified within the Doyalson Soil Landscape and alluvial soils, in addition to shell sites and, and PADs (Biosis Pty Ltd 2021). Midden sites are also most likely to be identified within the Wyong Soil Landscape (Nelson 1995).

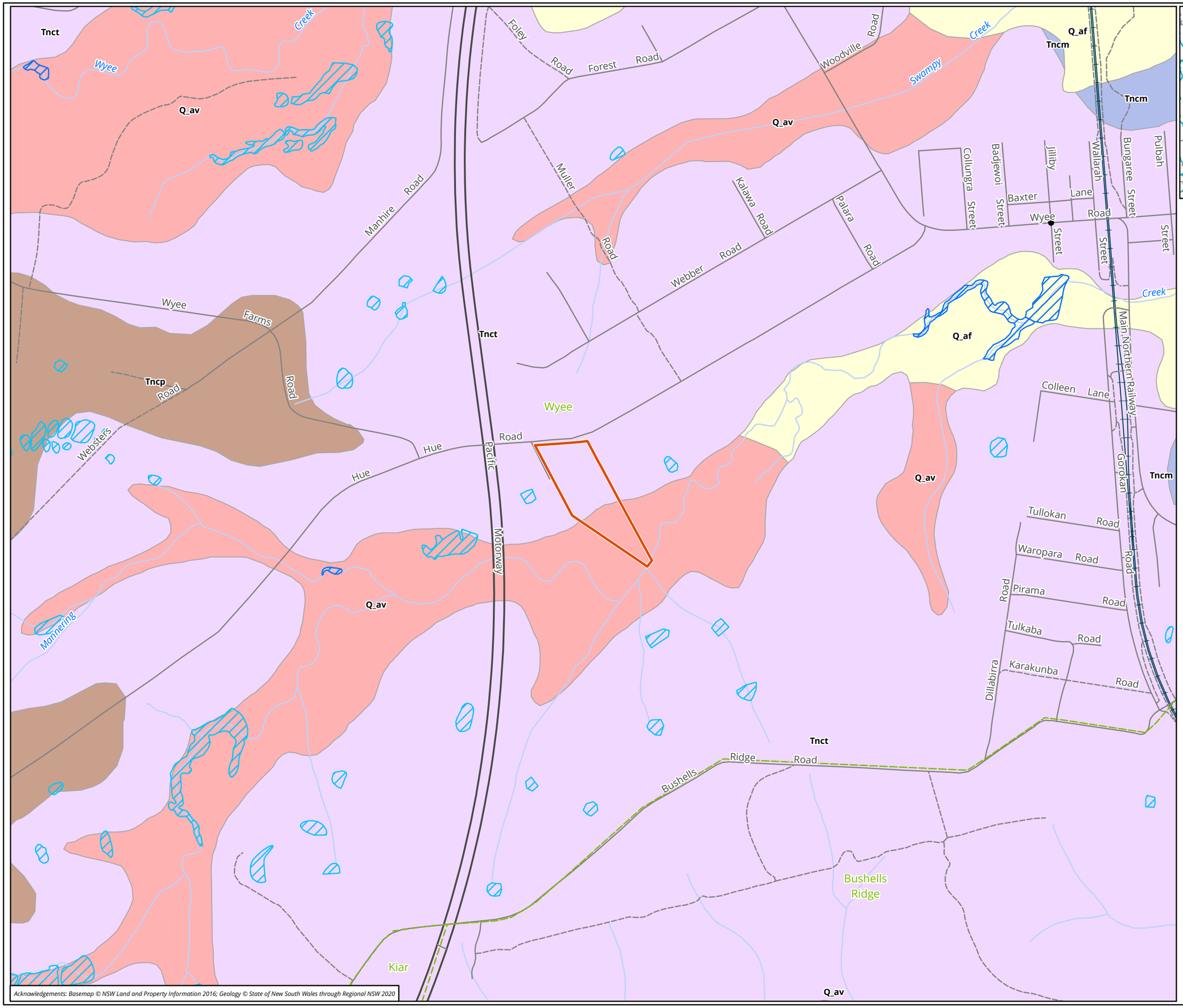
Table 3 Wyong soil landscape characteristics (Murphy 1993, pp.81–82)

Soil landscape	1. Description
Wyong 1 (Wy1) – Brownish black pedal loam	Brownish black loam to silty clay loam with moderate sub-angular structure and a rough ped fabric that occurs as topsoil. This material usually has a friable surface condition and is occasionally hard setting when dry. Colour ranges from a common brownish black (10YR 7/1) when organic matter is abundant to greyish yellow brown (10YR 4/2). The pH ranges from strongly acid to slightly acid (pH6.0). Roots are common, but charcoal and rock fragments are absent.
Wyong 2 (Wy2) – Mottled brownish grey plastic clay	Brownish slightly heavy clay with massive structure when wet and strong angular blocky structure when dry occurring as subsoil. This material is often plastic and silty. It is often permanently waterlogged at depth with strong anaerobic odour. Colour ranges from brownish grey (10YR 6/1) to yellowish brown (10YR 4/8). Orange and straw coloured mottles are often present along root channels. The pH ranges from strongly acid (pH 4.0) to slightly acid (pH 6.0). Roots are rare and charcoal and rock fragments are absent.



Schematic cross-section of the Wyong soil landscape illustrating the occurrence and relationship of the dominant soil materials.

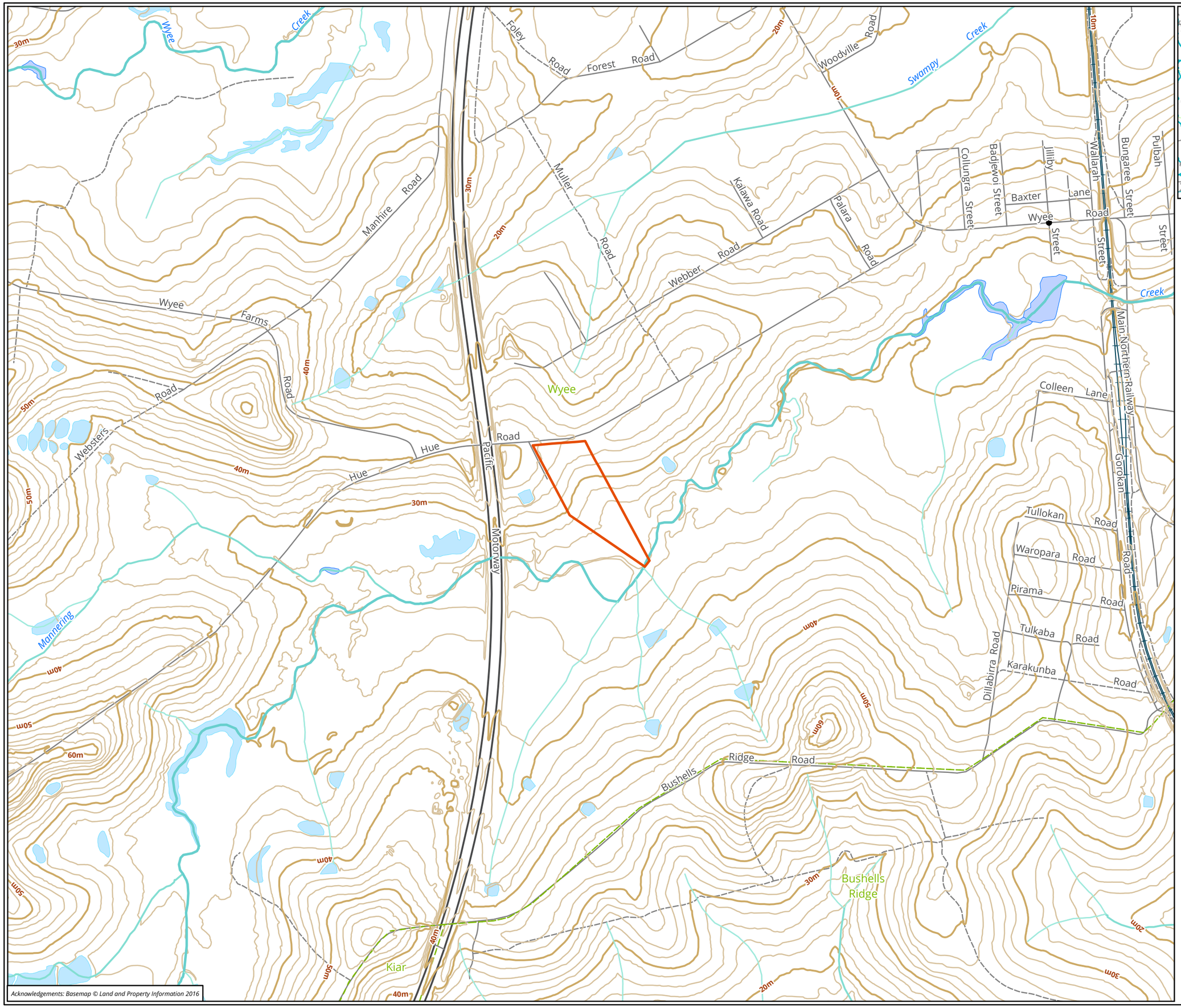
Photo 3 Schematic cross section of the Wyong soil landscape (Murphy 1993, pp. 82)



Acknowledgements: Basemap © NSW Land and Property Information 2016; Geology © State of New South Wales through Regional NSW 2020

Figure 4 Geological units in the vicinity of the study area

Matter: 37418, Date: 15 July 2022,
Drawn by: AM, Checked by: MEL, Last edited by: amackegard
Location: P:\37400s\37418\Mapping\37418_HueHueRd_ACHA_AR\37418_HueHueRd_ACHA_AR, Layout: 37418_AR_F4_Geology



Legend

- Study area
- Contour (2m)

Strahler Order

- 1
- 2
- 3

Figure 5 Hydrology and topography in the vicinity of the study area

0 80 160 240 320 400

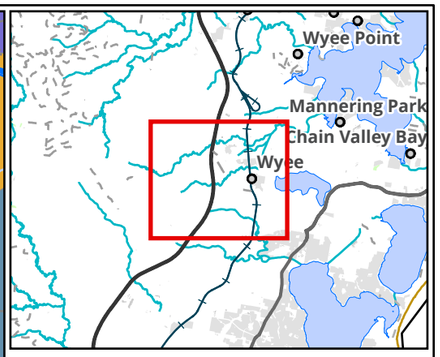
Metres
Scale: 1:10,000@ A3
Coordinate System:
GDA 1994 MGA Zone 56

N

biosis

Matter: 37418, Date: 15 July 2022,
Drawn by: AM, Checked by: MEL, Last edited by: amackegard
Location: P:\37400s\37418\Mapping\37418_HueHueRd_ACHA_AR\37418_HueHueRd_ACHA_AR, Layout:37418_AR_F5_Hydrology

Acknowledgements: Basemap © Land and Property Information 2016



Legend

Study area

Soil landscape units

- aw - AWABA
- do - DOYALSON
- gk - GOROKAN
- ml - MANDALONG
- ts - TACOMA SWAMP
- WATER - WATER
- wo - WOODBURYS BRIDGE
- wy - WYONG
- xx - DISTURBED TERRAIN

Figure 6 Soil landscapes in the vicinity of the study area

0 160 320 480 640 800

Metres

Scale: 1:20,000@ A3

Coordinate System:
GDA 1994 MGA Zone 56

N

biosis

Matter: 37418Date: 15 July 2022,
Drawn by: AM, Checked by: MEL, Last edited by: amackegard
Location: P:\37400s\37418\Mapping\37418_HueHueRd_ACHA_AR\
37418_HueHueRd_ACHA_AR, Layout: 37418_AR_F6_Soils

Acknowledgements: Basemap © Land and Property Information 2016; Soils: Murphy C.L., 1993, Soil Landscapes of the Gosford-Lake Macquarie 1:100,000 Sheet map and report, Department of Conservation and Land Management, Sydney;

3.1.3 Landscape resources

The wider region includes distinct ecological zones, including open forest and open woodland, with riparian vegetation extending along many of the watercourses. Each ecological zone hosts a different array of floral and faunal species, many of which would have been utilised according to seasonal availability. Aboriginal inhabitants of the region would have had access to a wide range of avian, terrestrial and aquatic fauna and repeated firing of the vegetation would have opened up the foliage allowing ease of access through and between different resource zones.

Vegetation present within the Doyalson soil landscape includes Scribbly Gum *Eucalyptus haemastoma*, Red Bloodwood *E. gummifera*, Brown Stringybark *E. capitella*, Smooth-barked Apple *Angophora costala* and Grey Gum *E. punctate*. Understory species include Hill Banksia *Banksia spinulosa*, Banksia *B. oblongifolia*, and Mountain Devil *Lambertia formosa* (Murphy 1993, p.49). Vegetation within the Wyong soil landscape includes *Melaleuca linarifolia*, Prickly-leaved Paperbark *M. stypheliodes*, Woolybutt *E. longidolia*, and Swamp Mahogany *E. robusta* (Murphy 1993, p.81). Plant resources were used in a variety of ways. Fibres were twisted into string, which was used for many purposes, including the weaving of nets, baskets and fishing lines. String was also used for personal adornment. Bark was used in the provision of shelter; a large sheet of bark being propped against a stick to form a gunyah (Attenbrow 2002).

This vegetation would have supported a range of animals including Galah *Eolophus roseicapilla*, Sulphurcrested Cockatoo *Cacatua (Cacatua) galerita* Eastern Grey Kangaroo *Macropus giganteus*, Common Ringtail Possum *Pseudocheirus peregrinus*, Common Brushtail Possum *Trichosurus vulpecula*, Swamp Wallaby *Wallabia bicolor*, Red-necked Wallaby *Notamacropus rufogriseus*, Common Wombat *Vombatus ursinus*, Dingo *Canis familiaris*, Short-beaked Echidna *Tachyglossus aculeatus*, Northern Brown Bandicoot *Isoodon macrourus*, and Red-necked Pademelon *Thylogale thetis*. Additionally, a number of fish species are present within the watercourses of the surrounding region, including the: Minnow *Galaxias maculatus,* the Gambies *Gambusia holbrooki,* the Brown Stingray *Hemitrygon fluviorum,* the Firetail Gudgeon *Hypseleotris galii,* and the Flathead Gudgeon *Philypnodon grandiceps.*

As well as being important food sources, animal products were also used for tool making and fashioning a myriad of utilitarian and ceremonial items. For example, tail sinews are known to have been used to make fastening cord, while 'bone points', which would have functioned as awls or piercers, are often an abundant part of the archaeological record. Animals such as Brush-tailed Possums were highly prized for their fur, with possum skin cloaks worn fastened over one shoulder and under the other. Kangaroo teeth were incorporated into decorative items, such as head bands (Attenbrow 2002).

The presence of a wide variety of flora and fauna in proximity to the study area would have made this location a resource rich open woodland, serving to attract Aboriginal people here. In taking advantage of available resources they may have left behind trace indicators of their lives.

3.1.4 Land use history

Exploration of the wider Central Coast regions began shortly after European colonization of NSW, with Governor Phillip pushing north of Sydney along the coast in the 1780s and 1790s. Early townships set up in the area included Gosford, Kincumber, and Snodgrass Valley (Strom 1982, pp.1–10). South of the study area by 18 kilometres, at Ourimbah, a timber cutting mill was established, with the proprietors immediately beginning to exploit blackbutt and blue gum resources in the area. The broader area covered by the lease entitled the owner to gather timber along Ourimbah Creek to the north of Ourimbah (Strom 1982, p.14, Secomb 2010, p.55).

The land surrounding the study area which would eventually become the township of Wyee was presented as a land grant to philanthropist Thomas Walker in 1839 with the belief that he would make improvements to the territory He failed to do so, reverting the grant back to ownership by the Morisset Parish. The area was

reportedly inhabited by a number of European settlers from 1835, the first being John Moore who had constructed a stock yard to handle cattle which ran wild in the region and numbered approximately 200. By 1860 the region was inhabited sporadically, with the Freeman family headed by patriarch James Freeman inhabiting the land but lacking any deeds of ownership (Bennett, F. C 1969).

In 1874 a large steam powered sawmill was built adjacent to the lake at Wyee Point, approximately 6 kilometres to the north-east of the study area. This construction was undertaken in order to extend the railway line from Murrunundi to Tamworth, a project that necessitated the production of sleepers. The mills output reached 40,000 feet of timber per week by 1875 allowing for the addition of a wharf to assist in transporting the output of the sawmill via Lake Macquarie, and attracted a number of families who took up residency along the shore (Bennett, F. C 1969). Wyee train station would eventually open in 1887, originally called Norahville after the small coastal settlement approximately 11 kilometres to the south-east of the study area; however, the name would change to Wyee by 1888. The construction of the railway station would enable the development of a small village centred on the station itself, the village would be proclaimed a town on the 22nd of August 1891 (Bennett, F. C 1969).

Historical aerial images allow for modern developments and disturbances to be identified within the study area. An aerial photograph dated to 1966 shows that initial tree clearance has occurred within the northern and central portion of the study area, while vegetation appears to remain in the south (Photo 4).

Photo 4 Aerial photograph dated to 1966 with the study area indicated by the orange boundary (Source: NSW Spatial Services)

An aerial photograph dating to 1980 shows that vegetation has been extensively cleared, with some remaining in the southern portion of the study area (Photo 5). A residential structure has been built within the north-western portion and plough lines are visible in the northern and central portions of the study area.

Photo 5 Aerial photograph dated to 1980 with the study area indicated by the orange boundary (Source: NSW Spatial Services)

An aerial photograph dated to 1994 shows additional structures have been constructed within the north western portion (Photo 6). Vegetation remains in the south and plough lines are present in the north-east. The M1 Motorway can be seen to the west of the study area.

Photo 6 Aerial photograph dated to 1994 with the study area indicated by the orange boundary (Source: NSW Spatial Services)

Current aerial imagery shows the structures remaining in the north-west (Figure 2). Stables and a yard have been constructed along the central western border, and vegetation remains in the south. Plough lines can be seen within the remaining land. Overall, minimal disturbance has occurred in the southern portion of the study area near Mannering Creek. Isolated disturbances have occurred within the north-west and west, with the remaining land containing surface impacts from agricultural use.

3.2 Previous archaeological work

Several cultural heritage surface (surveys) and sub-surface (excavations) investigations have been conducted throughout the region of NSW in the past 30 years. There has been an increasing focus on cultural heritage assessments in NSW due to ever increasing development, along with the legislative requirements for this work and greater cultural awareness of Aboriginal cultural heritage.

3.2.1 Regional overview

A number of Aboriginal cultural heritage investigations have been conducted for the Lake Macquarie region. Models for predicting the location and type of Aboriginal sites with a general applicability to the Lake Macquarie region and thus relevant to the study area have also been formulated, some as a part of these investigations and others from cultural heritage investigations for relatively large developments.

Dallas (1986) completed a field investigation of a proposed pipeline between Gwandalan and Mannering Park Sewerage Treatment Works, located approximately 10 kilometres north-west of the study area. One Aboriginal midden site was identified during the survey, consisting of a disturbed area of *Anadara trapezia* (Cockle) over approximately 60 x 40 metres. The site was considered to be disturbed and of little scientific

significance or research potential. It was recommended that the client apply for an s90 Consent to Destroy in order to construct the pipeline

HLA (2005) undertook an archaeological excavation at Dora Creek, 11 kilometres north of the study area, prior to the installation of a water pipeline, which passed through areas of PAD. The research design for the project stated that the aims were to "determine whether subsurface deposits with the potential for archaeological material existed within the alluvial flat around Dora Creek" (2005, p.20). Three boreholes were undertaken as part of geotechnical investigations at the development and the sediments were analysed in terms of their texture and colour to define the stratigraphy and placed into context within the broader region. No buried soil horizons were identified and no archaeological material was noted.

Insite Heritage Pty Ltd (Insite) (2011) conducted an Aboriginal archaeological assessment approximately 20 kilometres north of the study area, at Awaba. Insite also developed a predictive model for archaeological sites in the region that favoured river terraces as the location of archaeological sites. Site complexity would decrease as distance increased from water sources. In particular, grinding grooves are predicted to be located on creek lines where suitable rock exposures occur.

Although the field investigation was generally hindered by poor ground visibility, three sites were identified on gentle slopes in the east and south-east of the assessment area:

- AWTF_ST1 (Photo 7) – A modified mahogany or stringybark tree with a scar measuring 116 centimetres long and 18 centimetres wide. The distance from the base of the tree was 75 centimetres. The scar is located on the south side of the tree.
- AWTF_ST2 – A modified tree which has been burnt and is dead. The scar has dimensions 171 centimetres long, 43 centimetres wide with a distance to the base of the tree being 116 centimetres.
- AWTF_ST3 – A modified tree with dimensions 78 centimetres long, 42 centimetres wide. Distance to ground level was 110 centimetres. The scar was located on the western side of the tree.

Photo 7 AWF_ST1 scar tree (Source: Insite Heritage 2011, p.27)

Following the field investigation, a testing program was undertaken along creek lines within the site complex. Seven test pits were excavated in total to a maximum depth of 400 millimetres. Only one test pit contained no signs of disturbance and a single artefact; a silcrete flake found at the base of spit 3 (250 millimetres), was recovered.

Biosis (2018) completed a due diligence assessment for the NBN works at Toronto, NSW, approximately 21 kilometres north of the study area. Background research conducted as part of this assessment identified high levels of archaeological potential for artefact sites and middens to be located within the development foot print based on AHIMS sites present within the site. Midden sites were concentrated along the shoreline of Lake Macquarie, while artefacts were identified within close proximity to permanent water sources. Subsequently, a field investigation was undertaken to test the results of the predictive modelling. The field investigation was hindered by high levels of disturbance in all parts of their study area. The field investigation of 2TRT-22 identified the area to have been impacted by previous residential and industrial development. Visibility was considered low at 15% and areas of exposure were limited to 10% where erosion from recent development and vehicle movement had occurred. Several previously recorded artefact and midden sites were relocated.

AMAC (2019) conducted an interim archaeological report for 26 Mann Street, Gosford located approximately 30 kilometres south of the study area. A previously recorded artefact site was present within the study area with moderate potential for intact deposits to remain. The site is located within 200 metres of Brisbane Waters and 100 metres of a lower order unnamed creek. A site inspection noted that although some modern disturbances have occurred, the site remained intact. Further investigation via an ACHA was recommended in addition to test excavation prior to development.

Biosis (2021) conducted an ACHA at Old Main Road, Fennel Bay, located approximately 20 kilometres north of the study area. Background research identified two AHIMS sites, a grinding groove and rock shelter, previously recorded within 200 metres of the study area. Previous assessments in the area also noted potential for artefact scatters, being the most commonly occurring site type, in addition to middens, rock shelters and grinding grooves. Based on this, landform units including ridgelines, crest spurs and upper slopes were targeted during the field investigation. Lower slopes and creek terraces were also targeted. Scarred trees had potential to occur throughout the study area.

Predictive modelling for the site based on AHIMS results within the vicinity was also conducted and included the Doyalson soil landscape and Alluvial Valley deposits geological unit. Artefact scatters were the most common site type to occur within the Doyalson soil landscape followed by shell, PAD and Aboriginal ceremony and dreaming. Artefact scatters and PAD sites were the most common site types that occurred within the Alluvial Valley deposit geological unit, followed by water hole. Artefacts were found on average within 170 metres of ephemeral water courses, grinding grooves within 160 metres, shell within 190 metres, PAD within 150 metres and Aboriginal ceremony and dreaming within 270 metres. Within proximity to third order creek lines, which is present within the study area, artefact was the most common site type, followed by shell, PAD, water hole and grinding groove. These sites were predominantly found below 20 metres elevation.

A field investigation of the site identified an artefact scatter, four isolated finds, three rock shelters, three PAD sites, two areas of high archaeological sensitivity, four areas of moderate archaeological sensitivity and two areas of intangible Aboriginal cultural significance. Avoidance of the grinding groove, rock shelters, and areas of potential and intangible significance was recommended. Salvage of artefact, PAD and areas of potential that could not be avoided was also recommended, in addition to developing a Cultural Heritage Management Plan (CHMP) and long term care agreement.

3.2.2 Local overview

A number of Aboriginal cultural heritage investigations have been conducted within the region (within approximately 10 kilometres of the study area). Most of these investigations were undertaken as part of development applications and included surface and sub-surface investigations. These investigations are summarised below.

J.C Lough and Associates Archaeological Field Surveyors (1981) conducted an archaeological field investigation for Freeway No.3 Wallarah Creek Interchange to Wallsend, located approximately 93 metres west of the study area. A field investigation of the proposed route identified 15 sites primarily consisting of artefacts. Artefact sites were identified on tracks and roads with exposure. They comprised of a chips, flakes, cores and a scraper, of chert and cryptocrystalline chert, in addition to three axe grinding grooves located within creek beds. As a result of the field investigation, low archaeological significance was determined with the exception of the grinding grooves. An unexpected finds procedure was put in place with no alterations to the proposed route location.

Dallas (1986) conducted an archaeological field investigation along Hue Hue Road approximately 4 kilometres south-west of the study area. Based on the landscape and previous assessments within the area, artefact scatters were determined to be likely within flat landforms near water, and scarred trees in remnant vegetation. An artefact scatter containing three artefacts including a yellow mudstone flake, a grey silcrete flake, and a yellow chert flake, was identified within 90 metres of a creek line. This was determined to indicate a transitional landform rather than an occupation site. Further investigation was recommended.

Kuskie (1992) conducted a preliminary archaeological assessment for the proposed Optus communications fibre optic cable route between Wyong and Maitland, located approximately 30 metres west of the study area. Based on previously recorded sites, landforms and previous studies of the region it was determined that artefact scatters are most likely to occur, in addition to isolated finds. Middens and scarred trees also had

potential to occur. A number of artefact scatters and isolated finds were identified during the field investigation. The majority of the proposed route was located within highly disturbed landform. No further assessment was recommended. If the route was altered to impact identified sites further assessment was recommended.

Navin Officer (1994) was contracted by Sinclair Knight and Partners to provide a preliminary cultural heritage assessment on behalf of Optus, for the proposed cable route to be installed from Sydney to Newcastle, and onwards to Orange, including the study area. The purpose of the assessment was to provide a predicative model for site locations within the study area that would influence the cable route. Within the report, the archaeological sensitivity of five landforms (Sandstone Ranges of the Sydney Basin, Central Lowlands of the Hunter Valley, Cumberland Plain, the Coastal Margin and Plain, Western Rangelands) were assessed, and a predicted site location criteria was provided for each region. The Coastal Margin and Plain landform include the study area. It was determined to have undergone extensive research, particularly along the coastline of the Central Coast and South Coast. This was used to make predictive statements for the area:

- Middens are the most common site type along the coast, often located on or near rocky headlands or rock platforms adjacent to a creek mouth or hind dune water system.
- Estuarine middens are commonly located close to the estuarine environment on or adjacent to well drained elevated areas.
- Artefact scatters are likely to occur on level, well drained ground, adjacent to fresh water and wetlands or level ground on crests of ridgelines.
- Hinterland ridgelines providing access across and relative to the surrounding landscape will tend to contain more and larger sites.
- Burial sites are generally found in landforms with deep profile soft sediments such as Aeolian sand and alluvium. They can also occur in occupation sites such as middens.
- Scarred trees may occur in areas of remnant vegetation containing trees of sufficient age.

Nelson (1995) produced a thesis on shell middens on the shores of Lake Macquarie, located approximately 6 kilometres north=east of the study area. Nelson surveyed and recorded midden sites located along the lake foreshore, making particular reference to site size and complexity, to form a database of middens to test against environmental variables. It was assumed that large middens would reflect wider resource bases and more diverse environmental range, while smaller middens would reflect a less diverse environment. The study identified that this was not the case, with middens in Lake Macquarie reflecting "a singular pattern of simplicity in content" (Nelson 1995, p.5).

The field investigation covered approximately 100 kilometres (approximately 60%) of the foreshore and up to 10 to 20 m back from the water. The field investigation located 33 previously unrecorded sites and relocated 28 AHIMS sites. Analysis was conducted on 41 of the sites as 20 were too disturbed. Trends identified include:

- 43% of middens were located within the Wyong soil landscape, 38% in Doyalson soil landscape, 17% in Awaba soil landscape and 2% in Warners Bay soil landscape.
- Over 50% of the sites were 51 metres in length or larger. With large sites having greater potential for integrity. 20% of sites were less than 50 metres in length.
- There were no sites under 50 metres with dual aspects.
- Preference for the north-east quadrant of Lake Macquarie potentially due to cooling effect of the wind in summer.
- Smaller sites were more commonly associated with fresh water than large sites.

- The most common geological type containing midden sites was the Triassic Munmorah Conglomerate, and Quaternary fluvial alluvium.
- Middens were most commonly recorded in association with creeks.

Officer et al. (1996) undertook a field investigation and subsequent archaeological excavation at Mannering Bay, approximately 5 kilometres north-west of the study area. The identified archaeological site comprised of an open camp site with 137 artefacts recovered from surface and sub-surface contexts. All shell recovered from the site was not considered to be Aboriginal in origin (i.e was considered to be naturally occurring in that area or rubbish from fishing bait), which was considered surprising given the proximity to the coast.

Heritage Concepts (2006) were engaged to undertake a field investigation of a proposed gas pipeline at Munmorah Power Station, located approximately 7 kilometres southeast of the study area. Five areas of moderate archaeological potential were identified within swamp lands. It was recommended that preliminary test excavations occur at these areas. No other Aboriginal sites were identified during the field investigation.

Insite Heritage (2010) conducted an Aboriginal and European heritage assessment for the Wyee local environmental study, located to the east of the study area. Based on the landform and previous studies within the area, artefact scatters and isolated finds were determined to be the most likely site type. Grinding grooves were also identified to have potential where suitable rock outcrops occur in creek lines. A field investigation of the site identified two artefact scatters along the margins of Mannering Creek and a stone formation in the sout- western corner. Artefacts included flakes and debitage of quartzite, chert, red silcrete, mudstone and basalt. The field investigation was impacted by dense vegetation however it was hypothesised that artefact density would decrease with distance from the creek line but needed to be tested. Three proposed testing areas for future investigation were outlined to the south of the creek and within the southernmost portion of the study area.

Umwelt (2011) conducted an Aboriginal Heritage Management Strategy report for the Lake Macquarie LGA, which includes the study area. As part of the assessment, culturally sensitive landscapes within the LGA region were mapped, including coastal hinterlands, lower alluvial reaches, upper catchment areas, escarpments of Sugarloaf and Watagan Ranges, lake shore contexts, deltas of major creek lines and coastal dunes and headlands. No Sensitive Aboriginal Landscape areas were identified within the study area by Umwelt's assessment (Photo 8).

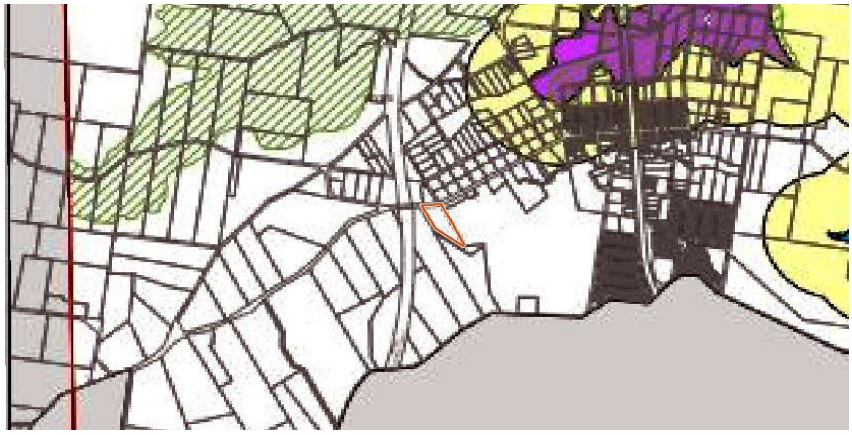


Photo 8 Areas of Aboriginal sensitivity within the Lake Macquarie LGA in green hash and the study area shown in orange (Source: Lake Macquarie LEP sensitivity map CL2_007)

Fresh water creek corridors were considered to be utilised for their natural resources for intermittent occupation, as Aboriginal people moved from the coastline to the mountain ranges. Within Riverine or Riparian landscapes similar to those located within the study area, it was predicted that grinding groove sites were likely to be found in association with the creek bed, with artefact sites associated with alluvial deposits

within creek terraces where intact subsurface deposits may be preserved by recent sediment. Artefact scatters also had the potential to occur upon bedrock-based foot slopes in an open context.

The current study area is located within the lower alluvial reaches of tributary catchment landform unit within the Lake Macquarie area. This is characterised to contain the following:

- Creek beds in alluvial fill with rare sandstone and conglomerate outcrops, with banks up to 3 metres high.
- Floodplain with stratified alluvial deposits including sand, gravel and clay.
- Terrace with high level of alluvium up to 50 metres above creek beds.
- Tributary creek channels with alluvial bed and rock outcropping.
- Low gradient foot slope with up to 10 metres local relief.
- Spur crest and steep upper slopes.
- Back swamp on floodplain, between valley side and low levee floodplain margin.
- Valley side slope with moderate to steep shallow duplex soils and relief of 20 to 40 metres
- Tributary valley side slopes with a local relief of up to 30 metres.

The alluvial reaches landform was predicted to contain artefact scatters, scarred trees, and story sites in floodplain wetlands, estuaries and fresh water areas. Artefact scatters were also present in low, extended ridges and spurs. Grinding grooves can be present in creek beds, and artefact scatters and scarred trees also have potential in levees and terraces (Table 4).

Table 4 Predicted Aboriginal site types within different landforms of the lower reaches (Umwelt 2011, p. Appendix 4)

Terrain unit	Predicted site types	Likelihood of occurring and site condition
Floodplain wetlands – estuarine and fresh water	Artefact scatters Scarred trees Story sites	In shallow soil units are the most likely site types. Extensive disturbance in wetlands. Likely site type in this landscape but few if any remain. Some wetlands are associated with community stories.
Low extended ridges and spurs	Artefact scatters	Most likely archaeological evidence, including isolated finds. High density deposits more likely in low spurs in close proximity to water.
Creek beds	Grinding grooves	Can occur if sandstone outcropping occurs.
Levees and terraces	Artefact scatters Scarred trees	Levees and terraces provide slightly elevated, level terrain adjacent to water. Artefact scatters are expected. Possible but few trees remain.

Biosis (2011) conducted an Aboriginal archaeological assessment for Lake Munmorah high voltage feeder lines, located approximately 6 kilometres west of the study area. Background research identified 36 sites within a 10 kilometre search area, none within the assessment area. Based on these results and previous research in the area scarred trees and artefact scatters were determined to be the most likely site type to occur. A field investigation of the assessment area did not identify any sites and was determined to have low archaeological potential. This was due to the disturbed nature of the area. No further assessment was recommended.

AMBS (2014) undertook an archaeological field investigation for the Pacific Motorway widening and replacement between Tuggerah and Doyalson, approximately 1 kilometre south of the study area. The assessment identified no sites and determined that no further assessment was required. The study also identified a number of regional reports which have made predictions in relation to site locations and distribution. The review undertaken by AMBS (2014) made a number of points, including:

- Sites are less likely to be identified in low lying swampy areas. The areas focused on for this assessment were a series of excavations and field investigations to the south and west of the Tuggerah Lakes area. The majority of assessments identified few or no sites, and those that went to excavation tended to contain low numbers of artefacts, if any.
- There are a small number of sites that do contradict this trend, particularly one excavated by Therin (AMBS 2014). AMBS was unable to obtain the report for Therin's assessment or state the landform, but noted the high number of artefacts recovered, with a density of two to 65 artefacts per square metre.
- Site variety and density is likely to be greater in coastal or estuarine environments.
- Stone artefact density is likely to be greater in closer proximity to major water resources, however these sites may still be of relatively low density.

RPS (2015) undertook a heritage impact assessment for the Mandalong Transmission Line Relocation Project, located approximately 6.3 kilometres north-west of the study area. Previous assessments within the area had identified an abundance of fresh water sources within the area in addition to resources associated with Lake Macquarie and Lake Munmorah, likely being the focus of Aboriginal occupation. Despite this, evidence for frequent occupation of inland areas was also shown. Four AHIMS sites had previously been recorded within the assessment area, including three grinding groove sites, a scarred tree and a stone arrangement. A potential scarred tree was located during the survey but was determined not to be cultural. No other sites were identified. No go zones around the known AHIMS sites were recommended

GML (2017) conducted an ADDA at Site 5 Wallarah, located approximately 3 kilometres south of the study area. A review of previous assessments and AHIMS sites identified that artefacts and midden sites were most common within the area. Grinding grooves were not considered likely due to lack of underlying sandstone. Artefacts were considered likely within raised landforms on alluvial deposits, low densities on ridgelines and large flat landforms near wetlands and waterways. Isolated finds were considered likely in areas of erosion. Scarred trees can be present in areas of remnant vegetation. A site inspection identified an anthropological and archaeological site within a large elevated flat landform associated with a local walking route. A fire trail was present within the area. This landform and another elevated landform were determined to have archaeological sensitivity. Further assessment and consultation were recommended.

Biosis (2021) conducted an ADDA archaeological field investigation at 1377 Hue Hue Road, Wyee, NSW, the current Biosis study area. The investigation focused on recording:

- Aboriginal objects or sites present in the study area during the field investigation.
- Field investigation coverage.
- Any resources that may have potentially have been exploited by Aboriginal people.
- Landform elements, distinguishable areas of land approximately 40 metres across or with a 20 metre radius (CSIRO 2009).
- Photographs of the site indicating landform.
- Ground surface visibility (GSV) and areas of exposure.

- Observable past or present disturbances to the landscape from human or animal activities.
- Aboriginal artefacts, culturally modified trees or any other Aboriginal sites.

The site was discovered to have suffered only superficial disturbances in the north-east, and minimal disturbances in the south. No Aboriginal sites or objects were recorded during the field investigation; however, the lack of surface material may be attributed to the limited exposure and areas of disturbance seen during the investigation. As such, three areas of moderate archaeological potential within flat well-draining areas overlooking and adjacent to Mannering Creek in the north-east, central and southern portions of the study area were identified.

3.2.3 AHIMS site analysis

An extensive search of the AHIMS database (Client Service ID: 699604) identified 110 Aboriginal archaeological sites within a 4.7 by 4.7 kilometre search area, centred on the study area. Table 5 provides the frequencies of Aboriginal site types in the vicinity of the study area. None of these registered sites are located within the study area (Figure 7). AHIMS search results are provided in Appendix 1. The mapping coordinates recorded for these sites were checked for consistency with their descriptions and location on maps from Aboriginal heritage reports where available. These descriptions and maps were relied on where notable discrepancies occurred.

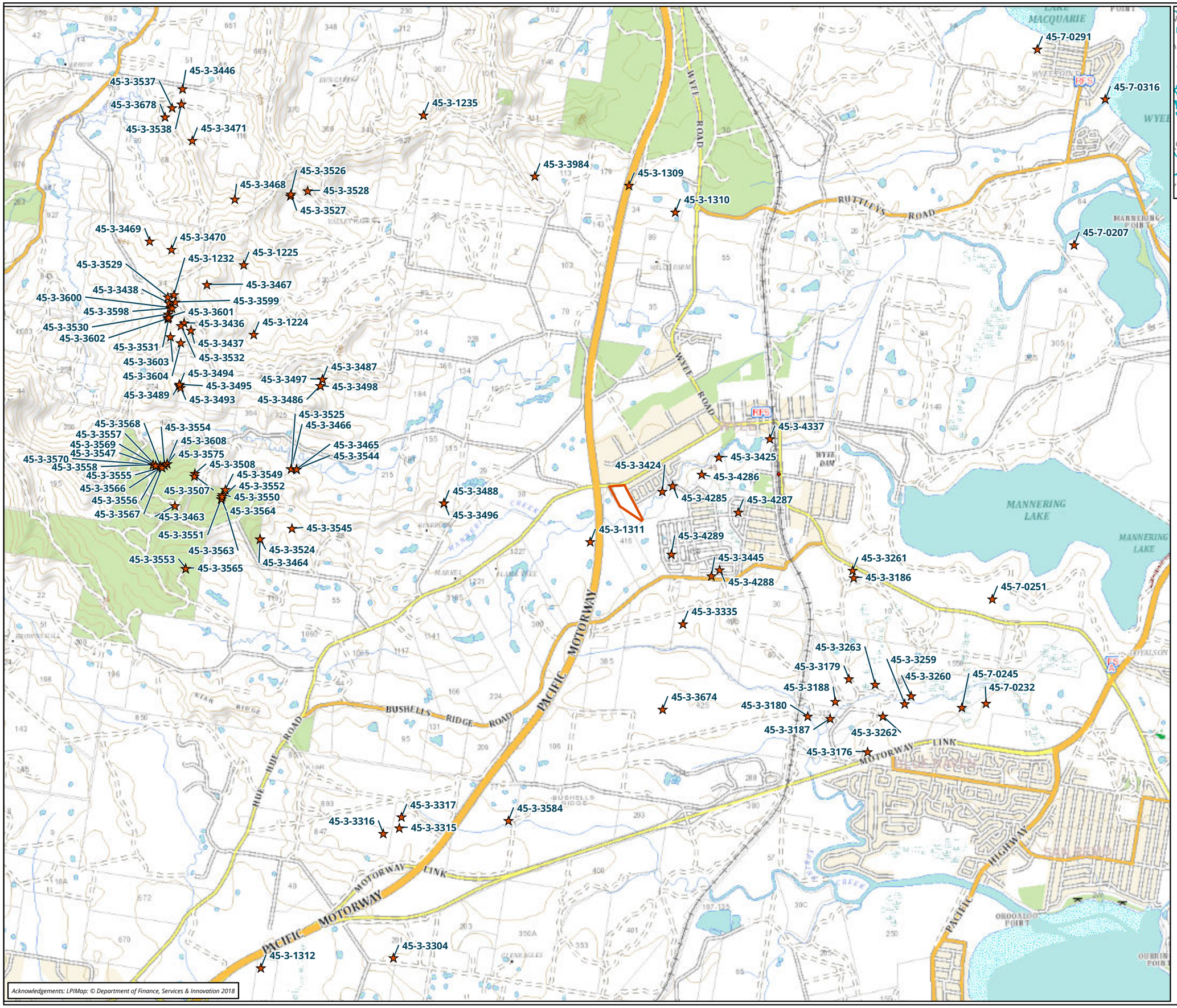
It should be noted that the AHIMS database reflects Aboriginal sites that have been officially recorded and included on the list. Large areas of NSW have not been subject to systematic, archaeological survey; hence AHIMS listings may reflect previous survey patterns and should not be considered a complete list of Aboriginal sites within a given area. Some recorded sites consist of more than one element, for example artefacts and a modified tree, however for the purposes of this breakdown and the predictive modelling, all individual site types will be studied and compared. This explains why there are 111 results presented here, compared to the 110 sites identified in AHIMS.

Table 5 AHIMS site type frequency

Site type	Number of occurrences	Frequency (%)
Artefact	40	36.0
Grinding Groove	39	35.0
Modified tree	12	12.0
PAD	8	7.0
Habitation Structure	6	5.0
Shell	2	1.8
Art	1	0.9
Hearth	1	0.9
Stone Arrangement	1	0.9
Water Hole	1	0.9
Total	**111**	**100.00**

A simple analysis of the Aboriginal cultural heritage sites registered within the 4.7 by 4.7 kilometre search area, centred on the study area indicates that Artefact is the most common site type representing 36% of

total sites (n=40). Grinding Groove sites were the second most frequent site type representing 35% of total sites (n=39). Third most represented site type is Modified tree with 12% (n=12), followed by PAD with 7% (n=8) and Shell with 1.8% (n=2). Art, Hearth, Stone Arrangement and Water Hole were each represented by 0.9% (n=1).



Legend

- Study area
- AHIMS

0 300 600 900 1,200 1,500

Metres
Scale: 1:35,000@ A3
Coordinate System:
GDA 1994 MGA Zone 56

biosis

Matter: 37418, Date: 15 July 2022,
Drawn by: AM, Checked by: MEL, Last edited by: amackegard
Location: P:\37400s\37418\Mapping\37418_HueHueRd_ACHA_AR\
37418_HueHueRd_ACHA_AR, Layout: 37418_AR_F7_AHIMS

NOT TO BE MADE PUBLIC

Figure 7 AHIMS within the vicinity of the study area

3.3 Discussion

The study area is located on the Central Coast Lowlands, underlain by the Tuggerah Formation and Alluvial Valley Deposits geological units. Topographically, the study area is situated within a gently sloping landform towards Mannering Creek, a third order non perennial water course located in the south. Soil landscapes within the study area include the moderately deep to deep (>100 millimetres) erosional Doyalson soil landscape and the alluvial Wyong soil landscape. Artefact scatters are the most common site type identified within both soil landscapes, in addition to shell and PAD (Biosis Pty Ltd 2021). Midden sites are also most likely to be identified within the Wyong Soil Landscape (Nelson 1995).

A search of the AHIMS register identified that no previously recorded sites were located within the study area or a 200 metre vicinity. Nearby sites include isolated finds and artefact scatters along Mannering Creek, which borders the southern portion of the study area. A review of historical aerials shows that limited development has occurred within the study area, with isolated disturbances located in the north-west and west. Remnant vegetation is visible in the south of the study area indicating minimal disturbance has occurred, while crop lines are present within the remaining portion causing surface disturbance of approximately 200 millimetres in depth. Due to the depth of the soil landscape, there is potential for undisturbed contexts to remain within the areas of cropping below the cropping disturbance present in the area.

The study area is not located within the Sensitive Aboriginal Landscape identified by Umwelt (2011). However, this study was assessed as part of a review of landforms and was not supported for further investigation (survey). An assessment conducted to the east of the study area identified a number of artefact sites nearby Mannering Creek, which is also located within the southern portion of the study area (Insite Heritage 2010). It was predicted that artefact densities were likely highest within proximity of the creek and decrease with distance. Therefore, indicating that Aboriginal sites have potential to occur within the study area.

As the study area is also located along Mannering Creek there is potential for artefact scatters, isolated finds and PAD be present, particularly within flat well draining and undisturbed areas nearby the creek (Kuskie 1992, Navin & Officer 1994, Umwelt 2011, AMBS 2014). Based on the findings of the background research, predictive statements for potential Aboriginal site types to be present within the study area have been provided in Section 3.4.1. These statements are based on a desktop assessment only and have undergone further archaeological investigation provided in Section 4.

3.3.1 Predictive statements

A series of predictive statements have been formulated to broadly predict the type and character of Aboriginal cultural heritage sites likely to exist throughout the study area and where they are more likely to be located.

This model is based on:

- Site distribution in relation to landscape descriptions within the study area.
- Consideration of site type, raw material types and site densities likely to be present within the study area.
- Findings of the ethnohistorical research on the potential for material traces to present within the study area.
- Potential Aboriginal use of natural resources present or once present within the study area.
- Consideration of the temporal and spatial relationships of sites within the study area and surrounding region.

Table 6 indicates the site types most likely to be encountered across the present study area. The definition of each site type is described firstly, followed by the predicted likelihood of this site type occurring within the study area.

Table 6 Aboriginal site prediction statements

Site type	Site description	Potential
Flaked stone artefact scatters and isolated artefacts	Artefact scatter sites can range from high-density concentrations of flaked stone and ground stone artefacts to sparse, low-density 'background' scatters and isolated finds.	High: Stone artefact sites have been previously recorded in the region on level, well-drained topographies in close proximity to reliable sources of fresh water, including Mannering Creek. A number of artefact sites nearby the study area have been identified along this creek line. Therefore, the potential for artefacts to be present within the study area is assessed as high.
Potential Archaeological Deposits (PADs)	Potential sub surface deposits of cultural material.	Moderate: PADs have been previously recorded in the region across a wide range of landforms. PADs are likely to be present within areas adjacent to water courses or on high points in undisturbed landforms.
Modified trees	Trees with cultural modifications	Moderate: Scarred trees have been recorded within the vicinity of the study area. Due to extensive vegetation clearance only a small number of mature native trees have survived within the southernmost part of the study area.
Hearth	Cultural deposit sometimes marked by hearth stones, usually also contains charcoal and may also contain heat treated stone fragments.	Moderate: A hearth has previously been recorded within the vicinity of the study area and Mannering Creek.
Grinding grooves	Grooves created in stone platforms through ground stone tool manufacture.	Low: Suitable horizontal sandstone rock outcrops are unlikely to occur along drainage lines.
Burials	Aboriginal burial sites.	Low: Aboriginal burial sites are generally situated within deep, soft sediments. Areas of deep sandy deposits will have the potential for Aboriginal burials. The soil profiles associated with the study area are not commonly associated with burials.

Site type	Site description	Potential
Shell middens	Deposits of shells accumulated over either singular large resource gathering events or over longer periods of time.	Low: Shell midden sites have not been recorded within the vicinity of the study area and are concentrated towards Lake Macquarie. There is low potential for shell middens to be located in the study area due to Mannering Creek being a lower order creek line.
Aboriginal Ceremony and Dreaming sites	Such sites are often intangible places and features and are identified through oral histories, ethnohistoric data, or Aboriginal informants.	Low: There are currently no recorded mythological stories for the study area.
Post-contact sites	These are sites relating to the shared history of Aboriginal and non-Aboriginal people of an area and may include places such as missions, massacre sites, post-contact camp sites and buildings associated with post-contact Aboriginal use.	Low: There are no post-contact sites previously recorded in the study area and historical sources do not identify one.
Aboriginal places	Aboriginal places may not contain any 'archaeological' indicators of a site but are nonetheless important to Aboriginal people. They may be places of cultural, spiritual or historic significance. Often, they are places tied to community history and may include natural features (such as swimming and fishing holes), places where Aboriginal political events commenced or particular buildings.	Low: There are currently no recorded Aboriginal historical associations for the study area.
Habitation structure	Structures constructed by Aboriginal people for short- or long-term shelter. More temporary structures are commonly preserved away from the NSW coastline, may include historic camps of contemporary significance. Smaller structures may make use of natural materials such as branches, logs and bark sheets or manufactured materials such as corrugated iron to form shelters. Archaeological remains of a former structure such as chimney/fireplace, raised earth building platform, excavated pits, rubble mounds etc.	Low: Habitation structures have previously been recorded within the vicinity of the study area, however not within the study area.

Site type	Site description	Potential
Stone arrangement	Human produced arrangements of stone usually associated with ceremonial activities, or used as markers for territorial limits or to mark/protect burials	Low: Stone arrangements have previously been recorded within the vicinity of the study area. However, they are unlikely to occur within the study area as they are typically identified in ridgeline landforms which are not present in the study area.
Waterhole	A source of fresh water for Aboriginal groups which may have traditional ceremonial or dreaming significance and/or may also be used to the present day as a rich resource gathering area (e.g. waterbirds, eels, clays, reeds etc.)	Low: Waterholes have previously been recorded within the vicinity of the study area; however, they are unlikely to occur due to the underlying geology present within the study area.
Quarries	Raw stone material procurement sites.	Low: There is no record of any quarries being within or surrounding the study area.
Rock shelters with art and / or deposit	Rock shelter sites include rock overhangs, shelters or caves, and generally occur on, or next to, moderate to steeply sloping ground characterised by cliff lines and escarpments. These naturally formed features may contain rock art, stone artefacts or midden deposits and may also be associated with grinding grooves.	Low: The sites will only occur where suitable sandstone exposures or overhangs possessing sufficient sheltered space exist, which are not present within the study area.

4 Archaeological survey

An archaeological survey of the study area was undertaken on 10 August 2021 by Biosis Archaeologist, Anthea Vella as part of the ADDA (Biosis 2021). The survey sampling strategy, methodology and a discussion of results are provided below.

4.1 Archaeological survey objectives

The objectives of the survey were to:

- Undertake a systematic investigation of the study area targeting areas with the potential for Aboriginal heritage.
- Identify and record Aboriginal archaeological sites visible on the ground surface.
- Identify and record areas of Aboriginal archaeological and cultural sensitivity.

4.2 Archaeological survey methodology

The survey methods were intended to assess and understand the landforms and to determine whether any archaeological material from Aboriginal occupation or land use exists within the study area.

4.2.1 Sampling strategy

The survey effort targeted all landforms that will potentially be impacted by the development. It focused on the crest landform as this possessed a higher potential for Aboriginal heritage, and on areas with increased ground surface visibility (GSV) and exposure as this enable Aboriginal objects to be identified on the ground surface.

4.2.2 Survey methods

The archaeological survey was conducted on foot. Recording during the survey followed the archaeological survey requirements of the Code and industry best practice methodology. Information that recorded during the survey included:

- Aboriginal objects or sites present in the study area during the survey.
- Survey coverage.
- Any resources that may potentially have been exploited by Aboriginal people.
- Landform.
- Photographs of the site indicating landform.
- Evidence of disturbance.
- Aboriginal artefacts, culturally modified trees or any other Aboriginal sites.

Where possible, identification of natural soil deposits within the study area was undertaken. Photographs and recording techniques were incorporated into the survey including representative photographs of survey units, landform, vegetation coverage, GSV and the recording of soil information for each survey unit were possible. Any potential Aboriginal objects observed during the survey were documented and photographed. The location of Aboriginal cultural heritage and points marking the boundary of the landform elements were

recorded using a hand-held Global Positioning System (GPS) and the Map Grid of Australia (MGA) (94) coordinate system.

4.3 Archaeological survey results

4.3.1 Constraints to the archaeological survey

With any archaeological survey there are several factors that influence the effectiveness (the likelihood of finding sites) of the archaeological survey. The factors that contributed most to the effectiveness of archaeological survey within the study area are dense vegetation and leaf litter within the southern portion of the study area and horses rendering some portions within the south and north inaccessible.

4.3.2 Visibility

In most archaeological reports and guidelines visibility refers to GSV, and is usually a percentage estimate of the ground surface that is visible and allowing for the detection of (usually stone) artefacts that may be present on the ground surface (DECCW 2010a). Visibility within the study area was generally low (10%) due to extensive grass coverage, leaf litter (Photo 9), dense vegetation (Photo 10), and residential developments (Photo 11). Areas of higher visibility (80% to 100%) were associated with high traffic areas (Photo 12) and surrounding some trees (Photo 13).

Photo 9 **Extensive grass coverage within the north of the study area**

Photo 10 **Dense vegetation in the south of the study area**

Photo 11 **Residences within the north of the study area**

Photo 12 **Visibility in high traffic area in the south**

Photo 13 **Higher visibility surrounding trees**

4.3.3 Exposure

Exposure refers to the geomorphic conditions of the local landform being surveyed and attempts to describe the relationship between those conditions and the likelihood the prevailing conditions provide for the exposure of (buried) archaeological materials. Whilst also usually expressed as a percentage estimate, exposure is different to visibility in that it is in part a summation of geomorphic processes, rather than a simple observation of the ground surface (Burke & Smith 2004, p.79, DECCW 2010a). Overall, the study area displayed areas of exposure around high traffic areas (Photo 14), vehicle and access tracks (Photo 15 and Photo 16), and surrounding trees (Photo 17).

Photo 14 Exposure in high traffic areas

Photo 15 Exposure within vehicle track

Photo 16 Exposure along access track

Photo 17 Area of exposure under trees adjacent to dam

4.3.4 Disturbances

Disturbance in the study area is associated with natural and human agents. Natural agents generally affect small areas and include the burrowing and scratching in soil by animals, such as wombats, foxes, rabbits and wallabies, and sometimes exposure from slumping or scouring. Disturbances associated with recent human action are prevalent in the study area and cover portions of the land surface. Example of human agents are residential development such as landscaping and construction of residential buildings; farming practices, such as initial vegetation clearance for creation of paddocks, fencing and stock grazing; agricultural practices such as fruit orchards; and light industrial practices such as nursery and creation of artificial dams.

Portions of the study area have been subject to disturbance by human activity. Historic and recent aerials (Photo 4 to Photo 6, and Figure 2) show that the study area has been subject to tree clearing, agricultural use through cropping, pastoral grazing, and construction of a dam, the construction of stables and yards, access tracks and development of residential housing and associated structures over the past 50 years. These disturbances were also noted during the field investigation and are shown in Photo 11, Photo 17, and Photo 18. A concrete slab (Photo 19) and rubbish dumping (Photo 20) was also identified during the field investigation.

Photo 18 **Stables and yard located within the south west of the study area-**

Photo 19 **Concrete slab within the central portion of the study area**

Photo 20 **Rubbish dumping within the south of the study area**

4.4 Discussion of archaeological survey results

The archaeological investigation consisted of a meandering pedestrian field investigation with one large transect walked across the entire study area. The results of the field investigation have been summarised below and in Figure 8 and Figure 9.

Moderately deep to deep soil landforms have been identified within the study area, with minimal disturbances present within the south and superficial disturbances in the north-east. A gently sloping landform towards Mannering Creek, a third order water course is present, which has previously been associated with nearby artefact sites (Insite Heritage 2010). Based on this, background research identified that artefact scatters and isolated finds were the most likely site type to occur within the study area on flat and well-draining landforms overlooking or nearby Mannering Creek (Kuskie 1992, Navin & Officer 1994, Umwelt 2011, AMBS 2014, Insite Heritage 2010).

A review of historical aerials shows that limited disturbance has occurred within the southernmost portion of the study area, surrounding Mannering Creek, and much of the central and north-eastern portion of the study area. Remnant trees are present throughout the south, suggesting reduced disturbance within this area. Cropping and grazing has occurred within the central and north eastern portion of the study area, which would have caused superficial disturbances (approximately 200 millimetres in depth) to the moderately deep to deep (>100 centimetres) Doyalson and Wyong soil landscapes (Murphy 1993), therefore providing potential for archaeological deposits to remain below disturbance within these areas. Development has occurred within the north-west through the construction of residential buildings and associated structures and subsurface infrastructure, in addition to stables and yards in the west. It is likely that the construction of these buildings has caused significant disturbances within these areas removing potential for remaining archaeological deposits within this portion.

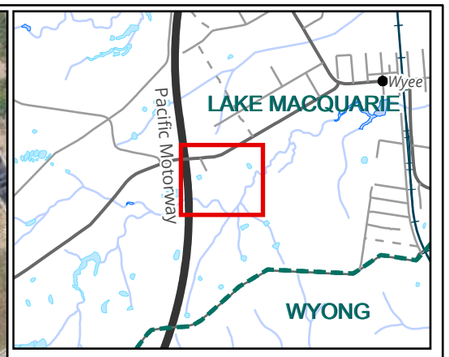
During the archaeological survey, no Aboriginal sites or objects were identified. However, the lack of surface material does not indicate that there is an absence of archaeological deposits. This is instead likely attributable to the limited exposure and areas of disturbance seen during the survey, rather than an absence of Aboriginal occupation of the area. As such, three areas of moderate archaeological potential within flat well-draining areas overlooking and adjacent to Mannering Creek in the north-east, central and southern portions of the study area were identified (Figure 8). These landform features have been subject to minimal and/or superficial disturbances providing further potential for archaeological deposits to remain intact. Previous regional and local archaeological studies within the nearby vicinity have identified a flat well-draining area with minimal disturbance nearby a creek line such as these to be archaeologically sensitive (Kuskie 1992, Navin & Officer 1994, Umwelt 2011, AMBS 2014, Insite Heritage 2010). Artefact scatters and PAD sites have also previously been recorded nearby the study area within similar landforms overlooking Mannering Creek, providing further support for this determination (Insite Heritage 2010). The remaining portions of the study area have been determined to contain low archaeological potential due to significant ground disturbances and sloping landforms unlikely to retain deposits (Figure 8).

Table 7 Survey coverage

Landform	Landform area (m²)	Visibility (%)	Exposure (%)	Effective coverage area (m²)	Effective coverage (%)
Upper Slope	10270.96	10	10	102.70	1%
Mid Slope	9441.10	10	10	94.41	1%
Lower Slope	13306.22	30	30	1197.56	9%
Flat	12508.23	80	80	8005.27	64%

Table 8 Landform summary

Landform	Landform area (m²)	Area effectively surveyed (m²)	Landform effectively surveyed (%)	No. of areas of archaeological potential	No. of artefacts or features
Upper Slope	10270.96	938.20	9.13%	1	0
Mid Slope	9441.10	1350.78	14.31%	0	0
Lower Slope	13306.22	1365.57	10.26%	1	0
Flat	12508.23	2380.90	19.03	1	0



Legend

- Study area
- Survey transect

Landforms

- Flat
- Lower slope
- Mid-slope
- Upper Slope

Figure 8 Survey coverage

0 10 20 30 40 50

Metres

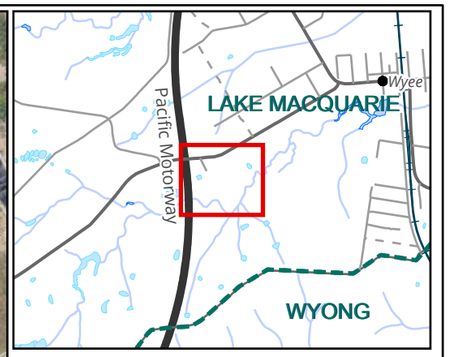
Scale: 1:2,000@ A3

Coordinate System:
GDA 1994 MGA Zone 56

N

biosis

Matter: 37418, Date: 09 November 2022,
Drawn by: AM, Checked by: MEL, Last edited by: amackegard
Location: P:\37400s\37418\Mapping\37418_HueHueRd_ACHA_AR\
37418_HueHueRd_ACHA_AR, Layout: 37418_AR_F8_SurveyCoverage



Legend

Study area

Archaeological potential

Low

Moderate

Figure 9 Survey results

0 10 20 30 40 50

Metres

Scale: 1:2,000@ A3

Coordinate System:
GDA 1994 MGA Zone 56

N

biosis

Matter: 37418, Date: 09 November 2022,
Drawn by: AM, Checked by: MEL, Last edited by: amackegard
Location: P:\37400s\37418\Mapping\37418_HueHueRd_ACHA_AR\
37418_HueHueRd_ACHA_AR, Layout: 37418_AR_F9_SurveyResults

5 Test excavation

Following the results of the archaeological survey, a test excavation program was undertaken to characterise the extent, nature and archaeological (scientific) value of Aboriginal cultural heritage within identified areas of PAD.

Test excavations were undertaken on 31 August 2022, 28 September 2022, 31 October, and 3 November 2022, by Charlotte Allen (Biosis, Consultant Archaeologist), Crystal Garabedian (Biosis, Archaeologist), Ashleigh Keevers-Eastman (Biosis, Consultant Archaeologist), Molly Crissell (Biosis, Archaeologist), Tracey Howie, Kyle Howie and Tyler Howie (Awabakal & Guringai Pty Ltd, Cultural Sites Officer). The sampling strategy, methodology and results of the test excavation program are discussed below.

5.1 Test excavation objectives

The principal objectives of the test excavations were to identify and understand the nature, extent and significance of the three areas of PAD within the study area. This will further our knowledge of Aboriginal archaeological site patterning within the study area and enable the predictive model to be further tested and refined.

The aims of the testing program were to:

- Determine the nature and extent of the sub-surface archaeological deposits in the study area.
- Identify if the archaeological material occurs in an intact, undisturbed context, by examining the soil profile and stratigraphy.
- Analyse and interpret any archaeological finds (such as stone artefacts, hearths, etc.) recovered during the testing program.
- Inform current knowledge of Aboriginal occupation and land use models of the region.
- Provide management and mitigation measures for Aboriginal archaeological objects located during the subsurface testing program.

5.2 Test excavation methodology

Test excavations were conducted in accordance with requirement 16a of the Code.

- Test excavations were conducted in 50 by 50 centimetre units.
- The test pits were excavated by hand (inclusive of trowels, spades and other hand tools) along transects at intervals of 20 metres or other justifiable and regular spacing (being no smaller than five metres).
- The first test pit within a site or PAD area was excavated in five centimetre spits; the subsequent test pits conducted within the site or PAD area were then excavated in either 10 centimetre spits or stratigraphic units (whichever is smaller) to the base of Aboriginal object-bearing units being the removal of the A-horizon soil deposit down to the sterile clay or bedrock layer (B-horizon).
- If the depth of deposit prevents reaching sterile deposits within the 50 by 50 centimetre test pit, additional 50 by 50 centimetre test pits may be excavated adjacent to the original test pit (for example expanding the test pit to 50 by 100 centimetres) to reach the sterile deposits.

- Test pits may be combined and excavated as necessary in 50 by 50 centimetre units for the purposes of further understanding site characteristics. Note that under the Code, the maximum area that can be excavated in any one continuous area is three metres squared (3 m^2).
- The Code dictates that the maximum surface area of all test excavation units must be no greater than 0.5% of the PAD or area being investigated.
- All excavated soil was wet sieved in 5 millimetre sieves.
- All cultural material was collected, bagged, and clearly labelled. They were temporarily stored in the Biosis Newcastle office for analysis (at Unit 8, 27 Annie St, Wickham NSW 2293).
- For each test pit that was excavated, the following documentation was taken:
  - Unique test pit identification number.
  - GPS coordinate of each test pit.
  - Munsell soil colour and texture.
  - Amount and location of cultural material within the deposit.
  - Nature of disturbance where present.
  - Stratigraphy.
  - Archaeological features (if present).
  - Photographic records.
  - Spit records.
- Test excavation units were backfilled as soon as practicable.
- An AHIMS Site Impact Recording form will be completed and submitted to the AHIMS Registrar for any sites impacted during test excavations.
- In the event that suspected human remains are identified works will immediately cease and the NSW Police and Heritage NSW will be notified.
- Test excavations will cease when enough information* has been recovered to adequately characterise the objects present with regard to their nature and significance.

**Enough information is defined by Heritage NSW as meaning "the sample of excavated material clearly and self-evidently demonstrates the deposit's nature and significance. This may include things like locally or regionally high object density: presence of rare or representative objects: presence of archaeological features: or locally or regionally significant deposits stratified or not."*(DECCW 2010a, p.28).

5.3 Test excavation results

A total of 11 test pits were excavated across PAD1, PAD 2, and PAD 3 (Figure 10). Individual test pit and soil analysis results are provided in Appendix 2. Results by PADs are shown in Table 9 and a detailed discussion of results is provided below.

Table 9 Test excavation results by PAD

PAD	Landform	PAD area (m^2)	Area tested (m^2)	PAD effectively tested (%)	No. of test pits	No. of artefacts
1	Creek flat	1,028	0.5	0.049	2	0
2	Flat	4,344	1.5	0.035	6	0
3	Rise	1,690	0.75	0.044	3	0

5.3.1 PAD 1

PAD 1 is located within a flat landform adjacent to Mannering Creek in the southern portion of the study area (Figure 10). This area was assessed during the survey to contain moderate archaeological potential and is located within an area of cleared land surrounded by dense vegetation. A total of two test pits were excavated at 20 metre intervals across one transect. Test pit 1 reached a basal layer at 420 millimetres. Test pit 2 reached a basal layer at 490 millimetres. All test pits ended on clay and displayed consistent stratigraphy. Soil within Test pit 1 and Test pit 2 varied in colour and consistency. This was considered likely due to the proximity of Test pit 2 to Mannering Creek which may have influenced the soil characteristics. However, no major disturbances to sub soils as a result of fluvial activity or bioturbation were observed. No artefacts were identified within PAD 1. The archaeological potential of PAD 1 was therefore reassessed as low.

A detailed summary of the soil profiles within Transect 1 PAD 1 is provided below:

Transect 1

- Test pit 1 (Photo 21 and Photo 22) contained two contexts. Context 1 was a very dark grey (7.5YR 3/1) soft loamy silt between 0 to 300 millimetres that possessed a pH level of 4.5 and contained rootlets and charcoal flecks. This was followed by Context 2 which consisted of a strong brown (7.5YR 4/6) soft silty clay, ending at approximately 420 millimetres in depth. Context 2's pH levels varied slightly from Context 1 at 5. Clay content within Context 2 increased with depth.
- Test pit 2 (Photo 23 and Photo 24) contained a brown (7.5YR 4/2) hard loamy silt between 0 to 320 millimetres in Context 1, with a pH of 5. This was followed by Context 2, a dark greyish brown (10YR 4.2) hard loamy silt between 320 and 470 millimetres, with a context of 5.5. Both context 1 and 2 contained rootlets, charcoal and gravel inclusions. Context 3 comprised of a pinkish grey (7/5YR 6/2) hard clay within a pH level of 6, and charcoal and gravel inclusions, ending on a depth of 490 millimetres.

Photo 21 PAD 1, Transect 1, Test pit 1

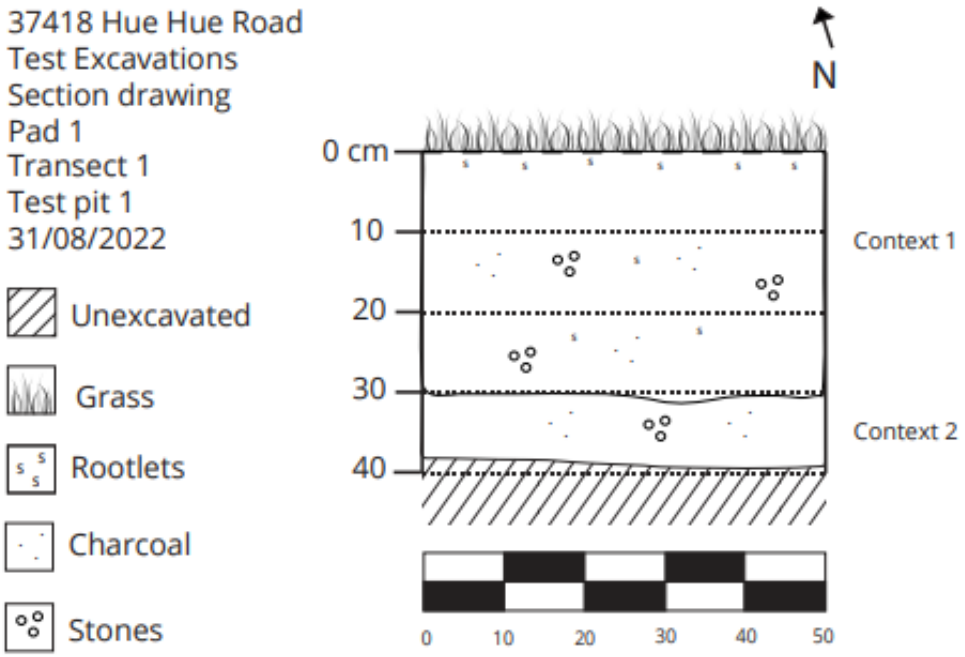


Photo 22 Section drawing of PAD 1, Transect 1, Test pit 1

Photo 23 PAD 1, Transect 1, Test pit 2

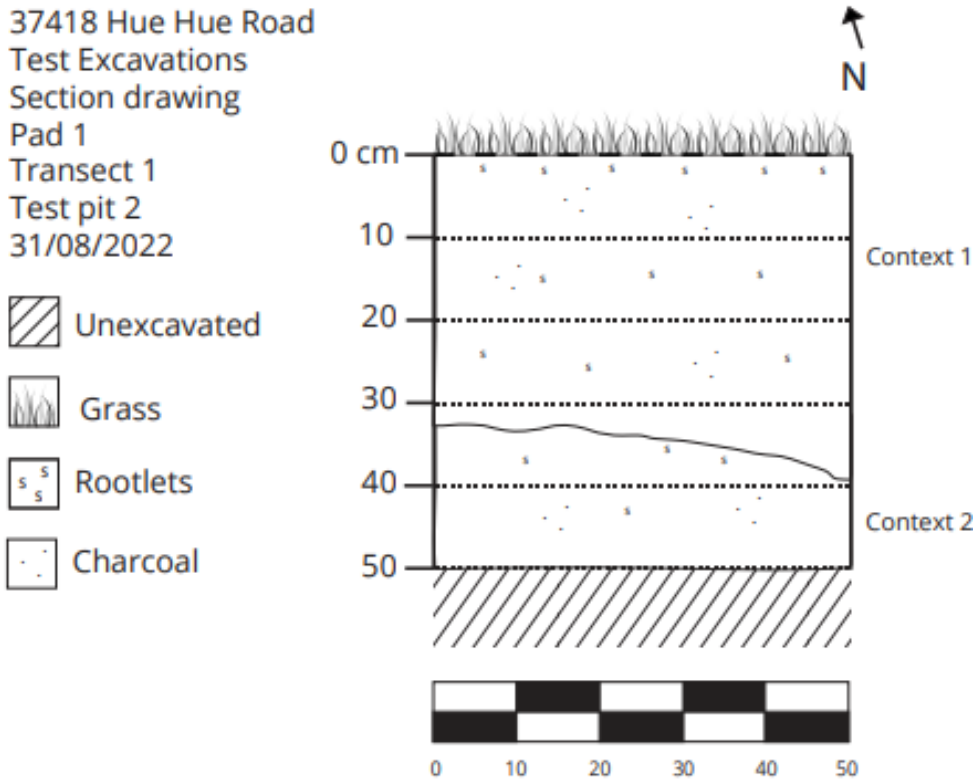


Photo 24 Section drawing of PAD 1, Transect 1, Test pit 2

5.3.2 PAD 2

PAD 2 is located within a raised level area within the central portion of the study area overlooking Mannering Creek (Figure 10). This area was assessed during the survey to contain moderate archaeological potential and is located within an area of cleared land currently used as an agistment. A total of six test pits were excavated across two transect. Transect 1 contained four test pits which contained one to three contexts each, finishing on clay at a depth of 450 to 520 millimetres. Within Transect 2 a total of two test pits were excavated finishing on clay at 310 to 400 millimetres. Two additional test pits were proposed to be excavated in the north-eastern extent of PAD2 within Transect 2 (Figure 10); however, this portion of the site was waterlogged and appear to be part of a small depression upon the flat. Observations within the field and discussion with Tracey Howie and Kyle Howie of Awabakal & Guringai Pty Ltd (31 October 2022), resulted in the consensus that this portion of the PAD possessed low potential, therefore excavations of these two test pits were not carried out.

Soils across PAD 2 did not appear to have been heavily disturbed with impacts to subsurface deposits limited to low levels of bioturbation and soil pugging as a result of the study areas current land use as an agistment. No artefacts were recovered from PAD 2. The archaeological potential of PAD 2 was therefore reassessed as low.

A detailed summary of the soil profiles within each test pit across Transect 1 and Transect 2 is provided below:

Transect 1

- Test pit 1 (Photo 25 and Photo 26) contained three contexts. Context 1 contained a very dark grey (7.5YR 3/1) moderately compacted loamy sand between 0 to 250 millimetres and contained rootlets. Context 2 consisted of very dark grey (7.5YR 3/1) sandy clay loam between 250 to 450 millimetres and contained grass rootlets and clay mottling. Context 1 and 2 both possessed a pH of 6.5. Context 3 consisted of a yellowish brown (10YR 5/4) moderately compacted clay basal layer with a pH of 5. This clay layer was reached between 450 to 500 millimetres.
- Test pit 2 (Photo 27 and Photo 28) Context 1 had a pH level of 5 and consisted of very dark grey (7.5YR 3/1) moderately compacted sandy loam between 0 to 100 millimetres which contained rootlets. Context 2 had a pH of 5 and ranged from 100 to 400 millimetres and consisted of moderately compacted dark grey (7.5YR 4.1) sand clay loam. Grass roots and charcoal flecks were noted throughout Context 2. This was followed by Context 3 which contained grey (7.5YR 5/1) moderately compacted sandy clay which finished on clay between 400 to 500 millimetres. Context 3 possessed a pH level of 7.
- Test pit 3 (Photo 29 and Photo 30) contained a single context consisting of very dark grey (7.5YR 3/1) moderately compacted clayey loam with a pH of 5, finishing on clay at 480 millimetres. Context 1 contained rootlets, and clay mottles towards the base of the pit.
- Test pit 4 (Photo 31 and Photo 32) Context 1 ranged from 0 to 300 millimetres and consisted of black (7.5YR 2/1) moderately compacted clayey loam. Context 1 contained grass roots and possessed a pH level of 5. Context 2 consisted of heavily compacted dark grey (7.5YR 4/1) loamy sand with a pH of 5. Context ranged from 300 to 470 millimetres and included rootlets and clay mottles, finishing on clay.

Photo 25 PAD 2, Transect 1, Test pit 1

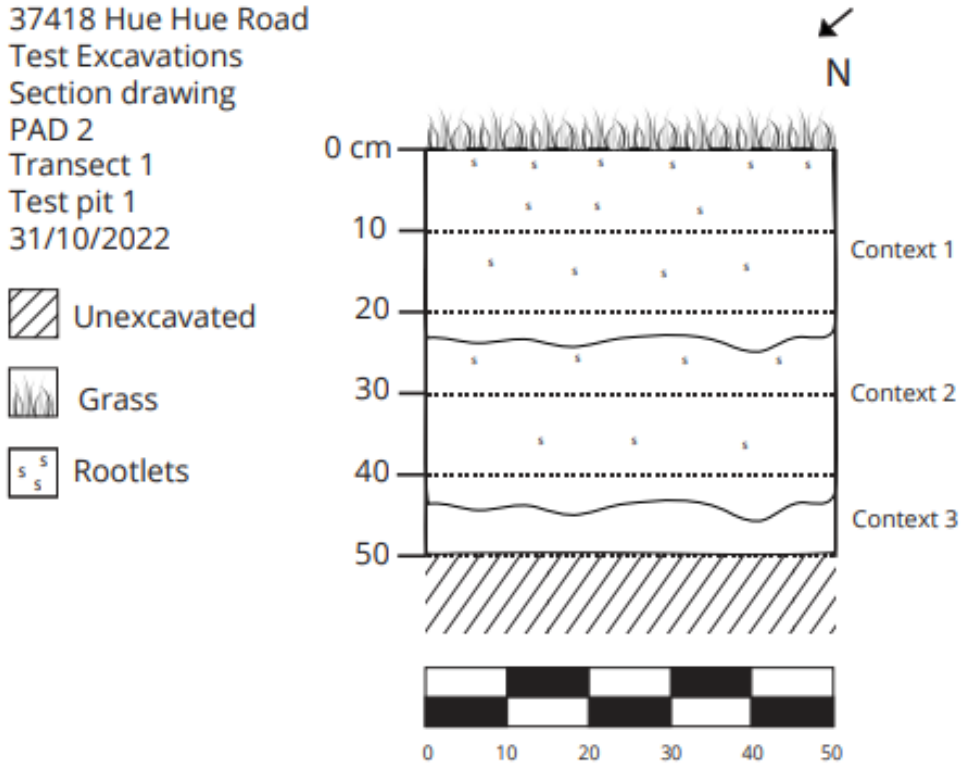


Photo 26 Section drawing of PAD 2, Transect 1, Test pit 1

Photo 27 PAD 2, Transect 1, Test pit 2

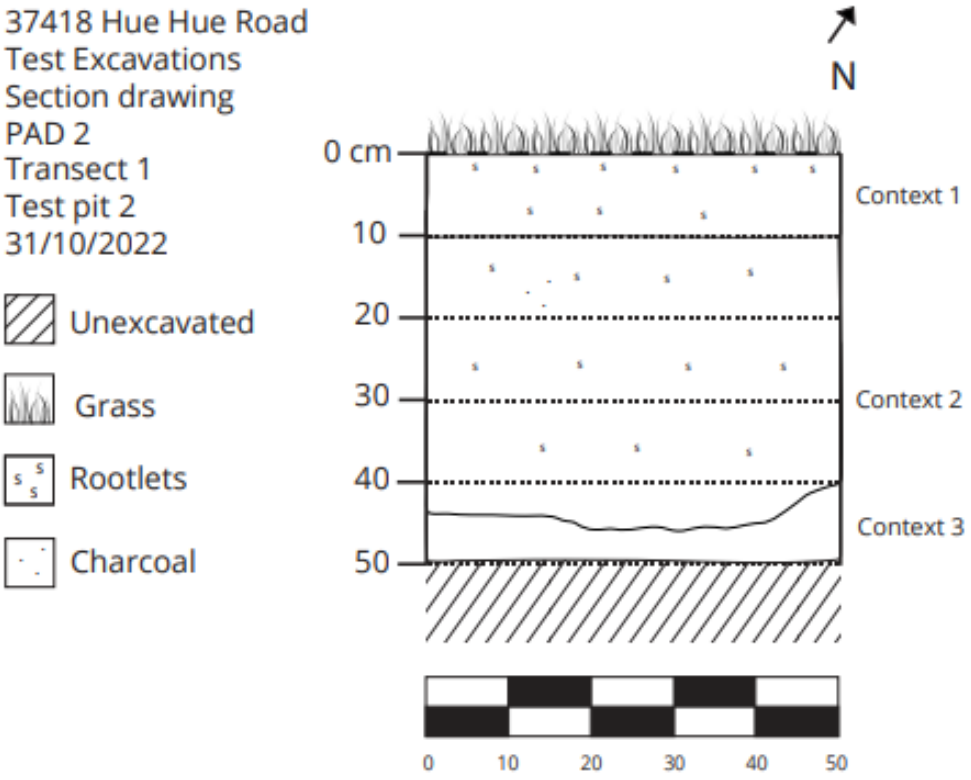


Photo 28 Section drawing of PAD 2, Transect 1, Test pit 2

Photo 29 PAD 2, Transect 1, Test pit 3

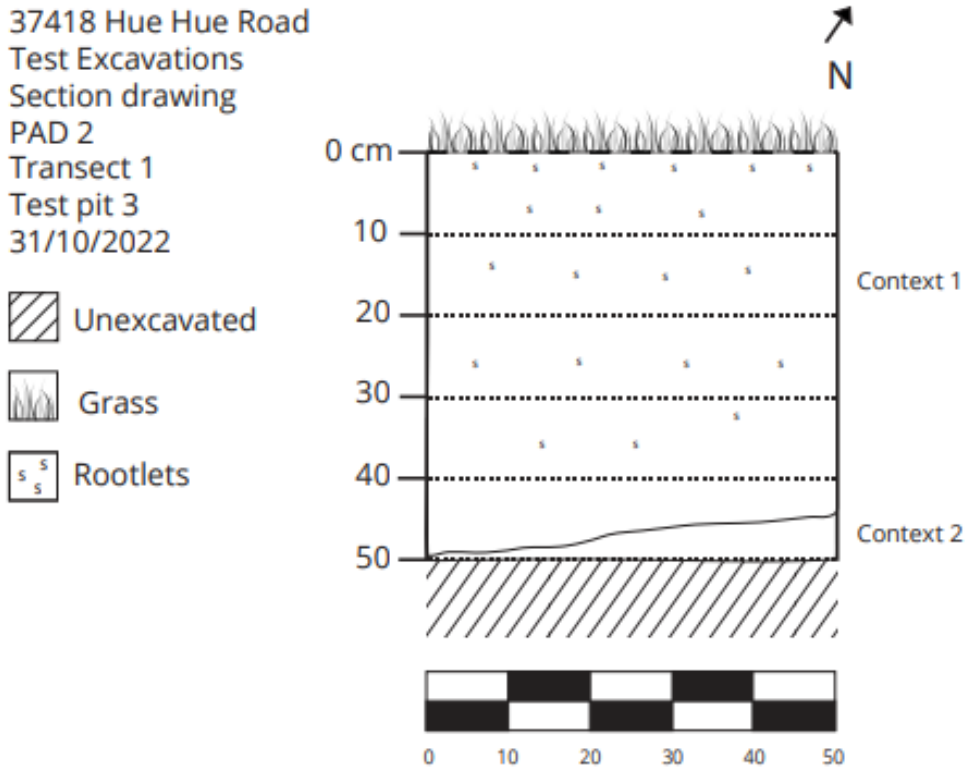


Photo 30 Section drawing of PAD 2, Transect 1, Test pit 3

Photo 31 PAD 2, Transect 1, Test pit 4

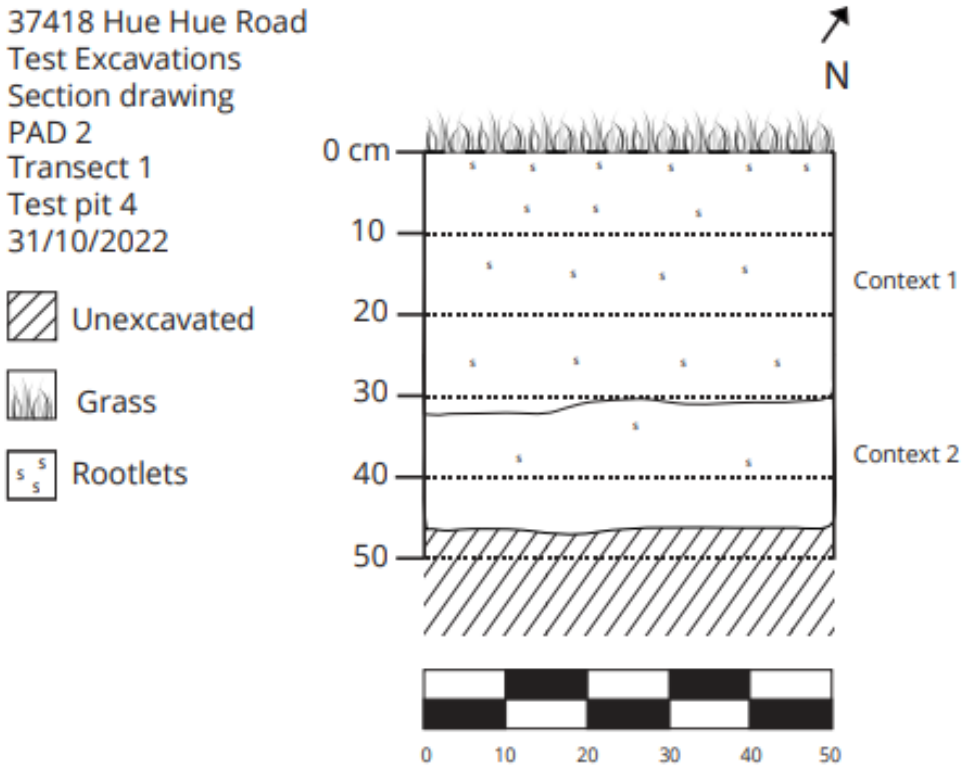


Photo 32 Section drawing of PAD 2, Transect 1, Test pit 4

Transect 2

- Test pit 1 (Photo 33 and Photo 34) contained two soil contexts. Context 1 contained a dark brown (7.5YR 3/2) hard clayey silty loam between 0 to 390 millimetres. Context 1 possess a pH of 6.5 and contained rootlets, charcoal and gravel inclusions. This was followed by Context 2 which consisted of a brown (7.5YR 4/2) hard clay basal layer at a depth of 390 millimetres with a pH level of 7.
- Test pit 2 (Photo 35 and Photo 36) contained two soil contexts. Context 1 was made up of dark grey (7.5YR 4/1) moderately compacted clayey loam with grass roots noted throughout. Context 1 had a pH of 5. Context 2 on the other hand had a pH of 7 and consisted of softly compacted grey (10YR 5/1) clay which ranged from 300 to 400 millimetres before the water table was reached and test excavations we unable to proceed.

Photo 33 PAD 2, Transect 2, Test pit 1

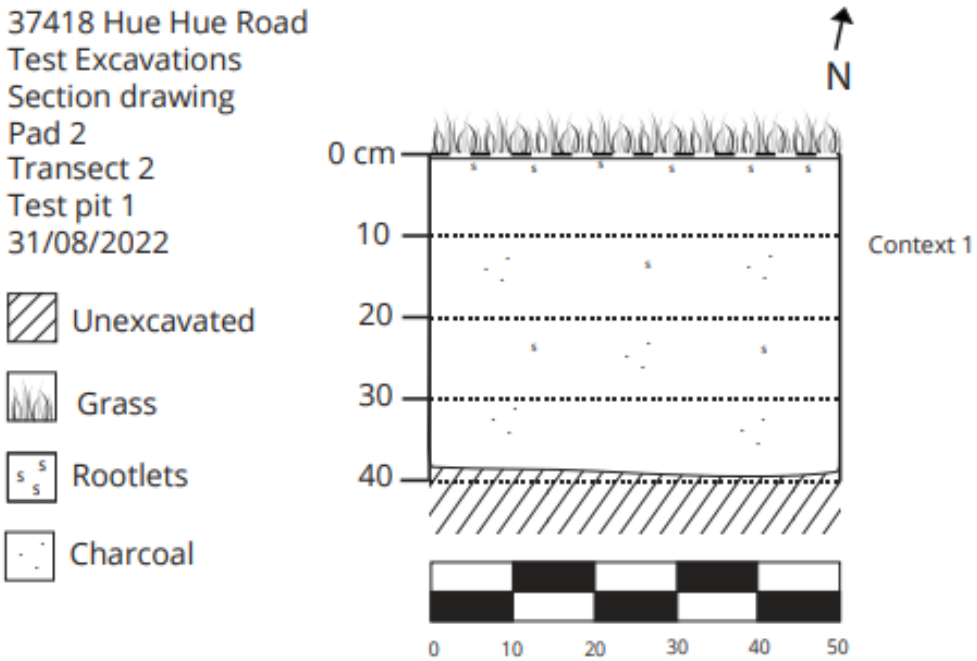


Photo 34 Section drawing of PAD 2, Transect 2, Test pit 1

Photo 35 PAD 2, Transect 2, Test pit 2

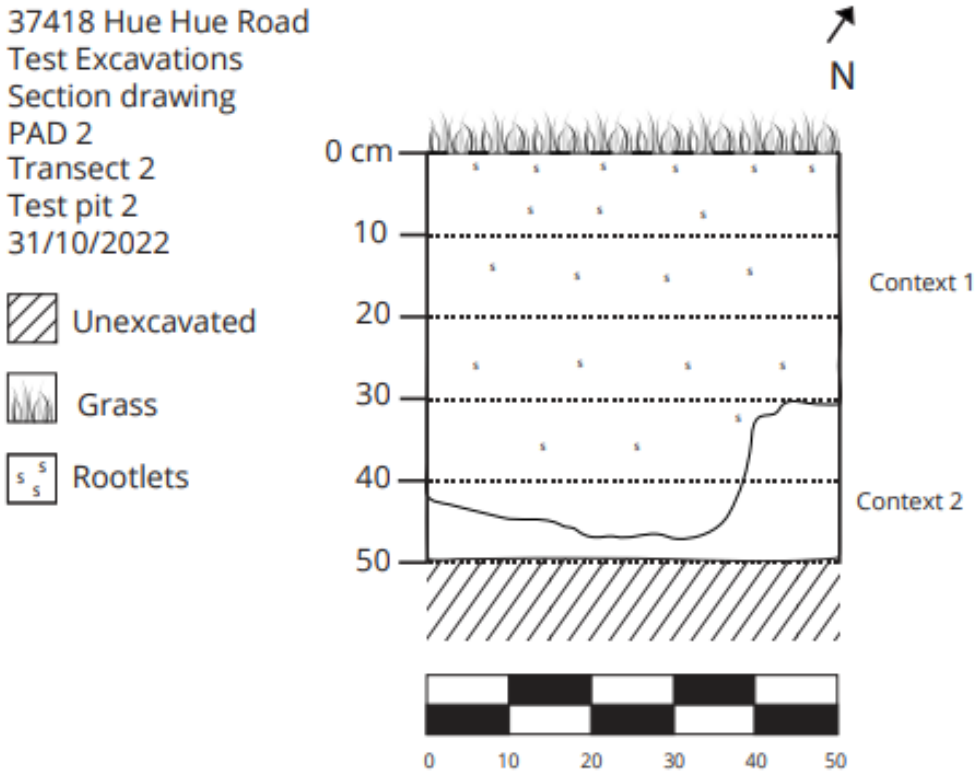


Photo 36 Section drawing of PAD 2, Transect 2, Test pit 2

5.3.3 PAD 3

PAD 3 is located within a raised level area within the northern portion of the study area overlooking Mannering Creek (Figure 10). This area was assessed during the survey to contain moderate archaeological potential and is located within an area of cleared land currently used as an agistment. Test excavations were conducted within this area of PAD on 27 September 2022. Three test pits at 20 to 40 metre intervals were excavated across two transects. Transect 1 contained two test pits which contained two contexts each, finishing on clay between 230 to 370 millimetres. Within Transect 2 one test pit was excavated finishing on clay at a depth of 150 millimetres.

Soils across PAD 3 did not appear to have been heavily disturbed with impacts to subsurface deposits limited to low levels of bioturbation and soil pugging as a result of the study areas current land use as an agistment. No artefacts were recovered from PAD 3. The archaeological potential of PAD 3 was therefore reassessed as low.

Detail of the soil profile within each test pit across Transect 1 and Transect 2 is provided below:

Transect 1

- Test pit 1 (Photo 37 and Photo 38) contained two contexts. Context 1 is brown (7.5YR 4/2) moderately compacted clayey silty loam between 0 to 220 millimetres with a pH of 6.5 and grass roots, and baked clay noted (5%). An iron rivet or nail was also identified within the first 0 to 100 millimetres of deposit. Context 2 ranged from 220 to 230 millimetres and consisted of hard strong brown (7.5YR 4/6) clay with a pH of 5. The water table was noted in the base of this test pit.

- Test pit 2 (Photo 39 and Photo 40) also contained two contexts. Context 1 was dark brown (7.5YR 3/2) moderately compacted clayey silty loam, with a pH of 6.5, and grass roots. This was followed by Context 2 which consisted of a moderately compacted strong brown (7.5YR 4/6) clay layer between 280 to 370 millimetres. Contexts 2 had a pH of 5.

Photo 37 PAD 3, Transect 1, Test pit 1

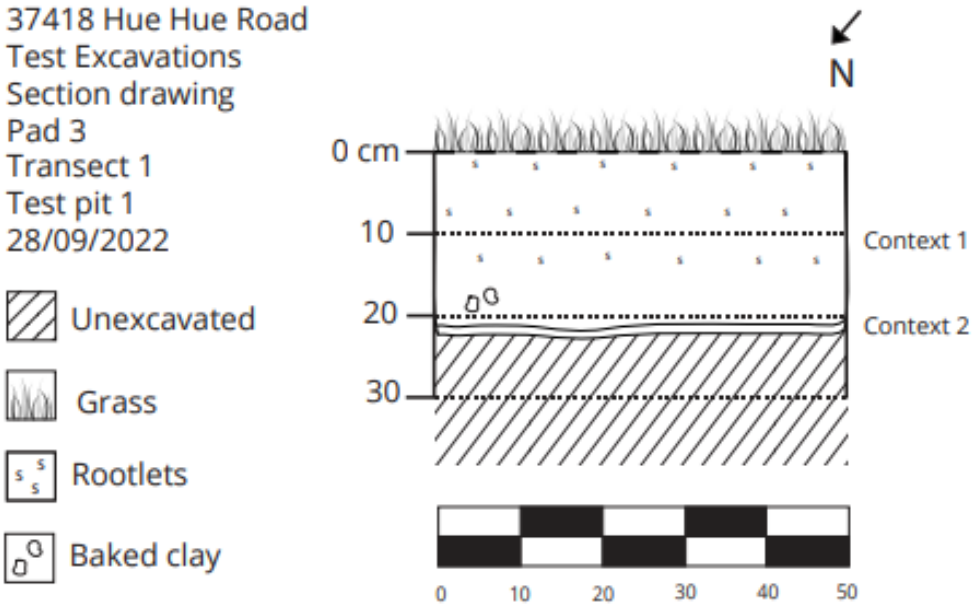


Photo 38 Section drawing of PAD 3, Transect 1, Test pit 1

Photo 39 PAD 3, Transect 1, Test pit 2

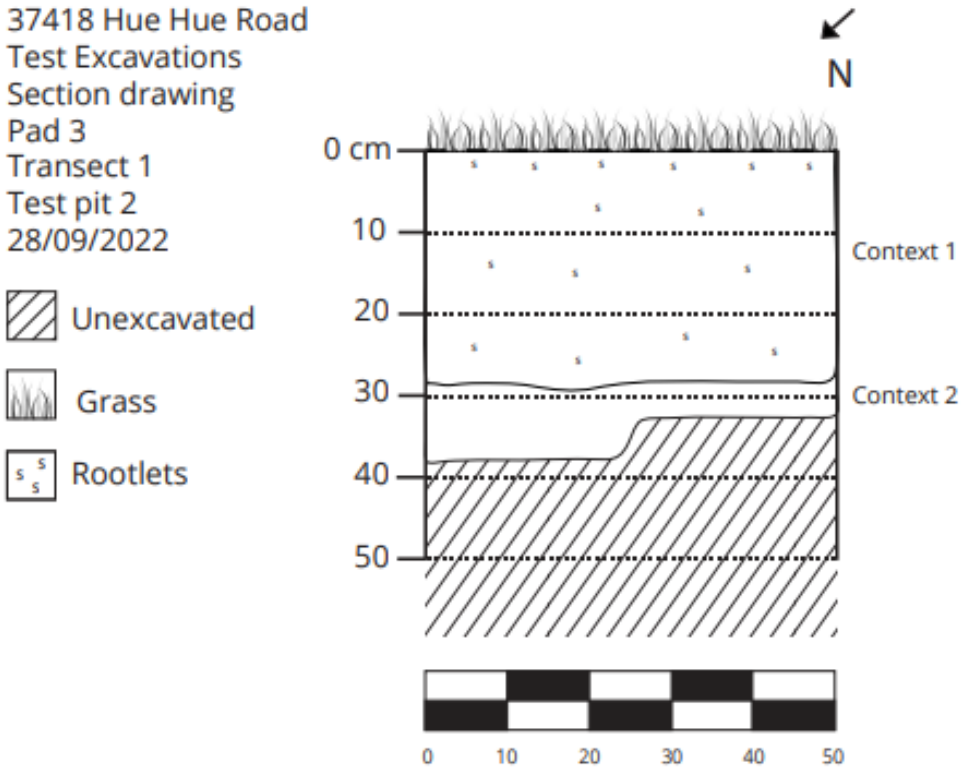


Photo 40 Section drawing of PAD 3, Transect 1, Test pit 2

Transect 2

- Test pit 1 (Photo 41 and Photo 42) in Transect 2 possessed two contexts, with context on ranging from 0 to 130 millimetres. Context 1 was brown (7.5YR 4/2) moderately compacted clayey silty loam with a pH of 6.5, and grass roots noted. Context two on the other hand, possessed a pH of 6, and moderately compacted strong brown (7.5YR 4/6) clay between 130-150 millimetres.

Photo 41 PAD 3, Transect 2, Test pit 1

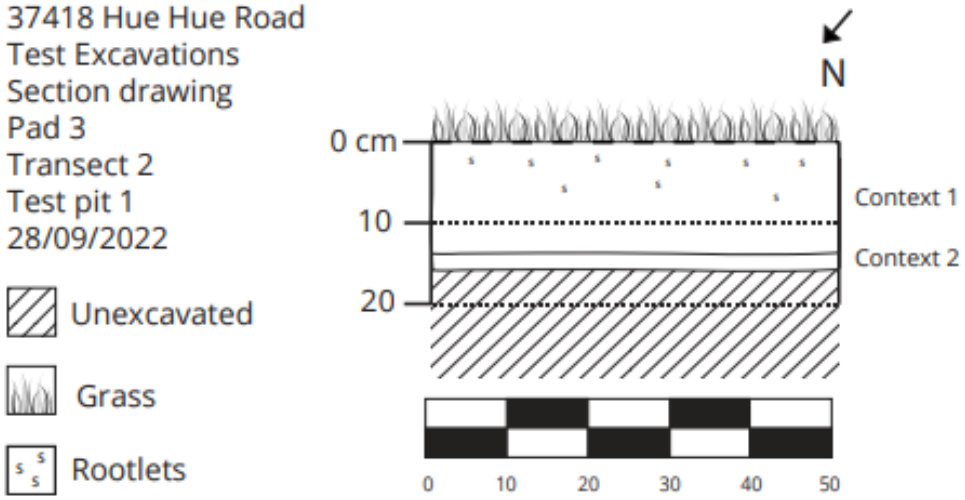


Photo 42 Section drawing of PAD 3, Transect 2, Test pit 1

5.4 Analysis and discussion

Information gathered during background research was analysed in order to formulate predictive modelling statements that were applicable to the landscape context of the study area. Predictive models for the study area were informed by a review of previous assessments undertaken across the region. Predictive modelling indicated that the most likely site types to occur within the local region were artefact scatters, shell and PAD sites (Biosis Pty Ltd 2021). Midden sites are also most likely to be identified within the Wyong Soil Landscape (Nelson 1995).

A field investigation of the study area was conducted on 10 August 2021 by Anthea Vela (Biosis Archaeologist) as part of an ADDA. The north-eastern and southern portions of the study area were identified to have been relatively undisturbed and contain flat landform features overlooking or located adjacent to Mannering Creek. The remaining area contained disturbances caused by residential development and associated structures, in addition to evidence of cropping. No Aboriginal objects were recorded during the field investigation; however, this was attributed to the limited levels of exposure and disturbance noted during the field investigation.

Based on the results of the field investigation and background review, it was determined that the study area had likely been utilised by Aboriginal people for both occupation and resource gathering, with Mannering Creek providing Aboriginal people access to a range of resources. Three areas of moderate archaeological were identified where low levels of previous disturbance towards the north-eastern and southern portions of the study area. These areas of moderate potential were recorded on level and well-draining landform features, where intact archaeological deposits were considered likely to be present. Areas containing extensive levels of residential development and associated structures were considered to have low archaeological potential as Aboriginal artefacts which may have been present would have likely been removed during construction.

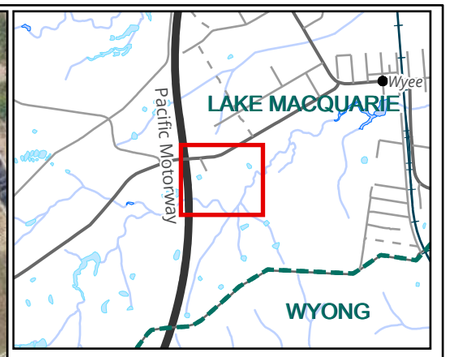
Test excavations were conducted in areas of moderate archaeological potential over four days on 31 August 2022, 28 September 2022, 31 October, and 3 November 2022. A total of 11 test pits were excavated across the three areas of moderate potential identified by Biosis ADDA in 2021 (in green, Figure 10). No Aboriginal sites or objects were identified during test excavations across PAD 1, 2 and 3.

Soils within PAD 1 were relatively consistent with the Wyong Soil Landscape and varied across the two test pits excavated within the lower flat. Variations within the soil contexts of PAD 2 was considered likely due to the proximity of Mannering Creek which may have influenced the soil characteristics of Test pit 2. However, no major disturbances to sub soils as a result of fluvial activity or bioturbation were observed. Based on the test excavations results and landform characteristics, the archaeological potential of PAD 1 has been revised from moderate to low (Figure 10).

Soils within PAD 2 were also relatively consistent with the Wyong Soils Landscape and consisted of moderately shallow deposits upon a gentle lower slope/flat. There appeared to be less variation between test pits within PAD 2 and this is likely due to increased distance from Mannering Creek. Test pits within Transect 2 were at a higher risk of remaining waterlogged however, with the water table present at a depth of 300 to 400 millimetres in Test pit 2. Two additional test pits were proposed to be excavated in the north-eastern extent of PAD2 within Transect 2 (in red, Figure 10); however, this portion of the site was waterlogged and appear to be part of a small depression upon the flat. Observations within the field and discussions with Tracey Howie and Kyle Howie of Awabakal & Guringai Pty Ltd (31 October 2022), resulted in the consensus that this portion of the PAD possessed low potential, therefore excavations of these two test pits were not carried out. No artefacts were identified within PAD 2 and the PAD was reassessed to possess low potential. Overall low levels of bioturbation and disturbance as a results of pastoral land use were observed.

PAD 3 was located within the north-western extent of the study area upon a gentle upper slope. Three test pits were excavated across two transect. Soils were comparable shallower within PAD 3 than in PAD 2 and PAD 1. This could be considered consistent with the Doyalson Soil Landscape which is erosional in nature. Soils across PAD 3 did not appear to have been heavily disturbed with impacts to subsurface deposits limited to low levels of bioturbation and soil pugging as a result of the study areas current land use as an agistment. No artefacts were recovered from PAD 3. The archaeological potential of PAD 3 was therefore reassessed as low.

The lack of archaeological deposits across the study area suggests that the study area was not suitable for Aboriginal occupation; however, the study area may have still be utilised for resource gathering (despite the lack of archaeological evidence) as part of a wider cultural landscape associated with occupation sites along Mannering Creek such as those identified by Insite Heritage (2010). This assessment therefore concluded that PAD 1, PAD 2, and PAD 3 possess low archaeological potential. No further archaeological investigation is recommended within these areas.



Legend

Study area

Test Pit

Reassessed as low potential - excavation not required

Excavated

Archaeological potential

Low

Figure 10 Test excavation results

0 10 20 30 40 50

Metres

Scale: 1:2,000@ A3

Coordinate System: GDA 1994 MGA Zone 56

N

biosis

Matter: 37418, Date: 09 November 2022,
Drawn by: AM, Checked by: MEL, Last edited by: amackegard
Location: P:\37400s\37418\Mapping\37418_HueHueRd_ACHA_AR\
37418_HueHueRd_ACHA_AR, Layout: 37418_AR_F10_TestExcavationResults

6 Scientific values and significance assessment

The two main values addressed when assessing the significance of Aboriginal sites are cultural values to the Aboriginal community and archaeological (scientific) values. This report will assess scientific values while the ACHA report will detail the cultural values of Aboriginal sites in the study area.

6.1 Introduction to the assessment process

Heritage assessment criteria in NSW fall broadly within the significance values outlined in the Australia International Council on Monuments and Sites (ICOMOS) Burra Charter (Australia ICOMOS 2013). This approach to heritage has been adopted by cultural heritage managers and government agencies as the set of guidelines for best practice heritage management in Australia. These values are provided as background and include:

- **Historical significance** (evolution and association) refers to historic values and encompasses the history of aesthetics, science and society, and therefore to a large extent underlies all of the terms set out in this section. A place may have historic value because it has influenced, or has been influenced by, an historic figure, event, phase or activity. It may also have historic value as the site of an important event. For any given place the significance will be greater where evidence of the association or event survives in situ, or where the 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.
- **Aesthetic significance** (Scenic/architectural qualities, creative accomplishment) refers to the sensory, scenic, architectural and creative aspects of the place. It is often closely linked with social values and may include consideration of form, scale, colour, texture, and material of the fabric or landscape, and the smell and sounds associated with the place and its use.
- **Social significance** (contemporary community esteem) refers to the spiritual, traditional, historical or contemporary associations and attachment that the place or area has for the present-day community. Places of social significance have associations with contemporary community identity. These places can have associations with tragic or warmly remembered experiences, periods or events. Communities can experience a sense of loss should a place of social significance be damaged or destroyed. These aspects of heritage significance can only be determined through consultative processes with local communities.
- **Scientific significance** (Archaeological, industrial, educational, research potential and scientific significance values) refers to the importance of a landscape, area, place or object because of its archaeological and/or other technical aspects. Assessment of scientific value is often based on the likely research potential of the area, place or object and will consider the importance of the data involved, its rarity, quality or representativeness, and the degree to which it may contribute further substantial information.

The cultural and archaeological significance of Aboriginal and historic sites and places is assessed on the basis of the significance values outlined above. As well as the ICOMOS Burra Charter significance values guidelines, various government agencies have developed formal criteria and guidelines that have application when assessing the significance of heritage places within NSW. Of primary interest are guidelines prepared by the Commonwealth Department of the Environment and Energy, Heritage NSW, NSW Department of Planning, Industry and Environment. The relevant sections of these guidelines are presented below.

These guidelines state that an area may contain evidence and associations which demonstrate one or any combination of the ICOMOS Burra Charter significance values outlined above in reference to Aboriginal heritage. Reference to each of the values should be made when evaluating archaeological and cultural significance for Aboriginal sites and places.

In addition to the previously outlined heritage values, the Heritage NSW Guidelines (OEH 2011) also specify the importance of considering cultural landscapes when determining and assessing Aboriginal heritage values. The principle behind a cultural landscape is that 'the significance of individual features is derived from their inter-relatedness within the cultural landscape'. This means that sites or places cannot be 'assessed in isolation' but must be considered as parts of the wider cultural landscape. Hence the site or place will possibly have values derived from its association with other sites and places. By investigating the associations between sites, places, and (for example) natural resources in the cultural landscape the stories behind the features can be told. The context of the cultural landscape can unlock 'better understanding of the cultural meaning and importance' of sites and places.

Although other values may be considered – such as educational or tourism values – the two principal values that are likely to be addressed in a consideration of Aboriginal sites and places are the cultural/social significance to Aboriginal people and their archaeological or scientific significance to archaeologists. The determinations of archaeological and cultural significance for sites and places should then be expressed as statements of significance that preface a concise discussion of the contributing factors to Aboriginal cultural heritage significance.

6.2 Archaeological (scientific significance) values

Archaeological significance (also called scientific significance, as per the ICOMOS Burra Charter) refers to the value of archaeological objects or sites as they relate to research questions that are of importance to the archaeological community, including indigenous communities, heritage managers and academic archaeologists. Generally the value of this type of significance is determined on the basis of the potential for sites and objects to provide information regarding the past life-ways of people (Burke & Smith 2004, p.249, NPWS 1997), For this reason, the NPWS summarises the situation as 'while various criteria for archaeological significance assessment have been advanced over the years, most of them fall under the heading of archaeological research potential' (NPWS 1997, p.26). The NPWS criteria for archaeological significance assessment are based largely on the ICOMOS Burra Charter.

Research potential

Research potential is assessed by examining site content and site condition. Site content refers to all cultural materials and organic remains associated with human activity at a site. Site content also refers to the site structure – the size of the site, the patterning of cultural materials within the site, the presence of any stratified deposits and the rarity of particular artefact types. As the site contents criterion is not applicable to scarred trees, the assessment of scarred trees is outlined separately below. Site condition refers to the degree of disturbance to the contents of a site at the time it was recorded.

Table 10 and Table 11 outline the site content and site condition rating used for archaeological sites.

Table 10 Site contents ratings used for archaeological sites

Rating	Description
0	No cultural material remaining.
1	Site contains a small number (e.g. 0–10 artefacts) or limited range of cultural materials with no evident

Rating	Description
	stratification.
2	Site contains a larger number, but limited range of cultural materials; and/or some intact stratified deposit remains; and/or are or unusual example(s) of a particular artefact type.
3	Site contains a large number and diverse range of cultural materials; and/or largely intact stratified deposit; and/or surface spatial patterning of cultural materials that still reflect the way in which the cultural materials were deposited.

Table 11 Site condition ratings used for archaeological sites

Rating	Description
0	Site destroyed.
1	Site in a deteriorated condition with a high degree of disturbance; lack of stratified deposits; some cultural materials remaining.
2	Site in a fair to good condition, but with some disturbance.
3	Site in an excellent condition with little or no disturbance. For surface artefact scatters this may mean that the spatial patterning of cultural materials still reflects the way in which the cultural materials were laid down.

Pearson and Sullivan (1995, p.149) note that Aboriginal archaeological sites are generally of high research potential because 'they are the major source of information about Aboriginal prehistory'. Indeed, the often great time depth of Aboriginal archaeological sites gives them research value from a global perspective, as they are an important record of humanity's history. Research potential can also refer to specific local circumstances in space and time – a site may have particular characteristics (well preserved samples for absolute dating, or a series of refitting artefacts, for example) that mean it can provide information about certain aspects of Aboriginal life in the past that other less or alternatively valuable sites may not (Burke & Smith 2004, pp.247–8). When determining research potential value particular emphasis has been placed on the potential for absolute dating of sites.

The following sections provide statements of significance for the Aboriginal archaeological sites recorded during the sub-surface testing for the assessment. The significance of each site follows the assessment process outlined above. This includes a statement of significance based on the categories defined in the Burra Charter. These categories include social, historic, scientific, aesthetic and cultural (in this case archaeological) landscape values. Nomination of the level of value—high, moderate, low or not applicable—for each relevant category is also proposed. Where suitable the determination of cultural (archaeological) landscape value is applied to both individual sites and places (to explore their associations) and also, to the Study Area as a whole. The nomination levels for the archaeological significance of each site are summarised below.

Representativeness

Representativeness refers to the regional distribution of a particular site type. Representativeness is assessed by whether the site is common, occasional, or rare in a given region. Assessments of representativeness are subjectively biased by current knowledge of the distribution and number of archaeological sites in a region. This varies from place to place depending on the extent of archaeological research. Consequently, a site that is assigned low significance values for contents and condition, but a high significance value for representativeness, can only be regarded as significant in terms of knowledge of the regional archaeology. Any such site should be subject to re-assessment as more archaeological research is undertaken.

Assessment of representativeness also takes into account the contents and condition of a site. For example, in any region there may only be a limited number of sites of any type that have suffered minimal disturbance. Such sites would therefore be given a high significance rating for representativeness, although they may occur commonly within the region.

Table 12 outlines the site representativeness ratings used for archaeological sites.

Table 12 Site representativeness ratings used for archaeological sites

Rating	Description
1	Common occurrence.
2	Occasional occurrence.
3	Rare occurrence.

Overall scientific significance ratings for sites, based on a cumulative score for site contents, site integrity and representativeness are provided in Table 13.

Table 13 Scientific significance ratings used for archaeological sites

Rating	Description
1-3	Low scientific significance.
4-6	Moderate scientific significance.
7-9	High scientific significance.

Each site or area of potential is given a score on the basis of these criteria – the overall scientific significance is determined by the cumulative score.

6.2.1 Statements of archaeological significance

The following archaeological significance assessment is based on Requirement 11 of the Code. Using the assessment criteria detailed in Scientific Values and Significance Assessment, an assessment of significance was determined and a rating for the study area was determined. The results of the archaeological significance assessment are given in Table 14 below.

Table 14 Scientific significance assessment of archaeological sites recorded within the study area

Site name	Site content	Site condition	Representativeness	Scientific significance
Areas of moderate PAD	0	0	0	Low – no Aboriginal objects were identified.

Table 15 Statements of scientific significance for archaeological sites recorded within the study area

Site name	Statement of significance
Areas of moderate PAD	A field investigation of the study area resulted in the identification of three areas of moderate archaeological potential. Subsequent test excavations revealed no Aboriginal sites or objects to be located within the study area. The lack of archaeological deposits across the study area suggests that the study area was not suitable for Aboriginal occupation; however, the study area may have still been utilised for resource gathering (despite the lack of archaeological evidence) as part of a wider cultural landscape associated with occupation sites along Mannering Creek such as those identified by Insite Heritage (2010). The results of this assessment confirmed that PAD 1, PAD 2 AND PAD 3 possessed low archaeological potential. The study area therefore possesses low archaeological scientific significance.

7 Development limitations and mitigation measures

As discussed above, TOPA intends to undertake the rezoning of 1377 Hue Hue Road, Wyee, NSW (Figure 3). In addition to the rezoning it is proposed that:

- Two new 16-metre-wide roads will be constructed.
- Three sections of housing lots consisting of 54 residential lots.
- Revegetation works to be completed within the southernmost portion of the study area.
- Inclusion of drainage infrastructure between the existing E2 Environmental Conservation zoned land and the newly zoned R2 Low density Residential land.

7.1 Predicted physical impacts

The results of the assessment have determined that the study area does not contain any known Aboriginal sites or objects and has been assessed as having low archaeological potential. The proposed works will therefore not impact on any known Aboriginal heritage values.

7.2 Management and mitigation measures

Ideally, heritage management involves conservation of sites through the preservation and conservation of fabric and context within a framework of 'doing as much as necessary, as little as possible' (Marquis-Kyle & Walker 1994, p.13). In cases where conservation is not practical, several options for management are available. For sites, management often involves the salvage of features or artefacts, retrieval of information through excavation or collection (especially where impact cannot be avoided) and interpretation.

Consideration has been given to the principles of Ecologically Sustainable Development (ESD) in order to minimise impacts. Avoidance of impacts to archaeological and cultural heritage sites through design of the development is the primary mitigation and management strategy and should be implemented where practicable. As part of the management and mitigation measures for the proposed works, an ACHA including archaeological survey, test excavations, and consultation with the Aboriginal community was undertaken. The purpose of the assessment was to determine the presence and nature of any potential Aboriginal sites so that appropriate management could be undertaken. Test excavations did not identify any Aboriginal sites or objects, therefore the study area has been assessed as having low archaeological potential. However, this assessment and the test excavation program has contributed to our knowledge of Aboriginal land use in the area and will be available for future generations to build on in line with inter-generational equity principles. The proposed works will avoid impacts to any known Aboriginal sites. Consultation with RAPs has resulted in the following management strategies being formulated.

7.2.1 No further archaeological work required

No further archaeological work is recommended for the study area. The study area has been assessed as having low archaeological potential and therefore no further investigations are required. This recommendation is conditional upon the recommendations outlined in this report.

7.2.2 Heritage induction

Heritage inductions for all site workers and contractors should be undertaken in order to prevent any unintentional harm to unexpected Aboriginal objects or sites, or Aboriginal sites or objects located within proximity to the study area. The heritage induction should include the following items:

- Relevant legislation.
- Location of identified Aboriginal heritage sites, areas of archaeological potential, and areas of archaeological sensitivity.
- Basic identification skills for Aboriginal and non-Aboriginal artefacts and human remains.
- Procedure to follow in the event of an unexpected heritage item find during construction works.
- Procedure to follow in the event of discovery of human remains during construction works.
- Penalties and non-compliance.

8 Recommendations

Strategies have been developed based on the archaeological (significance) of cultural heritage relevant to the study area and influenced by:

- Predicted impacts to Aboriginal cultural heritage.
- The planning approvals framework.
- Current best conservation practise, widely considered to include:
  - Ethos of the Australia ICOMOS Burra Charter.
  - The Code.

The recommendations below respond specifically to the wishes of the RAPs. Prior to any impacts occurring within the study area, the following is recommended:

Recommendation 1: No further archaeological assessment is required

No further archaeological work is required in the study area due to the entire study area being assessed as having low archaeological potential. This recommendation is conditional upon Recommendations 4 to 6.

Recommendation 2: Continued consultation with the Registered Aboriginal Parties

As per the consultation requirements, it is recommended that a copy of this final report be provided to the RAPs.

Recommendation 3: Heritage induction

Heritage inductions for all site workers and contractors should be undertaken in order to prevent any unintentional harm to unexpected Aboriginal objects or sites, or Aboriginal sites or objects located within proximity to the study area. The heritage induction should include the following items:

- Relevant legislation.
- Location of identified Aboriginal heritage sites, areas of archaeological potential, and areas of archaeological sensitivity.
- Basic identification skills for Aboriginal and non-Aboriginal artefacts and human remains.
- Procedure to follow in the event of an unexpected heritage item find during construction works.
- Procedure to follow in the event of the discovery of human remains during construction works.
- Penalties and non-compliance.

Recommendation 4: Discovery of unanticipated Aboriginal objects

All Aboriginal objects and Places are protected under the NPW Act. It is an offence to disturb an Aboriginal object without a consent permit issued by Heritage NSW. Should any unanticipated Aboriginal objects be encountered during works associated with this proposal, works must cease in the vicinity and the find should not be moved until assessed by a qualified archaeologist. If the find is determined to be an Aboriginal object, the archaeologist will provide further recommendations. These may include notifying Heritage NSW and RAPs.

Recommendation 5: Discovery of unanticipated historical relics

Relics are historical archaeological resources of local or State significance and are protected in NSW under the Heritage Act. Relics cannot be disturbed except with a permit or exception notification. Should unanticipated relics be discovered during the course of the project, work in the vicinity must cease and an archaeologist contacted to make a preliminary assessment of the find. Heritage NSW will require notification if the find is assessed as a relic.

Recommendation 6: Discovery of human remains

If any suspected human remains are discovered during any activity, you must:

1. Immediately cease all work at that location and not further move or disturb the remains.
2. Notify NSW Police and the NSW Environmental Line on 131 555 as soon as practicable and provide details of the remains and their location.
3. Not recommence work at that location unless authorised in writing by NSW Police and/or Heritage NSW.

References

AMAC 2019, *Interim Aboriginal Archaeological Report, Central Coast Quarter 26 Mann Street, Gosford, NSW*, For SH Gosford Residential Pty Ltd.

AMBS 2014, *M1 Pacific Motorway Widening and Replacement, Tuggerah to Doyalson: Aboriginal Archaeological Survey Report*.

Attenbrow, V 2002, *Pre-colonial Aboriginal land and resource use in Centennial, Moore and Queens Parks - assessment of historical and archaeological evidence for Centennail Parklands Conservation Management Plan. Report for Beyond Consulting for Conybeare Morrison & Partners.*

Australia ICOMOS 2013, *The Burra Charter: the Australia ICOMOS Charter for Places of Cultural Significance*, Australia ICOMOS, Burwood, VIC.

Bennett, F. C 1969, 'An historical tour of Wyong and district, 1st ed, Brisbane Water Historical Society and Wyong Shire Historical Society.'

Biosis 2011, *Lake Munmorah Feeders: Aboriginal Archaeological Assessment. Report for EnergyAustralia.*

Biosis 2018, *Aboriginal cultural heritage due diligence assessment: Toronto NSW (2TRT-22 and 2TRT-23). Report prepared for Tata Consultancy Services Limited.*

Biosis 2021, *1377 Hue Hue Road, Wyee Aboriginal Due Diligence Assessment*, Report prepared for TOPA Property Pty Ltd. Lucas. M, Biosis Pty Ltd. Wollongong, NSW. Project no 35633.

Biosis Pty Ltd 2021, *Old Main Road, Fennell Bay. Aboriginal Cultural Heritage Assessment*, Prepared for Landcom.

Burke, H & Smith, C 2004, *The Archaeologist's Field Handbook*, 1st edn, Allen and Unwin, Sydney, NSW.

CSIRO 2009, *Australian soil and land survey field handbook*, 3rd edn, CSIRO Publishing & National Committee on Soil and Terrain, Collingwood, Victoria.

Dallas 1986, *Pipeline Route between Gwandalan and Mannering Park Sewerage Treatment Works.*, Report to NSW Public Works Department.

DECCW 2010a, *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales*, Department of Environment and Climate Change, Sydney NSW.

DECCW 2010b, *Aboriginal Cultural Heritage Consultation Requirements for Proponents*, New South Wales Government Department of Environment and Climate Change, Sydney NSW.

GML 2017, *Site 5 - Wallarah Darkingjung Land Rezoning Site, Aboriginal Heritage, Due Diligence Assessment*, Report prepared for Darkinjung Local Aboriginal Land Council.

Heritage Concepts 2006, *Aboriginal Archaeological Assessment and Statement of Heritage Impact: Proposed Gas Pipeline Project Munmorah Power Station*, Report to Parsons Brinkerhoff.

HLA 2005, *Preliminary Research Permit Excavation Report. Sub-surface Investigations at Dora Creek, Lake Macquarie NSW. Report to Patterson Britton & Partners Ltd.*

Insite Heritage 2010, *Aboriginal and European Heritage Assessment Wyee - Local Environmental Study*, Report to Conics Pty Ltd.

Insite Heritage Pty Ltd 2011, *Aboriginal Cultural Heritage Impact Assessment Proposed Expansion Awaba Waste Treatment Facility Awaba, NSW*.

J.C Lough and Associates Archaeological Field Surveyors 1981, *Freeway No.3 Wallarah Creek Interchange to Wallsend Archaeological Survey*, Prepared for the department of Main Roads in NSW.

Kuskie, P 1992, *A preliminary archaeological assessment of the proposed route of Optus communications' fibre optic cable between Wyong and Maitland, New South Wales*, Report to Landscan Pty Ltd.

Marquis-Kyle, P & Walker, M 1994, *The illustrated Burra Charter : making good decisions about the care of important places*, Repr. with corrections., Australia ICOMOS with the assistance of the Australian Heritage Commission, Sydney, NSW.

Murphy, CL 1993, *Soil Landscapes of the Gosford-Lake Macquarie 1:100 00 Sheet*, Department of Conservation and Land Management, Sydney.

Navin, K & Officer, K 1994, *Preliminary Cultural Heritage Overview: Optus – Sydney, Newcastle, Orange*, Report for Sinclair Knight.

Navin Officer 1994, *Preliminary Cultural Heritage Overview: Optus Link from Sydney, Newcastle and Orange*, Sinclair Knight and Partners.

Nelson, L 1995, *Shell middens on Lake Macquarie*, University of New England.

NPWS 1997, 'Aboriginal Cultural Heritage: Standards and Guidelines Kit'.

OEH 2011, 'Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW', <Office of Environment and Heritage, Department of Premier and Cabinet, Sydney NSW>.

Officer, Navin, & Saunders 1996, *Test Excavations at 'The Hole 1', Mannering Bay, Lake Macquarie, NSW.*

Pearson, M & Sullivan, S 1995, *Looking after heritage places: the basics of heritage planning for managers, landowners and administrators*, Melbourne University Press, Carlton, Victoria.

Ritter, DF, Kochel, RC, & Miller, JR 1995, *Process Geomorphology*, Wm. C. Brown.

RPS 2015, *Mandalong Transmission Line (TL24) Relocation Project, Aboriginal Heritage Impact Assessment*, Prepared for Centennial Mandalong Pty Limited.

Secomb, N 2010, *Wyong Shire-wide Heritage Review Thematic History. Prepared by David Scobie Architects.*

Strahler, A 1952, 'Hypsometric (area-altitude) analysis of erosional topology', *Geological Society of America Bulletin*, vol. 63, no. 11, pp. 1117–1142.

Strom, B 1982, *Gosford/Wyong. History and Heritage*, Gosford District Historical Research and Heritage Association, Gosford.

Umwelt 2011, *Sustainable Managment of Aboriginal Cultural Heritage in the Lake Macquarie Local Government Area: Lake Macquarie Aboriginal heritage Managment Strategy*, Lake Macquarie City Council.

Appendices

Appendix 1 AHIMS results

THE FOLLOWING APPENDIX IS NOT TO BE MADE PUBLIC

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : 37418 NW 4.7km

Client Service ID : 699608

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
45-3-3570	Duplicate of RPS MAND STH TBM54	GDA	56	352695	6327785	Open site	Deleted	Grinding Groove : 1		
	Contact	**Recorders**	RPS East Australia Pty Ltd - Echuca Victoria,RPS East Australia Pty Ltd - Echuca Vic					**Permits**		
45-3-3547	RPS MAND STH TBM53	GDA	56	352721	6327776	Open site	Valid	Potential Archaeological Deposit (PAD) : 1		
	Contact	**Recorders**	RPS East Australia Pty Ltd - Echuca Victoria					**Permits**		
45-3-3557	Duplicate of RPS MAND STH TBM53	GDA	56	352721	6327776	Open site	Deleted	Potential Archaeological Deposit (PAD) : 1		
	Contact	**Recorders**	RPS East Australia Pty Ltd - Echuca Victoria,RPS East Australia Pty Ltd - Echuca Vic					**Permits**		
45-3-3608	Duplicate of RPS MAND STH TBM 49	GDA	56	352837	6327793	Open site	Deleted	Grinding Groove : 1		
	Contact	**Recorders**	RPS Australia East Pty Ltd - Hamilton,RPS East Australia Pty Ltd - Echuca Victoria					**Permits**		
45-3-3599	RPS MAND STH TBM 16	GDA	56	352918	6329416	Open site	Valid	Habitation Structure : 1		
	Contact	**Recorders**	RPS Australia East Pty Ltd - Hamilton					**Permits**		
45-3-3494	RPS CYL04b	GDA	56	352958	6328577	Open site	Valid	Grinding Groove : 1		
	Contact	**Recorders**	RPS East Australia Pty Ltd - Echuca Victoria					**Permits**		
45-3-3552	RPS MAND STH TBM46	GDA	56	353379	6327443	Open site	Valid	Grinding Groove : 1		
	Contact	**Recorders**	RPS East Australia Pty Ltd - Echuca Victoria					**Permits**		
45-3-3487	RPS MAND STH CYL02	GDA	56	354393	6328642	Open site	Valid	Grinding Groove : 1		
	Contact	**Recorders**	RPS East Australia Pty Ltd - Echuca Victoria					**Permits**		
45-3-3984	111 Scofield Wyee Scar Tree	GDA	56	356520	6330677	Open site	Valid	Modified Tree (Carved or Scarred) : 1		
	Contact	**Recorders**	Mr.David Ahoy,lower hunter aboriginal incorporated - cardiff south					**Permits**		
45-3-3445	Wyee 3	GDA	56	358290	6326670	Open site	Valid	Stone Arrangement : -		
	Contact Mr.Shane Frost	**Recorders**	Insite Heritage Pty Ltd,Insite Heritage Pty Ltd,Ms.Elizabeth Wyatt,Ms.Elizabeth Wy					**Permits**	4550	
45-3-4287	Wyee 7	GDA	56	358559	6327310	Open site	Valid	Artefact : -		
	Contact	**Recorders**	Insite Heritage Pty Ltd,Ms.Elizabeth Wyatt					**Permits**	4550	
45-7-0207	The Hole 1 (TH1)	AGD	56	361820	6329800	Open site	Valid	Artefact : -	Open Camp Site	3697,101093
	Contact	**Recorders**	Kerry Navin,Mr.Kelvin Officer,P Saunders					**Permits**		
45-3-3556	RPS MAND STH TBM52	GDA	56	352767	6327771	Open site	Valid	Modified Tree (Carved or Scarred) : 1		
	Contact	**Recorders**	RPS East Australia Pty Ltd - Echuca Victoria					**Permits**		
45-3-3601	RPS MAND STH TBM 21	GDA	56	352843	6329264	Open site	Valid	Habitation Structure : 1		
	Contact	**Recorders**	RPS Australia East Pty Ltd - Hamilton					**Permits**		

Report generated by AHIMS Web Service on 12/07/2022 for Samantha Keats for the following area at Datum :GDA, Zone : 56, Eastings : 352567.0 - 362309.0, Northings : 6322504.0 - 6332276.0 with a Buffer of 0 meters.. Number of Aboriginal sites and Aboriginal objects found is 110

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
45-3-3530	RPS MAND STH TBM19	GDA	56	352847	6329295	Open site	Valid	Potential Archaeological Deposit (PAD) : 1		
	Contact	**Recorders**	RPS East Australia Pty Ltd - Echuca Victoria					**Permits**		
45-3-3438	RPS Mandalong South 03	GDA	56	352856	6329404	Closed site	Valid	Artefact : -		
	Contact	**Recorders**	RPS Australia East Pty Ltd - Blacktown,Mrs.Tessa Boer-Mah					**Permits**		
45-3-3493	RPS CYL04c	GDA	56	352972	6328558	Open site	Valid	Grinding Groove : 1		
	Contact	**Recorders**	R.R.P. Property Consultants Pty Ltd					**Permits**		
45-3-3468	RPS MAND STH AH02	GDA	56	353514	6330449	Open site	Valid	Grinding Groove : 1		
	Contact	**Recorders**	RPS East Australia Pty Ltd - Echuca Victoria					**Permits**		
45-3-3466	RPS MAND STH TBM11	GDA	56	354080	6327742	Open site	Valid	Artefact : 3		
	Contact	**Recorders**	RPS Australia East Pty Ltd - Hamilton,Mrs.Tessa Boer-Mah					**Permits**		
45-3-3526	RPS MAND STH TBM12	GDA	56	354070	6330480	Open site	Valid	Grinding Groove : 1		
	Contact	**Recorders**	RPS East Australia Pty Ltd - Echuca Victoria					**Permits**		
45-3-3584	Wallarah Creek Open Site 2	GDA	56	356256	6324218	Open site	Valid	Artefact : 1		102920
	Contact	**Recorders**	OzArk Environmental and Heritage Management - Dubbo					**Permits**		
45-3-3424	Mannering Creek 1	GDA	56	357799	6327519	Open site	Valid	Artefact : 2		101909
	Contact	**Recorders**	Mrs.Angela Besant					**Permits**		
45-7-0251	PAD 3 - Munmorah	AGD	56	361000	6326250	Open site	Valid	Potential Archaeological Deposit (PAD) : -		
	Contact	**Recorders**	Heritage Concepts,Mr.Jakub Czastka					**Permits**		
45-3-3575	RPS MAND STH TBM49	GDA	56	352837	6327793	Open site	Valid	Grinding Groove : 1		
	Contact	**Recorders**	RPS East Australia Pty Ltd - Echuca Victoria					**Permits**		
45-3-3602	RPS MAND STH TBM 23	GDA	56	352843	6329249	Open site	Valid	Habitation Structure : 1		
	Contact	**Recorders**	RPS Australia East Pty Ltd - Hamilton					**Permits**		
45-3-3467	RPS MAND STH AH01	GDA	56	353235	6329591	Open site	Valid	Grinding Groove : 1		
	Contact	**Recorders**	RPS East Australia Pty Ltd - Echuca Victoria					**Permits**		
45-3-3563	Duplicate of RPS MAND STH TBM45	GDA	56	353387	6327468	Open site	Deleted	Grinding Groove : 1		
	Contact	**Recorders**	RPS East Australia Pty Ltd - Echuca Victoria,RPS East Australia Pty Ltd - Echuca Vic					**Permits**		
45-3-3545	RPS MAND STH TBM38	GDA	56	354087	6327145	Open site	Valid	Grinding Groove : 1		
	Contact	**Recorders**	RPS East Australia Pty Ltd - Echuca Victoria					**Permits**		
45-3-3525	Duplicate of RPS MAND STH TBM11	GDA	56	354080	6327742	Open site	Deleted	Artefact : 1		
	Contact	**Recorders**	RPS East Australia Pty Ltd - Echuca Victoria,RPS East Australia Pty Ltd - Echuca Vic					**Permits**		
45-3-3316	WC-IF1	GDA	56	355002	6324087	Open site	Valid	Artefact : -		102879,102920
	Contact Searle	**Recorders**	Doctor.Jodie Benton,Mr.Phillip Cameron					**Permits**		

Report generated by AHIMS Web Service on 12/07/2022 for Samantha Keats for the following area at Datum :GDA, Zone : 56, Eastings : 352567.0 - 362309.0, Northings : 6322504.0 - 6332276.0 with a Buffer of 0 meters.. Number of Aboriginal sites and Aboriginal objects found is 110

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
45-3-3317	WC-OS1	GDA	56	355185	6324252	Open site	Valid	Artefact : -		102879,102920
	Contact	**Recorders**	Doctor.Jodie Benton,Mr.Phillip Cameron					**Permits**		
45-3-1235	Moran's Creek;	AGD	56	355300	6331100	Open site	Valid	Grinding Groove : -	Axe Grinding Groove	294
	Contact	**Recorders**	ASRSYS					**Permits**		
45-3-3674	CASAR Park IF 1	GDA	56	357801	6325333	Open site	Valid	Artefact : -		
	Contact	**Recorders**	Extent Heritage Pty Ltd - Pyrmont - Individual users,Mrs.Laressa Barry					**Permits**		
45-3-3425	Mannering Creek 2	GDA	56	358365	6327862	Open site	Valid	Artefact : 1, Potential Archaeological Deposit (PAD) : -		101909
	Contact	**Recorders**	Mrs.Angela Besant,Insite Heritage Pty Ltd,Ms.Elizabeth Wyatt					**Permits**	4550	
45-3-3180	B14	AGD	56	359150	6325075	Open site	Valid	Artefact : -		100541,100863,101093
	Contact	**Recorders**	Michael Therin					**Permits**		
45-3-3176	B;1	AGD	56	359750	6324715	Open site	Destroyed	Artefact : -		100541,100863,101093
	Contact	**Recorders**	Michael Therin					**Permits**		
45-3-3259	B7	GDA	56	360227	6325388	Open site	Valid	Artefact : 1		
	Contact T Russell	**Recorders**	Michael Therin					**Permits**		
45-7-0291	RPS HSO M1	GDA	56	361555	6331952	Open site	Valid	Shell : -		
	Contact Koompahtoo LALC	**Recorders**	RPS Australia East Pty Ltd - Hamilton,Ms.Laraine Nelson					**Permits**		
45-3-3554	RPS MAND STH TBM50	GDA	56	352809	6327783	Open site	Valid	Grinding Groove : 1		
	Contact	**Recorders**	RPS East Australia Pty Ltd - Echuca Victoria					**Permits**		
45-3-3470	RPS MAND STH AH04	GDA	56	352880	6329942	Open site	Valid	Grinding Groove : 1		
	Contact	**Recorders**	RPS East Australia Pty Ltd - Echuca Victoria					**Permits**		
45-3-1232	Wyee Creek	AGD	56	352800	6329300	Closed site	Valid	Artefact : -, Art (Pigment or Engraved) : -	Shelter with Art,Shelter with Deposit	294,101093
	Contact	**Recorders**	ASRSYS					**Permits**		
45-3-3489	RPS CYL04	GDA	56	352959	6328590	Open site	Valid	Grinding Groove : 1		
	Contact	**Recorders**	RPS East Australia Pty Ltd - Echuca Victoria					**Permits**		
45-3-3436	RPS Mandalong South 01	GDA	56	353007	6329206	Closed site	Valid	Artefact : 2		
	Contact	**Recorders**	RPS Australia East Pty Ltd - Blacktown,Mrs.Tessa Boer-Mah					**Permits**		
45-3-3549	RPS MAND STH TBM43	GDA	56	353420	6327537	Open site	Valid	Grinding Groove : 1		
	Contact	**Recorders**	RPS East Australia Pty Ltd - Echuca Victoria					**Permits**		
45-3-3544	Duplicate of RPS MAND STH TBM37	GDA	56	354133	6327740	Open site	Deleted	Artefact : 1		
	Contact	**Recorders**	RPS East Australia Pty Ltd - Echuca Victoria,RPS East Australia Pty Ltd - Echuca Vic					**Permits**		
45-3-3486	RPS MAND STH CYL01	GDA	56	354372	6328578	Open site	Valid	Grinding Groove : 1		

Report generated by AHIMS Web Service on 12/07/2022 for Samantha Keats for the following area at Datum :GDA, Zone : 56, Eastings : 352567.0 - 362309.0, Northings : 6322504.0 - 6332276.0 with a Buffer of 0 meters.. Number of Aboriginal sites and Aboriginal objects found is 110

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : 37418 NW 4.7km

Client Service ID : 699608

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
	Contact	**Recorders**	RPS East Australia Pty Ltd - Echuca Victoria					**Permits**		
45-3-3304	Halloran ISO 1	AGD	56	355000	6322650	Open site	Valid	Artefact : -		102647
	Contact T Russell	**Recorders**	Mr.John Appleton					**Permits**		
45-3-3488	RPS MAND STH CYL03	GDA	56	355610	6327400	Open site	Valid	Modified Tree (Carved or Scarred) : 1		
	Contact	**Recorders**	RPS East Australia Pty Ltd - Echuca Victoria					**Permits**		
45-3-3496	Duplicate of RPS MAND STH CYL03a	GDA	56	355610	6327400	Open site	Deleted	Modified Tree (Carved or Scarred) : 1		
	Contact	**Recorders**	RPS East Australia Pty Ltd - Echuca Victoria,RPS East Australia Pty Ltd - Echuca Vic					**Permits**		
45-3-3187	BR13	AGD	56	359375	6325050	Open site	Valid	Artefact : -		100541,100863,101093
	Contact	**Recorders**	Michael Therin					**Permits**		
45-3-3179	B11	AGD	56	359563	6325450	Open site	Valid	Artefact : -		100541,100863,101093
	Contact	**Recorders**	Therin Archaeological Consulting					**Permits**		
45-3-3261	B9, Bushells Ridge	AGD	56	359601	6326537	Open site	Valid	Artefact : 2		
	Contact T Russell	**Recorders**	Michael Therin					**Permits**		
45-3-3186	BR10	AGD	56	359612	6326462	Open site	Valid	Artefact : -		100541,100863,101093
	Contact	**Recorders**	Michael Therin					**Permits**		
45-3-3531	RPS MAND STH TBM20	GDA	56	352853	6329261	Open site	Valid	Modified Tree (Carved or Scarred) : 1		
	Contact	**Recorders**	RPS East Australia Pty Ltd - Echuca Victoria					**Permits**		
45-3-3600	RPS MAND STH TBM 18	GDA	56	352863	6329360	Open site	Valid	Habitation Structure : 1		
	Contact	**Recorders**	RPS Australia East Pty Ltd - Hamilton					**Permits**		
45-3-3495	Duplicate of RPS CYL04	GDA	56	352959	6328590	Open site	Deleted	Grinding Groove : 1		
	Contact	**Recorders**	RPS East Australia Pty Ltd - Echuca Victoria,RPS East Australia Pty Ltd - Echuca Vic					**Permits**		
45-3-3564	Duplicate of RPS MAND STH TBM46	GDA	56	353379	6327443	Open site	Deleted	Grinding Groove : 1		
	Contact	**Recorders**	RPS East Australia Pty Ltd - Echuca Victoria,RPS East Australia Pty Ltd - Echuca Vic					**Permits**		
45-3-3527	RPS MAND STH TBM13	GDA	56	354077	6330500	Open site	Valid	Grinding Groove : 1		
	Contact	**Recorders**	RPS East Australia Pty Ltd - Echuca Victoria					**Permits**		
45-3-1311	Pasadena;	AGD	56	356972	6326822	Open site	Valid	Artefact : -	Open Camp Site	100541,100863,101093
	Contact	**Recorders**	Unknown Author					**Permits**		
45-3-4286	Mannering Ck 4 Potential Hearth & PAD	GDA	56	358193	6327689	Open site	Valid	Hearth : -, Potential Archaeological Deposit (PAD) : -		

Report generated by AHIMS Web Service on 12/07/2022 for Samantha Keats for the following area at Datum :GDA, Zone : 56, Eastings : 352567.0 - 362309.0, Northings : 6322504.0 - 6332276.0 with a Buffer of 0 meters.. Number of Aboriginal sites and Aboriginal objects found is 110

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : 37418 NW 4.7km

Client Service ID : 699608

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
	Contact	**Recorders**	Insite Heritage Pty Ltd,Ms.Elizabeth Wyatt					**Permits**	4550	
45-3-4288	Wyee 6	GDA	56	358373	6326732	Open site	Valid	Artefact : -		
	Contact	**Recorders**	Insite Heritage Pty Ltd,Ms.Elizabeth Wyatt					**Permits**	4550	
45-3-3260	B3, Bushells Ridge	AGD	56	360187	6325275	Open site	Valid	Artefact : 1		
	Contact T Russell	**Recorders**	Michael Therin					**Permits**		
45-7-0245	B5, Bushells Ridge	GDA	56	360800	6325350	Open site	Valid	Artefact : 2		
	Contact T Russell	**Recorders**	Michael Therin					**Permits**		
45-7-0316	RPS Wyee Point 2	GDA	56	362237	6331450	Open site	Valid	Shell : -		
	Contact	**Recorders**	RPS Australia East Pty Ltd - Hamilton,Ms.Laraine Nelson					**Permits**		
45-3-3566	Duplicate of RPS MAND STH TBM50	GDA	56	352809	6327783	Open site	Deleted	Grinding Groove : 1		
	Contact	**Recorders**	RPS East Australia Pty Ltd - Echuca Victoria,RPS East Australia Pty Ltd - Echuca Vic					**Permits**		
45-3-3603	RPS MAND STH TBM 24	GDA	56	352870	6329067	Open site	Valid	Habitation Structure : 1		
	Contact	**Recorders**	RPS Australia East Pty Ltd - Hamilton					**Permits**		
45-3-3598	RPS MAND STH TBM 15	GDA	56	352887	6329356	Open site	Valid	Habitation Structure : 1		
	Contact	**Recorders**	RPS Australia East Pty Ltd - Hamilton					**Permits**		
45-3-3604	RPS MAND STH TBM 25	GDA	56	352973	6329010	Open site	Valid	Habitation Structure : 1		
	Contact	**Recorders**	RPS Australia East Pty Ltd - Hamilton					**Permits**		
45-3-3565	Duplicate of RPS MAND STH TBM47	GDA	56	353023	6326746	Open site	Deleted	Grinding Groove : 1		
	Contact	**Recorders**	RPS East Australia Pty Ltd - Echuca Victoria,RPS East Australia Pty Ltd - Echuca Vic					**Permits**		
45-3-3553	RPS MAND STH TBM47	GDA	56	353023	6326746	Open site	Valid	Grinding Groove : 1		
	Contact	**Recorders**	RPS East Australia Pty Ltd - Echuca Victoria					**Permits**		
45-3-1312	Hue Hue Road;	AGD	56	353671	6322552	Open site	Valid	Artefact : -	Open Camp Site	101093,102647
	Contact	**Recorders**	Unknown Author					**Permits**		
45-3-3464	RPS MAND STH TBM10	GDA	56	353767	6327042	Open site	Valid	Grinding Groove : 29		
	Contact	**Recorders**	RPS Australia East Pty Ltd - Hamilton,Mrs.Tessa Boer-Mah					**Permits**		
45-3-3524	Duplicate of RPS MAND STH TBM10	GDA	56	353767	6327042	Open site	Deleted	Grinding Groove : 1		
	Contact	**Recorders**	RPS East Australia Pty Ltd - Echuca Victoria,RPS East Australia Pty Ltd - Echuca Vic					**Permits**		
45-3-3498	Duplicate of RPS MAND STH CYL01a	GDA	56	354372	6328578	Open site	Deleted	Grinding Groove : 1		
	Contact	**Recorders**	RPS East Australia Pty Ltd - Echuca Victoria,RPS East Australia Pty Ltd - Echuca Vic					**Permits**		
45-3-3497	Duplicate of RPS MAND STH CYL02a	GDA	56	354393	6328642	Open site	Deleted	Grinding Groove : 1		
	Contact	**Recorders**	RPS East Australia Pty Ltd - Echuca Victoria,RPS East Australia Pty Ltd - Echuca Vic					**Permits**		
45-3-3983	Restriction applied. Please contact ahims@environment.nsw.gov.au.					Open site	Valid			
	Contact	**Recorders**	GML Heritage Pty Ltd - Surry Hills,Ms.Jodi Cameron					**Permits**		

Report generated by AHIMS Web Service on 12/07/2022 for Samantha Keats for the following area at Datum :GDA, Zone : 56, Eastings : 352567.0 - 362309.0, Northings : 6322504.0 - 6332276.0 with a Buffer of 0 meters.. Number of Aboriginal sites and Aboriginal objects found is 110

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
45-3-1310	Pourmalong Creek;	AGD	56	357823	6330130	Open site	Valid	Artefact : -	Open Camp Site	
	Contact	**Recorders**	ASRSYS					**Permits**		
45-3-3262	B4, Bushells Ridge	GDA	56	360008	6325262	Open site	Valid	Artefact : 1		
	Contact T Russell	**Recorders**	Michael Therin					**Permits**		
45-3-3469	RPS MAND STH AH03	GDA	56	352661	6330027	Open site	Valid	Grinding Groove : 1		
	Contact	**Recorders**	RPS East Australia Pty Ltd - Echuca Victoria					**Permits**		
45-3-3558	RPS MAND STH TBM54	GDA	56	352695	6327785	Open site	Valid	Grinding Groove : 1		
	Contact	**Recorders**	RPS East Australia Pty Ltd - Echuca Victoria					**Permits**		
45-3-3568	Duplicate of RPS MAND STG TBM52	GDA	56	352767	6327771	Open site	Deleted	Modified Tree (Carved or Scarred) : 1		
	Contact	**Recorders**	RPS East Australia Pty Ltd - Echuca Victoria,RPS East Australia Pty Ltd - Echuca Vic					**Permits**		
45-3-3567	Duplicate of RPS MAND STH TBM51	GDA	56	352785	6327759	Open site	Deleted	Grinding Groove : 1		
	Contact	**Recorders**	RPS East Australia Pty Ltd - Echuca Victoria,RPS East Australia Pty Ltd - Echuca Vic					**Permits**		
45-3-3537	Duplicate of TBM 30a	GDA	56	352887	6331365	Open site	Deleted	Artefact : 1		
	Contact	**Recorders**	RPS East Australia Pty Ltd - Echuca Victoria,RPS East Australia Pty Ltd - Echuca Vic					**Permits**		
45-3-3532	RPS MAND STH TBM22	GDA	56	352975	6329179	Open site	Valid	Modified Tree (Carved or Scarred) : 1		
	Contact	**Recorders**	RPS East Australia Pty Ltd - Echuca Victoria					**Permits**		
45-3-3538	RPS MAND STH TBM30B	GDA	56	352981	6331403	Open site	Valid	Artefact : 1		
	Contact	**Recorders**	RPS East Australia Pty Ltd - Echuca Victoria					**Permits**		
45-3-3446	TBM 30a	AGD	56	352887	6331365	Open site	Deleted	Artefact : 14		
	Contact	**Recorders**	Mrs.Tessa Boer-Mah					**Permits**		
45-3-3437	RPS Mandalong South 02	GDA	56	353075	6329134	Closed site	Valid	Artefact : -		
	Contact	**Recorders**	RPS Australia East Pty Ltd - Blacktown,Mrs.Tessa Boer-Mah					**Permits**		
45-3-3508	RPS MAND STH PS12B	GDA	56	353115	6327699	Open site	Valid	Grinding Groove : 1		
	Contact	**Recorders**	RPS East Australia Pty Ltd - Echuca Victoria					**Permits**		
45-3-3471	RPS MAND STH AH05	GDA	56	353088	6331036	Open site	Valid	Modified Tree (Carved or Scarred) : 1		
	Contact	**Recorders**	RPS East Australia Pty Ltd - Echuca Victoria					**Permits**		
45-3-3550	RPS MAND STH TBM44	GDA	56	353389	6327486	Open site	Valid	Grinding Groove : 1		
	Contact	**Recorders**	RPS East Australia Pty Ltd - Echuca Victoria					**Permits**		
45-3-1225	Wyee Creek	AGD	56	353500	6329600	Open site	Valid	Grinding Groove : -	Axe Grinding Groove	294,101093
	Contact	**Recorders**	ASRSYS					**Permits**		
45-3-4289	Wyee 5	GDA	56	357889	6326888	Open site	Valid	Artefact : -		

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AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : 37418 NW 4.7km

Client Service ID : 699608

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
	Contact	**Recorders**	Insite Heritage Pty Ltd,Ms.Elizabeth Wyatt					**Permits**	4550	
45-3-3335	PAD 4 - Munmorah (not a PAD)	AGD	56	357900	6326000	Open site	Not a Site	Potential Archaeological Deposit (PAD) : -		100751,100944
	Contact	**Recorders**	Heritage Concepts,Mr.Jakub Czastka					**Permits**	2780,2781	
45-3-3188	BR12	AGD	56	359427	6325219	Open site	Valid	Artefact : -		100541,100863,101093
	Contact	**Recorders**	Michael Therin					**Permits**		
45-3-3569	Duplicate of RPS MAND STH TBM53 (second)	GDA	56	352721	6327776	Open site	Deleted	Potential Archaeological Deposit (PAD) : 1		
	Contact	**Recorders**	RPS East Australia Pty Ltd - Echuca Victoria,RPS East Australia Pty Ltd - Echuca Vic					**Permits**		
45-3-3555	RPS MAND STH TBM51	GDA	56	352785	6327759	Open site	Valid	Grinding Groove : 1		
	Contact	**Recorders**	RPS East Australia Pty Ltd - Echuca Victoria					**Permits**		
45-3-3529	RPS MAND STH TBM17	GDA	56	352843	6329468	Open site	Valid	Modified Tree (Carved or Scarred) : 1		
	Contact	**Recorders**	RPS East Australia Pty Ltd - Echuca Victoria					**Permits**		
45-3-3678	RPS Mand 2016_1	GDA	56	352816	6331272	Open site	Valid	Modified Tree (Carved or Scarred) : -		
	Contact	**Recorders**	RPS Australia East Pty Ltd - Hamilton,Ms.Jo Nelson					**Permits**		
45-3-3463	RPS MAND STH TBM08	GDA	56	352915	6327374	Open site	Valid	Water Hole : 1		
	Contact	**Recorders**	RPS Australia East Pty Ltd - Hamilton,Mrs.Tessa Boer-Mah					**Permits**		
45-3-3507	RPS MAND STH PS12A	GDA	56	353111	6327672	Open site	Valid	Grinding Groove : 1		
	Contact	**Recorders**	RPS East Australia Pty Ltd - Echuca Victoria					**Permits**		
45-3-3551	RPS MAND STH TBM45	GDA	56	353387	6327468	Open site	Valid	Grinding Groove : 1		
	Contact	**Recorders**	RPS East Australia Pty Ltd - Echuca Victoria					**Permits**		
45-3-1224	Wyee Creek;	AGD	56	353600	6328900	Open site	Valid	Grinding Groove : -	Axe Grinding Groove	294,101093
	Contact	**Recorders**	ASRSYS					**Permits**		
45-3-3465	RPS MAND STH TBM37	GDA	56	354133	6327740	Open site	Valid	Artefact : 2		
	Contact	**Recorders**	RPS Australia East Pty Ltd - Hamilton,Mrs.Tessa Boer-Mah					**Permits**		
45-3-3528	RPS MAND STH TBM14	GDA	56	354245	6330532	Open site	Valid	Grinding Groove : 1		
	Contact	**Recorders**	RPS East Australia Pty Ltd - Echuca Victoria					**Permits**		
45-3-3315	WC-ST1	GDA	56	355162	6324145	Open site	Valid	Modified Tree (Carved or Scarred) : -		102879,102920
	Contact Searle	**Recorders**	Doctor.Jodie Benton,Mr.Phillip Cameron					**Permits**		
45-3-1309	Pourmalong Creek;	AGD	56	357361	6330396	Open site	Valid	Artefact : -	Open Camp Site	

Report generated by AHIMS Web Service on 12/07/2022 for Samantha Keats for the following area at Datum :GDA, Zone : 56, Eastings : 352567.0 - 362309.0, Northings : 6322504.0 - 6332276.0 with a Buffer of 0 meters.. Number of Aboriginal sites and Aboriginal objects found is 110

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : 37418 NW 4.7km

Client Service ID : 699608

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
	Contact	**Recorders**	ASRSYS					**Permits**		
45-3-4285	Mannering Ck 3	GDA	56	357902	6327572	Open site	Valid	Artefact : -		
	Contact	**Recorders**	Insite Heritage Pty Ltd,Ms.Elizabeth Wyatt					**Permits**	4550	
45-3-4337	Mannering Creek AS1	GDA	56	358875	6328046	Open site	Valid	Artefact : -		
	Contact	**Recorders**	Umwelt (Australia) Pty Limited - Individual users,Miss.Nicola Roche					**Permits**		
45-3-3263	B8, Bushells Ridge	GDA	56	359931	6325584	Open site	Valid	Artefact : 1		
	Contact T Russell	**Recorders**	Michael Therin					**Permits**		
45-7-0232	B2	AGD	56	360937	6325205	Open site	Valid	Modified Tree (Carved or Scarred) : -		100541,100863,101093
	Contact	**Recorders**	Michael Therin					**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 12/07/2022 for Samantha Keats for the following area at Datum :GDA, Zone : 56, Eastings : 352567.0 - 362309.0, Northings : 6322504.0 - 6332276.0 with a Buffer of 0 meters.. Number of Aboriginal sites and Aboriginal objects found is 110

Appendix 2 Test excavation results

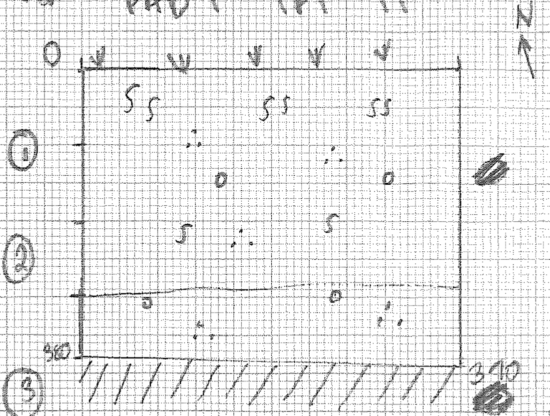
Transect	Test Pit Number	Context Number	StartDepth_mm	EndDepth_mm	Colour (Munsell Code)	Compaction	Texture	Inclusions	PH	Horizon clarity	Disturbance	Notes
PAD 1												
Transect 1	Test pit 1	1	0	300	7.5yr 3/1 very dark grey	Soft	Loamy Silt	Rootlets, charcoal flecks	4.5	Gradual	Large paperbark root	
		2	300	420	7.5yr 4/6 strong brown	Soft	Silty Clay		5	Gradual		Clay content increases with depth
	Test pit 2	1	0	320	7.5 yr 4/2 brown	Hard	Loamy Silt	Rootlets,charcoal, gravel	5	Gradual	Horses	
		2	320	490	10yr 4/2 dark greyish brown	Hard	Loamy Silt	Rootlets, charcoal, gravel	5.5	Gradual		
		3	470	490	7.5 yr 6/2 pinkish grey	Hard	Clay	Charcoal, gravel	6	Gradual		
PAD 2												
Transect 1	Test pit 1	1	0	250	7.5yr 3/1	Moderate	Loamy Sand	Grass roots	6.5	Clear		
		2	250	450	7.5yr 3/1	Moderate	Sandy Clay Loam	Grass roots, clay mottling	6.5	Gradual		
	Test pit 2	1	0	100	10yr 3/1	Moderate	Sandy Loam	Grass roots	5	Clear		
		2	100	400	7.5yr 4/1	Moderae	Sandy Clay Loam	Grass roots, charcoal	5	Clear		
		3	400	500	7.5yr 5/1	Moderate	Sandy Clay		7	Clear		
	Test pit 3	1	0	480	7.5yr 3/1	Moderate	Clayey Loam	Grassroot, clay mottling towards base	5	Clear		
	Test pit 5	1	0	300	7.5yr 2.5/1	Moderate	Clayey Loam	Grass roots	5	Clear		
		2	300	470	7.5yr 4/1	Hard	Loamy Sand	Mottled clay towards base	5	Clear		
Transect 2	Test pit 1	1	0	390	7.5yr 3/2 dark brown	Hard	Clayey Silty Loam	Rootlets charcoal gravel	6.5	Gradual		
		2	390	390	7.5 yr 4/2 brown.	Hard	Clay		7	Gradual		
	Test pit 2	1	0	300	7.5yr 4/1	Moderate	Clayey Loam	Grass roots	5	Gradual		
		2	300	400	10Yyr 5/1	Soft	Clay		7	Gradual	Water table at base	
PAD 3												
Transect 1	Test pit 1	1	0	220	7.5yr 4/2	Moderate	Clayey Silty Loam	Grass roots, Baked clay 5%	6.5	Clear		
		2	220	230	7.5yr 4/6	Hard	Clay		5	Clear		Water table at base
	Test pit 2	1	0	280	7.5yr 3/2	Moderate	Clayey Silty Loam	Grass roots	6.5	Clear		
		2	280	370	7.5yr 4/6	Moderate	Clay		5	Clear		
		1	0	130	7.5yr 4/2	Moderate	Clayey Silty Loam	Grass roots	6.5	Clear		

Transect 2	Test pit 1						Loam	Roots				
		2	130	150	7.5yr 4/6	Moderate	Clay		6	Clear		

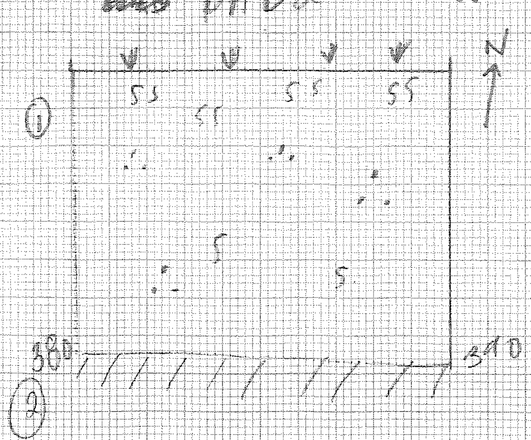
37418 HUE HUE RD

31.8.22

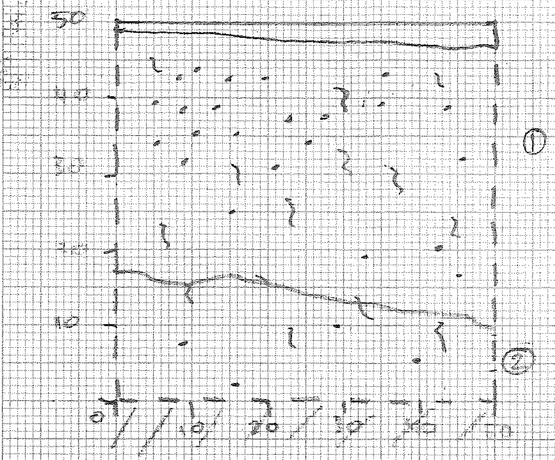
CMG PAD 1 TP1 T1



DAD 2 T2 TP1



CLA PAD 1 T1 TP2



Legend

V = grass

SS = rootlets

∴ = charcoal

//, = unexcavated

O = gravel

1mm Squares

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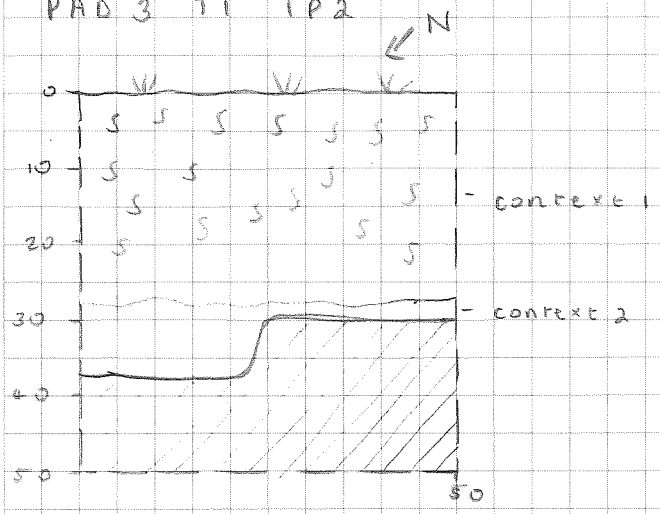
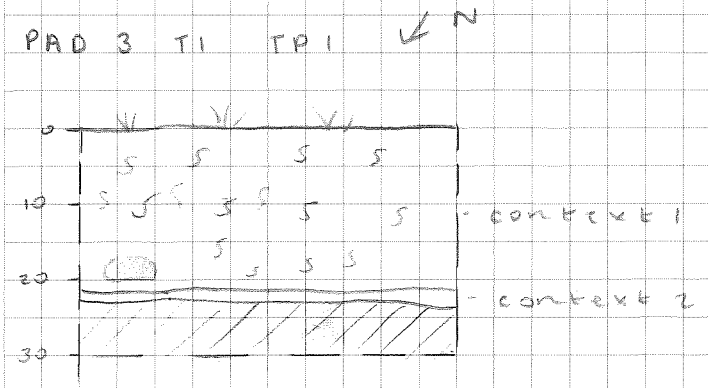
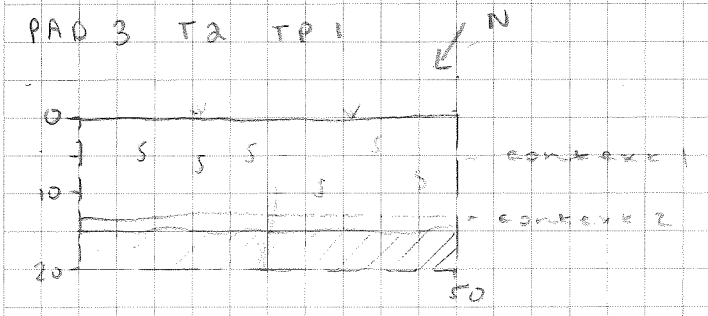
PAD 3 T1 TP2



PAD 3 T1 TP1

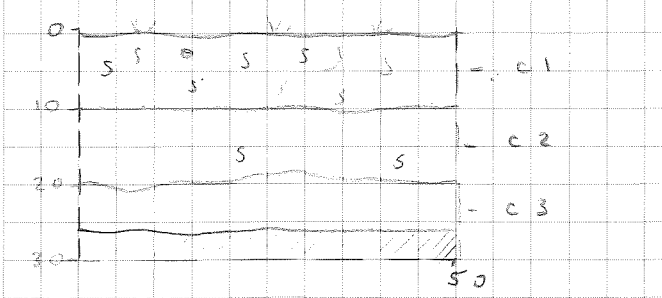


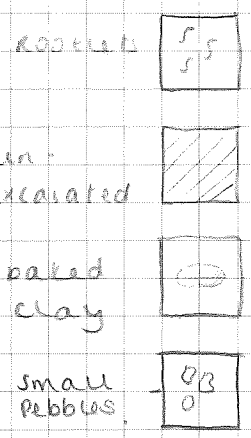
PAD 3 T2 TP1



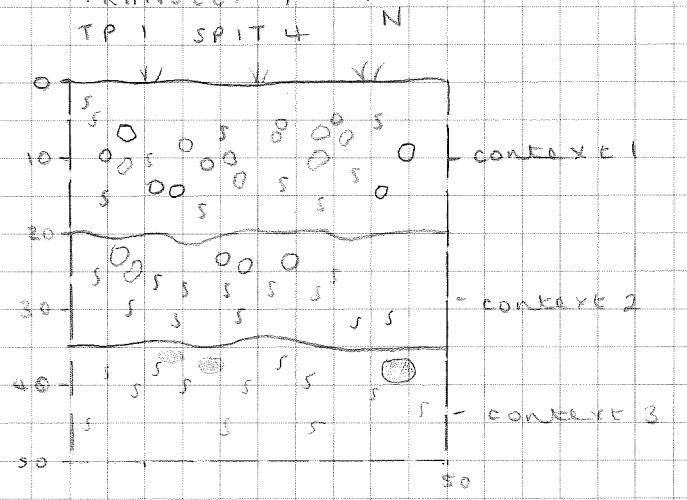
TRANSECT 6 TP1

↳ ADDITIONAL TESTING

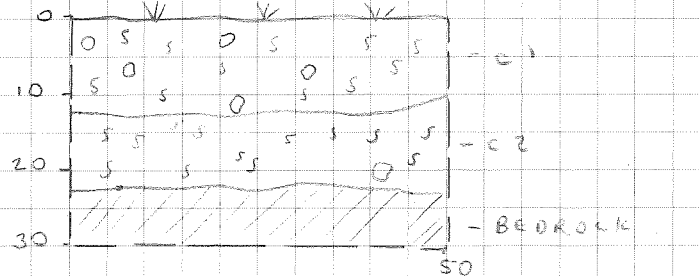




ADDITIONAL TESTING
TRANSECT 7
TP1 SPIT 4



ADDITIONAL TESTING
TRANSECT 7
TEST PIT 2



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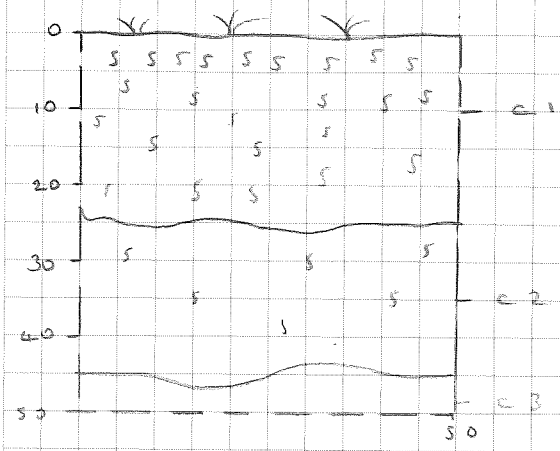
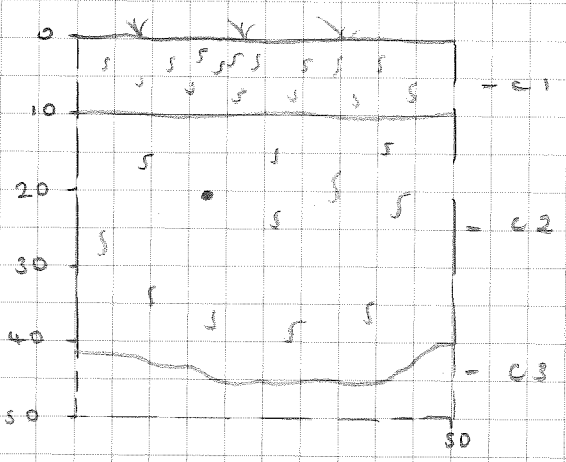
PAD 2 TRANSECT 1
TEST PIT 1 SPIT 9



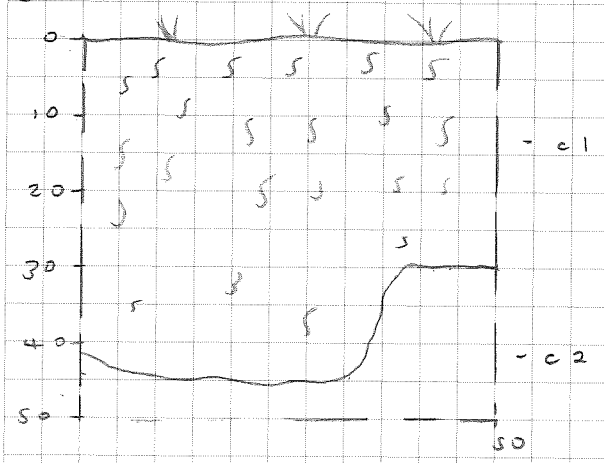
PAD 2 TRANSECT 1
TEST PIT 2 SPIT 5



S - GRASS ROOTS

C - CHARCOAL

PAD 2 TRANSECT 2
TEST PIT 2
SPIT 4



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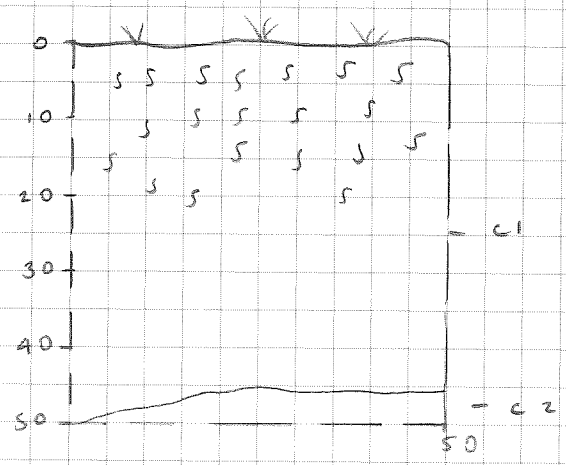
SPIT 5



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TEST PIT 4
SPIT 5