Tallawarra Central Precinct: Archaeological Report

FINAL REPORT

Prepared for Cardno

26 September 2017

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Registered Aboriginal Parties

- Illawarra Local Aboriginal Land Council (ILALC)
- Warra Bingi Nunda Gurri
- Woronora Plateau Gundangara Elders Council
- Darug Land Observations
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- Office of Environement and Heritage (OEH)
- National Native Title Tribunal (NNTT)
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Glossary

ACHAR	Aboriginal Cultural Heritage Assessment Report
AHIMS	Aboriginal Heritage Information Management System
Consultation requirements	*Aboriginal cultural heritage consultation requirements for proponents 2010* (DECCW 2010b)
DA	Determining application
DECCW	Department of Environment, Climate Change and Water (now OEH)
DP	Deposited Plan
EPA	Environment Planning and Assessment
GDA	Geocentric Datum of Australia
GPS	Global Positioning System
GSV	Ground Surface Visibility
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
NPWS	National Parks and Wildlife Service
NSW	New South Wales
NTSCORP	Native Title Services Corporation
OEH	NSW Office of Environment and Heritage
PAD	Potential Archaeological Deposit
Study area	Defined as lot 15 DP 1050255, lot 1 DP 1146409, lot 102 DP 716727, lot 1 DP 551658, lot 1 DP 543285, lot 7 DP 1049520 and lot 8 DP 1049520
RAP	Registered Aboriginal Party
REF	Review of Environmental Factors
REP	Regional Environmental Plan
SEPP	State Environmental Planning Policy
The code	*Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (DECCW 2010a)

Summary

Biosis Pty Ltd was commissioned by Cardno on behalf of Bridgehill Group to undertake an Aboriginal cultural heritage assessment (ACHA) and Archaeological Report (AR) (this report) of a proposed residential development at Tallawarra, Yallah NSW (Central Precinct).

Bridgehill Group have acquired some of the Tallawarra Lands in the Northern and Central Precincts from Energy Australia, and intend to develop new residential communities, a light industrial development, and tourism facilities on those lands. The original concept approval (MP09_0131) was granted on 23 May 2013 by the Planning Assessment Commission as a delegate for the Minister for Planning and Infrastructure for a mixed use development including residential, commercial, industrial and retail development, public open space areas, new recreational facilities, environmental management, conservation areas and riparian corridors at Tallawarra Lands, Yallah.

Bridgehill Group, intends to modify the existing concept approval for the Central Precinct at Tallawarra, Yallah (MP 09_0131 MOD 1) under Part 75W of the *Environmental Planning and Assessment Act 1979*.

This AR covers the Central Precinct (the study area), and aims to determine whether the proposed modification will have any additional impacts on Aboriginal cultural values. The purpose of this assessment is to support an EIS application to modify the existing concept approval for the Central Precinct (MP 09_0131 MOD 1) to allow an increased residential lot yield.

The study area is located in lot 15 DP 1050255, lot 1 DP 1146409, lot 102 DP 716727, lot 1 DP 551658, lot 1 DP 543285, lot 7 DP 1049520 and lot 8 DP 1049520 (Figure 1and Figure 2). It is approximately 14 kilometres south west of the Wollongong central business district (CBD).

This report has responded to Section 6.10.1 Aboriginal Cultural Heritage of the *Tallawarra Lands, Yallah: Request for Secretary's Environmental Assessment Requirements* (Urbis 2016) to:

- Confirm the location of archaeological sites relative to the proposed expanded areas.
- Consultation with relevant stakeholders will be carried out prior to preparation of the EIS.
- Identifying the nature and extent of impacts on Aboriginal and cultural heritage values across the project area; and
- Provide the actions that will be taken to avoid or mitigate impacts or compensate to prevent unavoidable or mitigate impacts of the project or Aboriginal cultural heritage values.

SEARs Item	Response
12. Aboriginal Cultural Heritage **Aboriginal Cultural Heritage Assessment in accordance with *the Guide to investigating Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (DECCW 2011) and *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (DECCW)**	This report has been conducted in accordance with the *Guide to Investigating Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (OEH 2011). This report supports the Aboriginal cultural heritage assessment, which has been conducted in accordance with the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (DECCW 2010a). Consultation with Registered Aboriginal Parties is currently underway.

There are 86 Aboriginal cultural heritage sites registered with the Aboriginal Heritage Information Management System (AHIMS) register in the vicinity of the study area, four of which are located within the study area; TLPD AFT 7 (AHIMS 52-5-0613), TLPD AFT 8 (AHIMS 52-5-0614), TLPD AFT 9 (AHIMS 52-5-0615), and Tallawarra Pipeline PAD 3 (AHIMS 52-5-0523).

The survey was conducted on 29 June 2017. The overall effectiveness of the survey for examining the ground for Aboriginal sites was deemed low. This was attributed to vegetation cover restricting ground surface visibility combined with a low amount of exposures.

No previously unrecorded Aboriginal cultural heritage sites were identified during the field survey.

Based on the site survey and previous assessments the drainage line that runs through the study area and into Ducks Creek was assessed as having high archaeological potential to contain further subsurface cultural deposits, as their proximity to useful resources and fresh water made them valuable occupation areas. The ridgeline in the study area was assessed as having moderate potential as previous research had determined that the landform is likely to contain low density or isolated artefacts that were discarded as Aboriginal people travelled along them.

This assessment has concluded that impacts to site Tallawarra Pipeline PAD 3 (AHIMS 52-5-0523) cannot be avoided by the proposed development. The proposed modification will therefore have an additional impact on Aboriginal cultural heritage.

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:
  - Ethos of the Australia International Council on Monuments and Sites (ICOMOS) Burra Charter
  - The *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (DECCW 2010b) (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: Further archaeological assessment is required in areas of moderate and high archaeological potential

Areas identified as having high and moderate archaeological potential should be avoided wherever possible (Figure 10). If impact to these areas cannot be avoided subsurface investigations (test excavations) will be required prior to the commencement of works as a condition of the DA or concept approval. Test excavations should be conducted in accordance with the *Code of Practice for archaeological investigation for Aboriginal objects in NSW* (DECCW 2010b) and *Aboriginal cultural heritage consultation requirements for proponents in New South Wales* (DECCW 2010a).

Recommendation 2: Further archaeological assessment is required at Tallawarra Pipeline PAD 3 (AHIMS 52-5-0523)

If impacts to Tallawarra Pipeline PAD 3 (AHIMS 52-5-0523) cannot be avoided, subsurface investigations (test excavations) will be required prior to the commencement of works as a condition of the DA or concept approval. Test excavations should be conducted in accordance with the *Code of Practice for archaeological investigation for Aboriginal objects in NSW* (DECCW 2010b) and *Aboriginal cultural heritage consultation requirements for proponents in New South Wales* (DECCW 2010a).

Recommendation 3: Conservation of Fig Tree associated with TLPD AFT 9 (AHIMS 52-5-0615)

If possible the Fig Tree associated with TLPD AFT 9 (AHIMS 52-5-0615) should be conserved and incorporated into the modification of the concept approval.

Recommendation 4: No further archaeological assessment is required in areas of low archaeological potential

No further archaeological work is required in areas identified as having low archaeological potential except in the event that unexpected Aboriginal sites, objects or human remains are unearthed during development (refer to Recommendations 8 and 9 below).

Recommendation 5: Fencing of AHIMS sites

AHIMS sites or PAD areas located within 30 metres of the area of proposed works should be clearly marked and fenced in order to avoid unintentional impacts during construction.

Recommendation 6: Aboriginal cultural heritage induction for workers and contractors

The locations of each AHIMS site and PAD area located within the Tallawarra Lands development should be clearly mapped. Workers and contactors working at, or visiting the site should be made aware of the location of all AHIMS sites and PAD areas within the Tallawarra Lands development through an Aboriginal cultural heritage induction.

Recommendation 7: Application for an Aboriginal heritage impact permit (AHIP)

Should the Development Application (DA) be approved, it is recommended that Cardno apply to OEH for an AHIP to destroy the listed Aboriginal sites within the study area which are currently protected under the NSW *National Parks and Wildlife Act 1974*. **The AHIP should be for a term of ten (10) years.** The sites that will be impacted by the proposed works are as follows

- TLPD AFT 7 (AHIMS 52-5-0613)
- TLPD AFT 8 (AHIMS 52-5-0614)
- TLPD AFT 9 (AHIMS 52-5-0615)
- Tallawarra Pipeline PAD 3 (AHIMS 52-5-0523

For information about AHIPs and their preparation, see below.

Advice preparing AHIPs

An AHIP is required for any activities likely to have an impact on Aboriginal objects or Places or cause land to be disturbed for the purposes of discovering an Aboriginal object. The Office of Environment and Heritage (OEH) issues AHIPs under Part 6 of *the National Parks and Wildlife Act 1974* (NPW Act).

AHIPs should be prepared by a qualified archaeologist and lodged with the OEH. Once the application is lodged processing time can take between 8-12 weeks. It should be noted that there will be an application fee levied by the OEH for the processing of AHIPs, which is dependent on the estimated total cost of the development project.

Recommendation 7: Discovery of Unanticipated Aboriginal Objects

All Aboriginal objects and Places are protected under the *NSW National Parks and Wildlife Act 1974*. It is an offence to knowingly disturb an Aboriginal site without a consent permit issued by the Office of Environment and Heritage (OEH). Should any 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 the OEH and Aboriginal stakeholders.

Recommendation 9: Discovery of Aboriginal Ancestral Remains

Aboriginal ancestral remains may be found in a variety of landscapes in NSW, including middens and sandy or soft sedimentary soils. 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 the NSW Police and OEH's 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 to the OEH.

Recommendation 10: Continued consultation with the registered Aboriginal stakeholders

As per the *Aboriginal cultural heritage consultation requirements for proponents 2010* (DECCW 2010a), it is recommended that the proponent provides a copy of this report to the Aboriginal stakeholders and considers all comments received. The proponent should continue to inform these groups about the management of Aboriginal cultural heritage sites within the study area throughout the life of the project.

1 Introduction

1.1 Project background

Biosis Pty Ltd was commissioned by Cardno to undertake an Aboriginal cultural heritage assessment of a proposed residential development of the Tallawarra Central Precinct, Yallah NSW. This assessment will support an application to modify the existing concept approval for the Central Precinct (MP 09_0131 MOD 1) to allow an increased residential lot yield.

The original concept approval (MP09_0131) was granted on 23 May 2013 by the Planning Assessment Commission as a delegate for the Minister for Planning and Infrastructure for a mixed use development including residential, commercial, industrial and retail development, public open space areas, new recreational facilities, environmental management, conservation areas and riparian corridors at Tallawarra Lands, Yallah.

A previous Aboriginal archaeological assessment for the Tallawarra Lands Part 3A Concept Plan (MP 09_0131) was conducted by Biosis in 2010. The previous assessment consisted of an Aboriginal archaeological survey, Aboriginal community consultation, and Aboriginal archaeological test excavations (Biosis 2010). An impact assessment conducted as part of the 2010 assessment concluded that three Aboriginal archaeological sites TLPD AFT-7 (AHIMS 52-5-0613), TLPD AFT-8 (AHIMS 52-5-0614), and TLPD AFT-9 (AHIMS 52-5-0615), along with a Fig Tree identified as having cultural significance; would be impacted on by the proposed development. Site Tallawara Pipeline PAD3 (AHIMS 52-5-0523) is also located within the study area however the previous assessment determined that it would not be impacted on.

All AHIMS sites located within the study area were assessed as having high cultural significance. TLPD AFT-7 (AHIMS 52-5-0613), TLPD AFT-8 (AHIMS 52-5-0614), and TLPD AFT-9 (AHIMS 52-5-0615) were assessed as having low archaeological significance, while Tallawara Pipeline PAD3 (AHIMS 52-5-0523) was determined to have unknown archaeological significance.

The majority of the Central Precinct study area was assessed as having moderate subsurface archaeological potential, with the northern section of the study area assessed as having low subsurface archaeological potential based on the results of the archaeological test excavations, and predictive modelling. The area along the first order tributary to Ducks Creek, located within the centre of the study area was assessed as having high subsurface archaeological potential. Further assessment in the form of additional archaeological test excavations in areas of high and moderate subsurface archaeological potential were recommended prior to development in order to establish the significance and extent of the archaeological resource.

The purpose of this assessment is to determine if the proposed modification will impact on any additional areas of archaeological potential or Aboriginal sites or objects; in particular Tallawara Pipeline PAD3 (AHIMS 52-5-0523). This investigation has been carried out under Part 6 of the *National Parks and Wildlife Act 1974* (NPW Act). It has been undertaken in accordance with the *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW 2010b) ('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.

1.2 Study area

The study area is located within the Tallawarra Central Precinct, Yallah NSW (Figure 1). It encompasses lot 15 DP 1050255, lot 1 DP 1146409, lot 102 DP 716727, lot 1 DP 551658, lot 1 DP 543285, lot 7 DP 1049520 and lot 8 DP 1049520 and is approximately 14 kilometres south west of Wollongong central business district (CBD) (Figure 2). The Central Precinct area covers 73.2 hectares of private access land.

The study area is within the:

- Wollongong Local Government Area (LGA).
- Parish of Calderwood
- County of Camden

The study area is bounded by Yallah Bay Road to the south, Princes Motorway to the west the suburb of Dapto to the north, and rural land to the east (Figure 2).

1.3 Planning approvals

The proposed modification will be assessed against under Part 3A section 75W of the *Environmental Planning and Assessment Act 1979* NSW (EP&A Act). Other relevant legislation and planning instruments that will inform this assessment include:

- Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999.*
- NSW *National Parks and Wildlife Act 1974* (NPW Act).
- NSW *National Parks and Wildlife Amendment Act 2010.*
- Infrastructure State Environmental Planning Policy 2007.
- Wollongong Development Control Plan 2009.

1.4 Objectives of the investigation

The objectives of the investigation can be summarised as follows:

- Confirm the location of archaeological sites (particularly Tallawara Pipeline PAD3 (AHIMS 52-5-0523) relative to the proposed expanded areas.
- Consult with relevant Aboriginal stakeholders.
- 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
Taryn Gooley **BA /Sci (Hons) Archaeology**	Taryn is a consultant archaeologist with seven years of experience across south eastern NSW and Western Australia. Taryn has a particular interest in Aboriginal archaeology of North Western NSW, and the Hunter Valley and Newcastle regions. Taryn has experience in the successful completion of Aboriginal Cultural Heritage assessments, archaeological surveys, test excavations, and salvage excavations, as well as Aboriginal community consultation. She is also accomplished in obtaining approvals under the NSW National Parks and Wildlife Act 1974 and NSW Heritage Act 1977.	• Project Manager
Mathew Smith **BA/BSc (Hons) Archaeology**	Mathew is a field archaeologist with Biosis Wollongong office. Mathew has over one year of experience as an archaeologist, and specialises in lithics analysis. In addition to this, Mathew has well developed skills in archaeological survey and test excavation, as well as Aboriginal community consultation and background research.	• Background research • Aboriginal groups consultation • Report writing
Samantha Keats **BA**	Samantha is a field archaeologist with Biosis Wollongong office. Samantha has over one year of experience as an archaeologist, with a particular research focus on rock art assemblages and ochre in the north-west Kimberley region of Australia. Samantha has experience in conducting desktop assessments, archaeological survey and Aboriginal and historical excavation as well as consulting with Traditional Owners. She has participated in a number of European historical excavations and monitoring programs in NSW and has authored several Statement of Heritage Impact reports and Heritage Assessments.	• Report writing

Name and qualifications	Experience summary	Project role
Ashleigh Pritchard **Dip. GIS.**	Ashleigh has eight years' experience in the field of mapping and has contributed to over 600 consultant reports in both the Natural and Cultural heritage teams across NSW, Victoria and Queensland for a diverse range of clients. Ashleigh has utilised the functionality of GIS to undertake spatial analysis projects such as calculations of habitat loss as well as geo-referencing and digitising. She has extensive experience in spatial data management and map production for large, ongoing impact monitoring projects in NSW. More recently Ashleigh has used spatial modelling to detect cliff lines with potential to support Aboriginal shelter sites and areas of upland swamp potential in the Sydney Catchment Authority special areas using LiDAR data.	• GIS/Mapping
Alexander Beben **Principal Archaeologist** **BA (Hons), MA**	Alexander is Biosis' Principal Archaeologist with 12 years' experience in NSW. Alexander has a detailed knowledge the Aboriginal and non-Aboriginal heritage requirements of the *Environmental Planning & Assessment Act 1979, NSW Heritage Act 1977* and *NSW Parks and Wildlife Act 1974.* Alexander is experienced in undertaking Aboriginal and non-Aboriginal heritage projects, especially archaeological investigation of known or potential archaeological deposits and implementing EIS approval requirements relating to the salvage of known sites. Alex has authored in excess of 150 heritage reports including heritage assessments, archaeological reports, AHIP applications, salvage reports and management plans. Alexander is adept at undertaking consultation with Aboriginal stakeholders, particularly coordinating their involvement in archaeological surveys and excavations Recently, Alex has focused on non-Aboriginal heritage projects and approvals and has managed some of the largest heritage projects in NSW, including an impressive portfolio of Roads and Maritime projects.	• Quality assurance

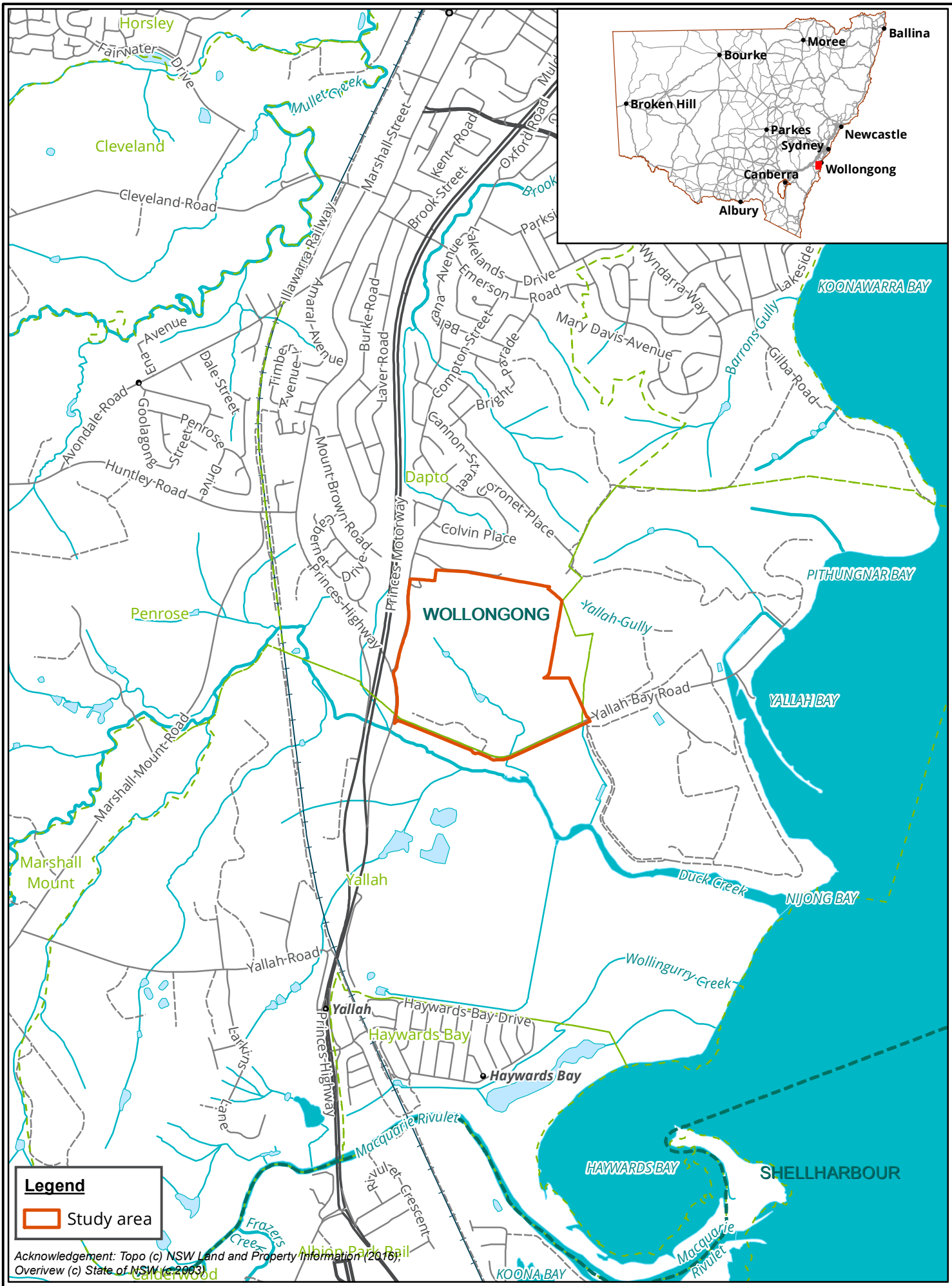

Figure 1: Location of the study area in a regional context

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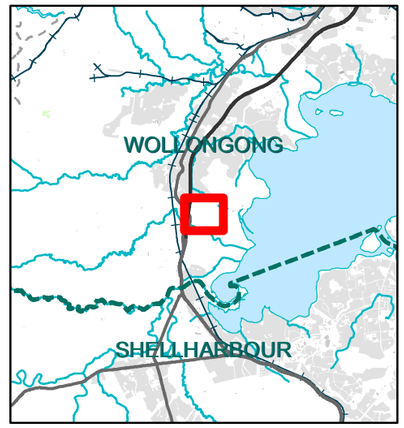

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Study area

Figure 2: Study area detail

0 40 80 120 160 200

Metres
Scale: 1:4,000 @ A3
Coordinate System: GDA 1994 MGA Zone 56

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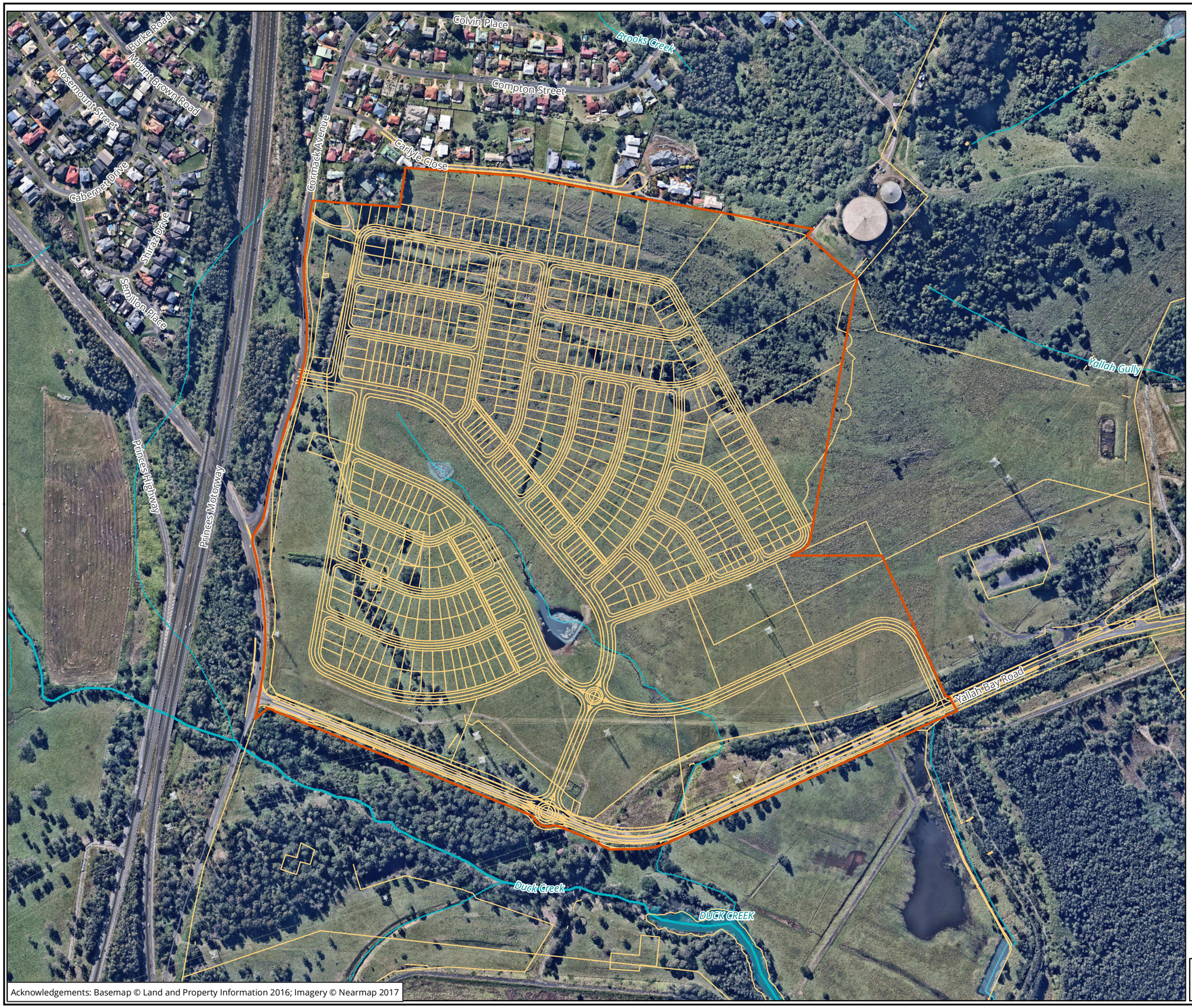
2 Proposed development

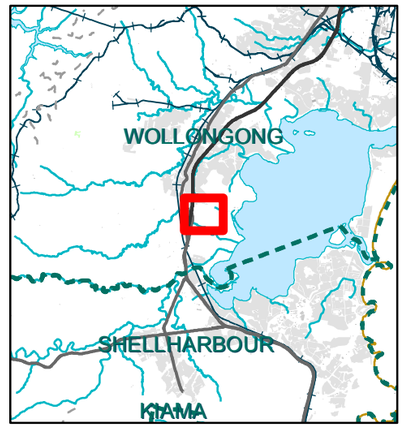
The Tallawarra Central Precinct comprises lot 15 DP 1050255, lot 1 DP 1146409, lot 102 DP 716727, lot 1 DP 551658, lot 1 DP 543285, lot 7 DP 1049520 and lot 8 DP 1049520, with an area of 73.2 hectares (Figure 3). The development of the Central Precinct will comprise commercial, retail, industrial, open space and associated civil works. The modification to the concept approval seeks to increase the footprint and residential yield for the Central Precinct from 350 lots to 588 lots. Currently approved components of the concept plan for the Central Precinct include:

- Approximately 340 residential lots (27 hectares) and 10 large residential lots (11 hectares) to be modified to 588 residential lots.
- A Neighbourhood Centre (4.25 hectares), incorporating a small supermarket, speciality shops, medical centre and child-care centre
- A tourism (2.5 hectares) use on the Lake foreshore headland at the eastern end of the precinct
- An open space, incorporating the residential sports ground and Duck Creek riparian lands (109 hectares environmental and recreational)
- Industrial and light industrial uses (54 hectares)

The following amendments are proposed to the Concept Plan for the Central Precinct:

- Expand the R2 Zone (for low density residential development) east, into the E3 Environmental Management zone.
- Expand the R2 zone (for low density residential) north into the R5 (large lot residential) zone.
- Minor alterations to R2 zone (for low density residential development) into E3 Environmental Management Zone.
- The composition of lots has been altered from the Concept Plan, with a new indicative layout that includes lots down to 300m² and 12.5 metres frontages, where suited to the topography of the site.





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- Study area
- Proposed development

Figure 3: Proposed development

0 50 100 150 200 250

Metres

Scale: 1:5,000 @ A3

Coordinate System: GDA 1994 MGA Zone 56

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3 Desktop assessment

The desktop assessment involves researching and reviewing existing archaeological studies and reports relevant to the study area and Lake Illawarra 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 of Practice for the Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW 2010b).

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 Geology, Topography and hydrology

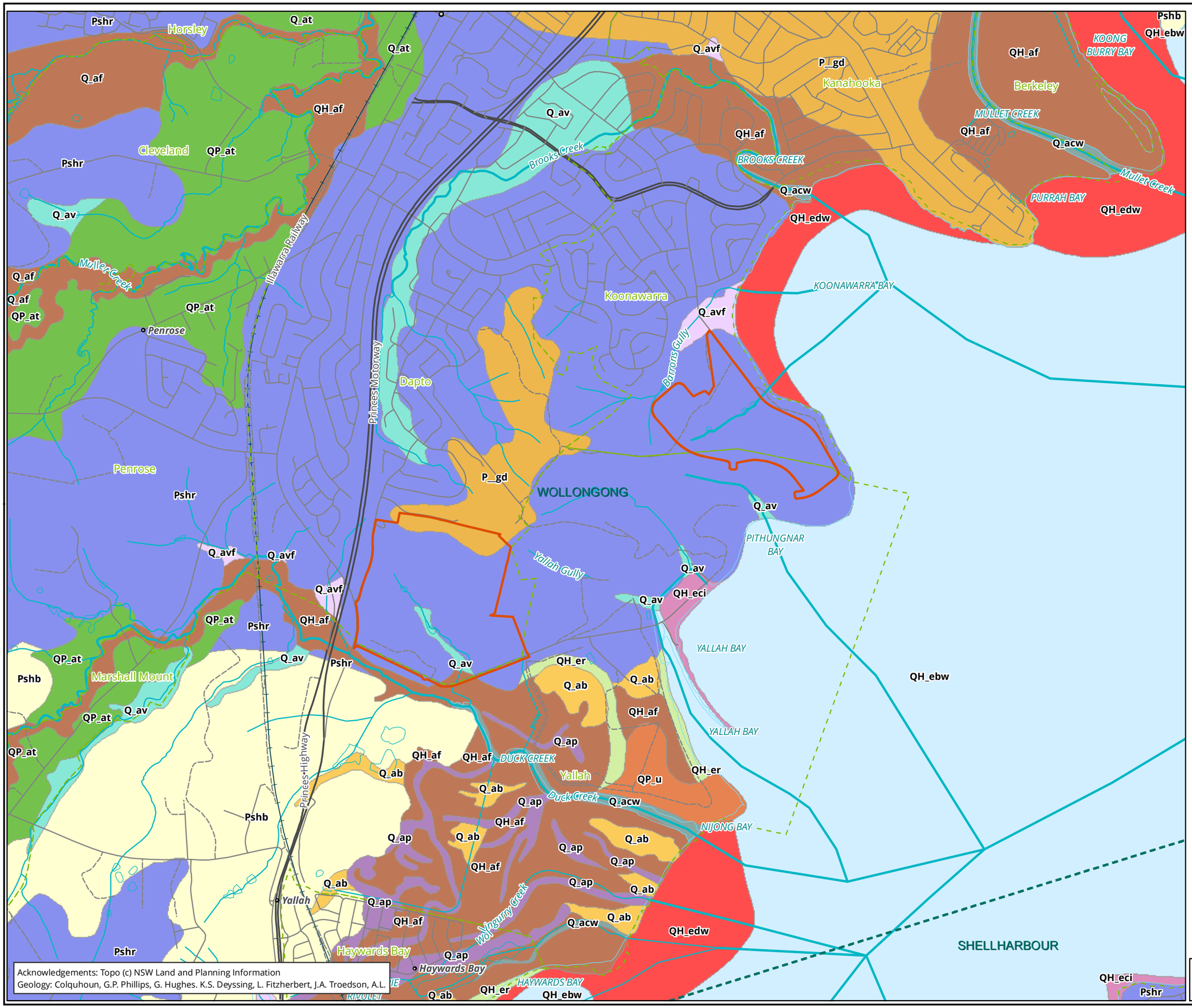
The Illawarra region forms part of the Sydney Basin; a geological basin filled with near horizontal sandstones and shales of Permian to Triassic age overlying older basement rocks of the Lachlan Fold Belt. The Illawarra subregion of the Sydney Basin is characterised by Permian siltstones, shale, sandstones and interbedded volcanics on and below the coastal escarpment. The geology of the region provides useful stone resources for toolmaking, including volcanic rocks useful for the manufacture of edge ground axes (Figure 4).

The study area is situated on the Coastal Plain on the edge of Lake Illawarra and the Escarpment (Figure 6). This physiographic unit has formed from the gradual recession westward of the Plateau (Bowman 1971). The Coastal Plain is characterised as a mosaic of foothills, ridges, spurs, hillocks and floodplains with slopes varying from very gently inclined to steep with the occasional low cliff. It is dissected by easterly flowing streams at intervals that become more frequent towards the north (Fuller 1982: 18). The Coastal Plain is widest at the points where the Macquarie Rivulet has entrenched into the Plateau at Macquarie Pass and where other waterways that provide the catchment area of Lake Illawarra carved into the Escarpment (Bowman 1971).

The Central Precinct is located approximately 750 metres inland from the shore of Lake Illawarra. Lake Illawarra was formed from the drowning of the Macquarie Rivulet valley during the raising of Holocene sea levels (6-7,000 years ago); the estuary was subsequently formed behind the large sand barrier that now forms the Windang Peninsula. Lake Illawarra is the largest estuarine lagoon on the south coast of NSW, covering an area of 33 square kilometres and extending over 9 kilometres in length and 5 kilometres in width. It receives salt water from the Pacific Ocean and fresh water from the Illawarra Escarpment (Roy 1984). Lake Illawarra is classified as an early Intermediate Barrier Estuary or an estuarine lagoon. Barrier estuaries are characterised by 'narrow elongated entrance channels with broad tidal and back barrier sand flats' (Roy 1984: 5).

One water stream also passes through the study area. This stream is a non-perennial tributary of Ducks Creek, and so would not have contained water all year round.

Lake Illawarra, Duck Creek, and the first order creek running through the study area would have provided abundant food resources to Aboriginal groups in the area. It is likely that the proximity to water and food will have resulted in the presence of Aboriginal sites, such as middens, in the vicinity of the study area.



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Geology: Colquhoun, G.P. Phillips, G. Hughes. K.S. Deyssing, L. Fitzherbert, J.A. Troedson, A.L.

Legend

Study area

Geological units

- Alluvial backswamp deposits
- Alluvial channel deposits- subaqueous
- Alluvial fan deposits
- Alluvial floodplain deposits
- Alluvial palaeochannel deposits
- Alluvial terrace deposits
- Alluvial valley deposits
- Berry Siltstone
- Broughton Formation
- Dapto Latite Member
- Estuarine basin and bay (subaqueous)
- Estuarine in-channel bar and beach deposits
- Estuarine shoreline ridge and dune
- Estuarine- fluvial delta front (subaqueous)
- Pleistocene undifferentiated regolith

Figure 4: Geology within the study area

0 200 400 600 800 1,000

Metres

Scale: 1:20,000 @ A3

Coordinate System: GDA 1994 MGA Zone 55

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3.1.2 Soil landscapes

Soil landscapes have distinct morphological and topological characteristics that result in specific archaeological potential. Because they are defined by a combination of soils, topography, vegetation and weathering conditions, soil landscapes are essentially terrain units that provide a useful way to summarise archaeological potential and exposure. The study area contains one erosional soil landscape called the Shellharbour soil landscape, one residual landscape called the Gwynneville soil landscape, and one swamp soil landscape called the Fairy Meadow soil landscape (Figure 5).

Erosional soil landscapes comprise soils that are derived from the erosive action of running water, primarily well-defined streams that have the ability to transport their sediment load. Soils may be either absent, derived from water-washed parent materials, or derived from *in situ* weathered bedrock. Residual soil landscapes are characterised by areas where soils are derived from the long-term, *in situ* weathering of parent materials. Examples of these types of soil landscapes are typically level to undulating elevated landforms, flats and plains, with poorly defined drainage lines. Swamp soil landscapes are dominated by ground surfaces and soils that are at least seasonally wet, with water tables frequently close to the surface. Soil parent material includes large amounts of accumulated decayed organic matter.

The characteristics of the Shellharbour soil landscape are summarised in Table 2.

Table 2 Shellharbour soil landscape characteristics (Hazelton 1992: 58-60)

Soil Landscape	Topography	Soils
Shellharbour	Rolling low hills with long side slopes and broad drainage lines. Relief 30-50 metres. Slopes <20% incline.	Crests and upper slopes: Hard setting black rich clays overlying <100 cm of brown strongly pedal heavy clay. Mid slopes: Up to 20 cm of brownish black sandy loam overlies <50 cm of strongly pedal reddish brown sandy clay. 50 cm of mottled reddish brown sandy clay overlies <50 cm of brown strongly pedal heavy clay. Foot slopes and drainage plains: Up to 40 cm of reddish brown sandy clay overlies >50 cm of strongly pedal brown heavy clay.

The Shellharbour soil landscape has a high to very high erodibility rating and would therefore be susceptible to frequent soil movement (Hazelton 1992: 58-60). This would result in poor preservation of archaeological material at shallow depths but would potentially lead to exposures of any deeper archaeological deposits were topsoil has eroded away.

The Gwynneville soil landscape has the following characteristics (Table 3):

Table 3 Gwynneville soil landscape characteristics (Hazelton and Tille 1990: 38-40)

Soil Landscape	Topography	Soils
Gwynneville	Undulating to steep hills with broad to moderate ridges, steeply inclined foot slopes, and isolated rises on the coastal plain. Local relief from 10-70 m, slopes 3-25%.	Ridges: 10-30 cm of friable brown loam overlying bedrock. Upper and mid slopes: 10-30 cm of friable brown loam overlies 100 cm brown pedal clay. Lower slopes and localised position on mid

Soil Landscape	Topography	Soils
		slopes: 20-50 centimetres of brown pedal clay overlies brown pedal clay or bedrock.

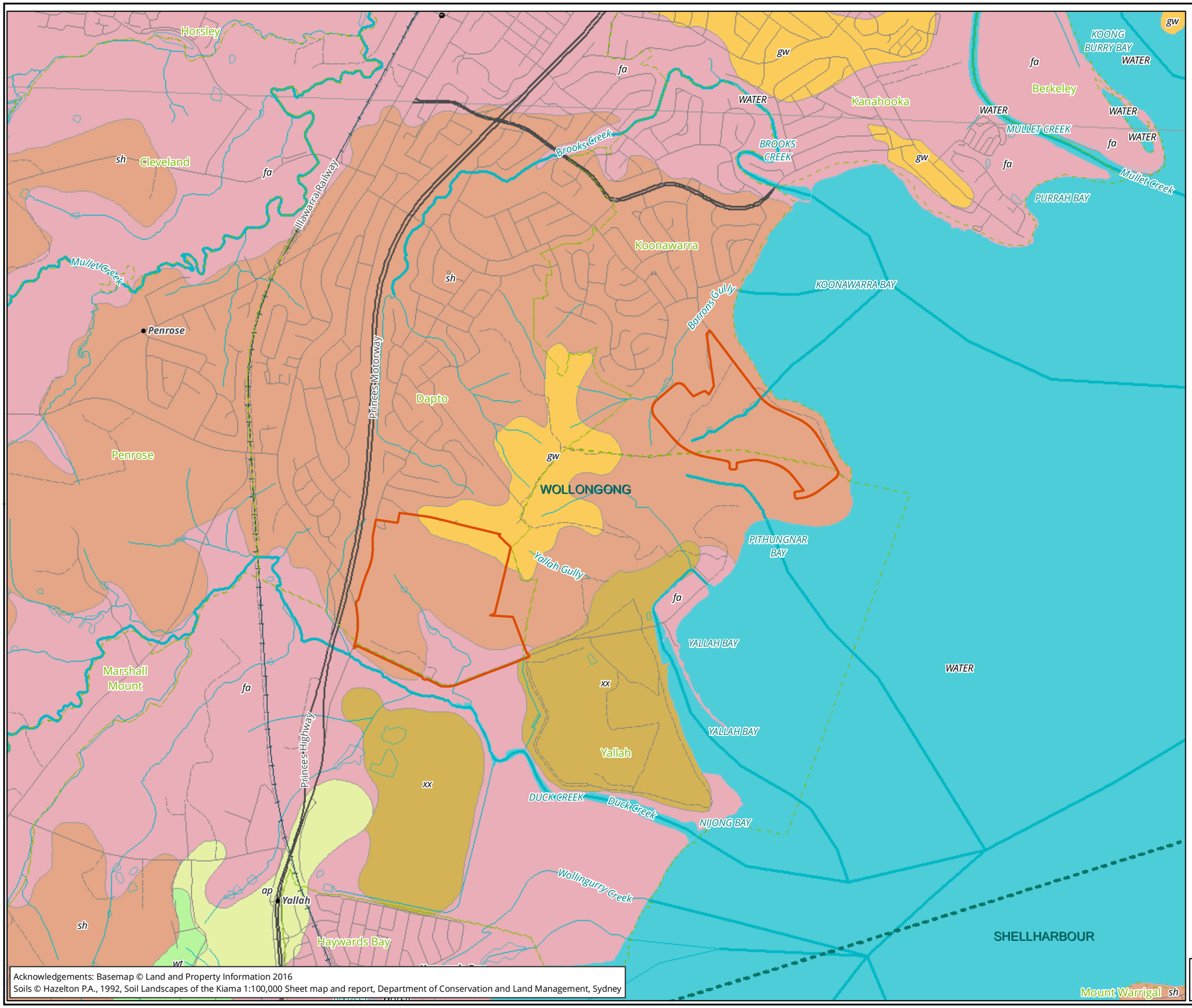
The Gwynneville soil landscapes has a moderate soil erodability and would be susceptible to some soil movement as a result. The erodability combined with the shallow loam soils suggests that the preservation of archaeological material is likely to be poor throughout the study area.

The Fairy meadow soil landscape has the following characteristics (Table 4):

Table 4 Fairy meadow soil landscape characteristics (Hazelton and Tille 1990, pp. 100-102)

Soil Landscape	Topography	Soils
Fairy Meadow	Gently undulating alluvial plains including floodplains, valley flats, and terraces. Slopes greater than 5% and relief greater than 20 m.	Upper floodplains and terraces: Up to 20 cm of sandy loam overlying up to 40 cm of sand. Valley flats: Soils are highly variable but a typical soil consists of up to 40 cm of sandy clay loam overlying 50 cm of light clay and 80 cm of heavy clay.

The Fairy meadow soil landscape has a low soil erodability and would therefore preserve any potential sub-surface deposits present; however it is susceptible to flooding and seasonal waterlogging so sites are likely to be present only on raised landforms in this soil landscape (Hazelton and Tille 1990: 100-102).



Acknowledgements: Basemap © Land and Property Information 2016
Soils © Hazelton P.A., 1992, Soil Landscapes of the Kiama 1:100,000 Sheet map and report, Department of Conservation and Land Management, Sydney

Legend

Study area

Soil landscape units (1:100,000)

- ALBION PARK
- DISTURBED TERRAIN
- FAIRY MEADOW
- GWYNNEVILLE
- SHELLHARBOUR
- WATER
- WATTAMOLLA ROAD

Figure 5: 1:100,000 Soil landscapes within the study area

0 200 400 600 800 1,000

Metres

Scale: 1:20,000 @ A3

Coordinate System: GDA 1994 MGA Zone 55

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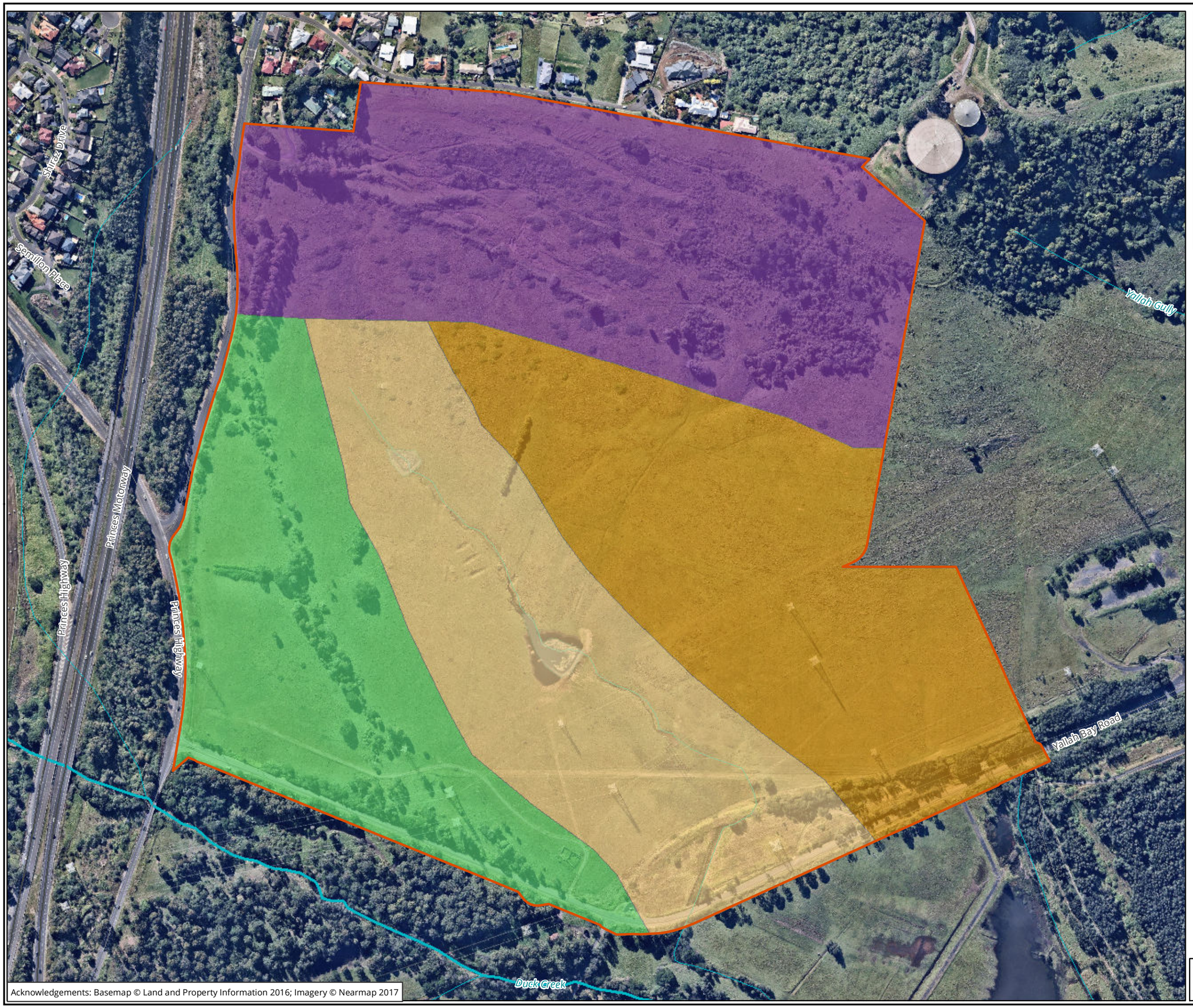

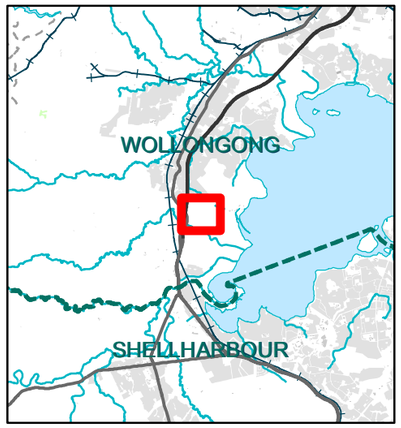

Legend

- Study area

Landforms

- Crest
- Drainage line
- Hill slope
- Spur line

Figure 6: Landforms within the study area

0 40 80 120 160 200

Metres
Scale: 1:4,000 @ A3
Coordinate System: GDA 1994 MGA Zone 56

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3.1.3 Landscape resources

The Coastal Plain of the Illawarra region provides a number of resources used by Aboriginal inhabitants. The geology of the region provides an abundant supply of raw materials. Quartz is the main stone raw-material type suitable for Aboriginal tool manufacture that is likely to occur in the vicinity of the study area in any abundance. This would have been available locally and also from trading with other groups (Donlon and Sefton 1988: 23). Igneous material would have come from the south of the study area in areas like Gerringong (Donlon and Sefton 1988: 55) due to its volcanic nature. Some of the other fined grain siliceous material may have come from the Cumberland Plain. Silcrete cobbles are known to have occurred along the Cumberland Plain (McDonald 1992), to the north of the study area. Elsewhere on the Plain, the potential raw materials for stone artefact making include silicified wood, tuff, mudstone, quartz, quartzite and basalt. River gravels and cobbles containing silcrete, chert, and other fine grained volcanic rocks were also used (Attenbrow 2010). While previous archaeological work within the region has not identified any specific stone sources, the presence of the volcanic Dapto Latite Member in the region may have provided a suitable source of raw material, providing lithic material for stone axes. Resources would have been accessible in the outcrops of siltstone, shale and tuffaceous sandstones of the Berry Siltstone formation.

Aerial imagery and vegetation mapping undertaken by the National parks and Wildlife Service (NPWS) shows that the study area has been cleared of native vegetation; however, native vegetation communities in the vicinity of the study area and around Lake Illawarra would have been comparable to vegetation found in the study area prior to clearing. These vegetation communities include (NPWS 2002):

- Lowland Woollybutt – Melaleuca Forest located on flat low-lying Shoalhaven Group sediments at elevations between 10 and 35 metres above sea level. It is characterised by the presence of woolybutt (*Eucalyptus longifolia*), stringybark (*E. globoidea/E. eugenioides*), and honey myrtle (*Melaleuca decora).*
- Coastal Swamp Oak Forest occuring in estuarine environment that include low-lying areas of coastal floodplain and the finges of lakes and lagoons. Common and abundant species that occur include swamp oak (Casuarine glauca) , Common Reed (Phragmites australis), and various sedges

A number of these plant species would have been used by Aboriginal groups to make various wooden implements. Wood from the Swamp oak was used to make tools such as nulla nullas, while the bark was removed and made into canoe hulls (Robinson 1991:152).

Local Aboriginal groups would have had access to an abundant range of marine, terrestrial and avian species present in the coastal resource zone which would have provided a variety of uses. Marine animals such as cockles, lobster and periwinkles were eaten (Wesson 2009). Abalone and stingrays were also used to make fish hooks and tools in addition to their use as a food source (Wesson 2009). Terrestrial species on the coastal plain, such as kangaroos, possums and wombats would have been exploited for food and to make cloaks, and tools (Attenbrow 2010). Avian species were used as a food source, and in the case of the pelican and black duck were often totem animals for Aboriginal groups (Wesson 2009).

3.1.4 Land use history

Within the study area, soil disturbance is associated with historic pastoral land-use practices and recreational usage. The entire area between Koonawarra and Yallah bays have been subjected to extensive grazing and agricultural practices from 1880's onwards (McDonald 1976). As well as vegetation clearing for pasture and agriculture, other land disturbances within the property include construction of the high voltage transmission lines and towers; recreational usage resulting in impact trails particularly by trail bikes and pedestrian traffic in the low lying areas along the foreshore.

Although these past land activities caused disturbances, they may have impacted only the surface contexts of any existing Aboriginal archaeological sites; it is unlikely that they would have destroyed sites. Clearing of the

land would have most likely removed any native culturally modified trees that were originally present in the study area.

3.2 Previous archaeological work

The majority of south coast sites date to the last 6,000 years when the sea-level stabilised following the last ice age. Prior to this, sea-levels were lower and the coast-line was located approximately 14 kilometres to the east of its current position. Coastal sites older than 6,000 years are rare, as most would have been inundated by the rising sea. Pleistocene-aged Aboriginal sites on the south coast include Bass Point, dated at 17,010+/-650 BP (ANU-536) (Bowdler 1976: 254) and Burrill Lake rock shelter, dated at 20,830+/-810 BP (ANU-138) (Lampert 1971:122). Test excavations undertaken at the Wollingurry Point midden dated the site to 3360 +/-90 years BP (Navin 1987: 104).

Several studies of site patterns and distribution have been completed for the Illawarra and South Coast.

3.2.1 Regional overview.

Sefton's (1984) study formed part of the Local Environmental Study prior to the Stage 1 of the West Dapto Release Area (WDRA) development in Horsley, north of the study area. A copy of the Sefton's report could not be obtained, but the review was revised from the AMBS study (2006).

The following key elements constitute Sefton's site predictive model of the WDRA:

- Archaeological sites at Bass Point provide evidence of Pleistocene occupation, and there is no evidence to suggest West Dapto could not have been occupied at this time.
- It is possible that stratified occupational deposit could be located in the Pleistocene sediments of the flood plains at West Dapto. Stratified occupational deposit of Holocene age is also likely (and more possible) to occur in the floodplain sediments.
- Ethnohistorical records suggest two major zones of exploitation: (1) the coastal zone, including the shoreline, off shore islands and Lake Illawarra; and (2) the inland zone, including undulating tablelands. Groups who used both areas were small, mobile, and associated with a locality, but also ranged over larger areas. On this basis, it could be expected that the West Dapto area could have been exploited from both east and west directions, in addition to tracks along ridgelines.
- The Lake Illawarra shoreline presents restricted areas for campsites relative to the concentrated resources. Midden sites may not represent base camps (occupation sites) but instead preferred sites for resource exploitation. These preferred sites are expected to occur within two kilometers of the Lake Illawarra shoreline, and would have been established around the lake shore.
- The resources of West Dapto (flora, fauna, available water) would have made the locality attractive to occupation and exploitation. However, resources would have been scattered and at low density in comparison to the lake, and the locality was probably not economically self-contained. Base camps would not have been suitable for exploitation of these resources.
- Stone materials are not sourced within the area, with the exception of latite cobbles and occasional quartz pebbles. Consequently, stone would have been conserved at camp sites.
- Tracks connecting the coast to the interior would be expected through the West Dapto area, due to its geographic location between the two. Aboriginal tracks are usually along ridges, and consequently, sites could be expected in the saddles of ridges.
- Along the eastern coastal plain and the foothills of the escarpment to the west, sites are likely to occur on ridgelines or on dry level land within 100 metres of a creek line.

- In the foothills of the Escarpment to the west, sites may also occur further away from water on saddles of the Marshall Mount spur and on level areas of smaller ridgelines along the escarpment slopes and foothills.
- Extractive sites will also be located in West Dapto. These would occur as scarred trees, isolated large cores, tools of latite or small isolated stone artefacts. These sites may occur in all landform contexts, although scarred trees could only be identified in areas where trees have not been fired or cleared.
- It is not expected that latite quarry sites will occur at West Dapto. Although these tools have been located in adjacent areas on the shores of Lake Illawarra, those tools have been prepared from pebbles or cobbles and not from quarried materials (AMBS 2006: 87-8).

The following four areas were identified in WDRA as having high archaeological potential:

- All level areas of the Western foothills zone and the Coastal Plain within 100 metres of a creek located on:
  - Quaternary deposited flood plains.
  - Budgong Sandstone
  - Berry Siltstone.
- Saddles on the ridges of Marshall Point spur.
- Level areas in the Forest Creek Valley in the Escarpment Protection Zone.
- Level areas of the escarpment slopes on the topographic benches and bluffs.

Three main categories of sites being of potential significance were also identified:

- Stratified occupational deposits: may occur in the flood plain deposits of West Dapto, these deposits would have significant research potential and would be rare. Such a site may contain stone artefacts, food refuse and charcoal, which could be dated to establish a chronology of occupation of West Dapto. This would be significant to the public and be of educational significance. If the site were of Pleistocene age, it would be of major heritage significance to the Australian people, such as that identified at Bass Point.
- Surface camp sites: these unstratified deposits are likely to contain stone artefacts, and possibly, remnants of shell and charcoal. Bone is unlikely to have survived. These sites may provide information on settlement patterns, economic exploitation and stone tool manufacture and maintenance. These sites have research potential, but it is also predicted that they will be the most common site type at West Dapto.
- Scarred trees: although the identification of scarred trees is recognized to be problematical, any found in West Dapto will be of research potential (i.e. study of individual tree scars, relationship with other site types). Scarred trees are rare in the North Illawarra as in most areas, mature native trees have been burnt, and the rarity of scarred trees increases their significance (AMBS 2006: 90).

Sefton (1990) completed an archaeological survey for West Dapto Stage One Release Area in 1990, located west of the study area, south of Bong Bong Road. The survey targeted areas previously identified as having high archaeological potential, i.e. all level areas within 100 metres of a creek situated on Quaternary deposits (floodplains) and/or Budgong Sandstone, and areas with remnant mature native vegetation. Three new Aboriginal sites were identified: two scarred trees Bong Bong 1 (AHIMS 52-2-1542) and Bong Bong 3 (52-2-1543) and an artefact scatter, Bong Bong 2 (AHIMS 52-2-1544). Two scars are located on Forest Red Gum *Eucalyptus tereticornis* and Narrow-leaf Stringybark *Eucalyptus eugenoides* trees. Two stone artefacts associated with Bong Bong 2 were located in an erosion gully above a cow track, approximately 2 metres from Reid Creek. Sefton concluded that the alluvium of the Robins Creek floodplains would contain significant stratified

archaeological deposits. However, floodplains associated with the Mullet Creek tributary, derived from Budgong Sandstone, would have been waterlogged and sites were unlikely to be present below alluvial deposits (Sefton 1990: 9).

Koettig (1992) conducted an assessment of Aboriginal sites for the electrification of the Dapto to Kiama railway line. Landforms surveyed included the low lying coastal plain and foothills. Due to the levels of previous disturbance during the construction of the railway it was considered that any possible archaeological sites would have been destroyed. No sites were located during the survey. Since the railway crosses areas that are deemed as having high archaeological sensitivity, such as dunes, old terraces, areas close to water sources that have not been affected by the recent development, archaeological material could still remain. Any new development outside the boundary of the railway easement was assessed as having archaeological sensitivity (Koettig 1992: 4).

Navin Officer (1993) completed archaeological testing of a proposed residential subdivision on the southern side of Bong Bong Road, West Dapto. This investigation followed on from Silcox's 1993 recommendation that the site had three areas of potential archaeological sensitivity. Area WD1 located within the lower slope and undulating creek flat landform was divided into five transects which were then sampled with a 35 test excavation units consisting of combination of auger holes and spade probes. One surface artefact was located at the western end of the identified WD1 Area. A series of ten random probes was excavated at 1to2 metres apart averaging 28 centimetres in depth. Four additional artefacts were recovered and the area was deemed as a site WD1, registered on AHIMS 52-2-1688. WD 2 Area located within a low rise landform between a creek and a swampy cut-off channel had a single transect running through it with a total of five test excavation units and no artefacts recovered. WD 3 Area was subject to only three random spade probes as it had a similar landform as WD 2; no artefacts were recovered.

Artefacts at the site WD1 (AHIMS 52-2-1688) were recovered from the upper 26 centimetres of the loam deposit within a 1 metre by 2 metre area, and consisted of silicified wood, chert and quartz flakes and one unidentified sedimentary core. Navin Officer stated that it was unlikely the artefacts were *in situ*, due to the extensive land use modifications of the topsoil from where artefacts were recovered (Navin Office 1993: 11). Given the dense grass cover, size of the test area and the limitations of subsurface testing, Navin Officer considered that there was a possibility that more artefacts were present both on surface and subsurface in WD1 Area. However, potential for archaeologically significant sites and/or undisturbed archaeological deposits was assessed to be minimal (Navin Officer 1993:12). Consent to Destroy was issued by the National Park and Wildlife in 1993 in order to destroy the site WD1 (AHIMS 52-2-1688).

Navin Officer (1994) was commissioned by Camp Scott and Furphy to undertake an archaeological survey of the proposed Illawarra water quality project installation at Kembla Grange. The survey was a targeted survey of creek banks and flats, areas of exposure around an existing dam, and flat ground on the southern part of their study area. These areas had higher degree of ground surface visibility and were considered as being favoured by Aboriginal people for occupation activities. Footslopes, creek banks, creek flats and plains were all aggrading landforms due to colluvial deposition and mass soil movement and deposition of sediments by water. The steep slopes on the spurs and in the north were sampled (1994: 7). During this survey there were no new Aboriginal sites identified. It was argued that archaeological potential in the proposed works area was low due to the results of previous testing in the similar landforms (Navin Officer 1993).

AMBS (2006) completed an Aboriginal Heritage Management Plan for the West Dapto Release Area (WDRA). This large scale study was commissioned by the Wollongong City Council and encompasses the study area. From the initial survey program, a total of 24 archaeological sites; 13 open camp sites, 6 isolated finds, 5 scarred trees were located within the boundaries of the WDRA study area. These were positioned on all landforms including creek lines (6), alluvial flats (3), spanning creek lines and alluvial flats (3), hillslopes (8) and spur crests (4). A second stage of assessment consisted of subsurface testing of a 100 square metres area

(100, 1 metre by 1 metre test pits) was undertaken across all representative landforms of the Mullet, Duck and Marshall Mount Creeks catchment area.

A total of 425 artefacts (353 from within < 20 centimetres of deposit) were recovered from the following landscape contexts:

- Hillslopes (158, of which 146 were from one test pit).
- Alluvial flats -Pleistocene and Holocene terraces more than 10 metres away from stream channels (118).
- Streams- edges of Pleistocene and Holocene terraces within 10 metres of stream channels (86).
- Spur crests (63).

A range of raw materials were represented including, chert, quartz, quartzite, silcrete, silicified tuff and fine-grained siliceous. Artefact types included broken flakes, flakes, flaked pieces and cores. The range of raw materials and artefact types was considered characteristic of the region by AMBS.

AMBS concluded that from known site patterning it is likely that additional archaeological sites may occur throughout all landforms of the WDRA, although at varying site and artefact densities, and subsequently all parts of the WDRA are considered to have some archaeological potential. AMBS classified the current study area as low to moderate potential. In general, the highest artefact density was encountered along second-order streams, followed by the first order streams, spur crests and then hillslopes. Although artefact numbers recovered from individual test pit was low, high artefact recovery across all the landforms illustrate that the use of WDRA area was widespread, but not intensive. It was concluded that low density artefact scatters would be relatively common within the entire WDRA area (AMBS 2006: 245).

The report recommended further investigation and management of those areas considered to have higher archaeological potential, including a number of spur crests within the Mullet Creek corridor, the benched foot slopes within the Escarpment foothills adjacent to creek lines and the lower tributaries of major creeks (AMBS 2006: 266). These landforms would have provided camping sites, functioned as travel routes or provided a range of resources.

Areas of cultural value highlighted by the Aboriginal stakeholders throughout the development of this report are closely related to the archaeological record and the natural environment (AMBS 2006: VIII). All archaeological sites were identified as having cultural values, with the connection between cultural and natural values being emphasised. Large scatters and scarred trees were considered of higher significance, as were those sites retained within a natural setting. Conservation of important archaeological sites and natural areas such as creek lines and vegetated areas was a common theme identified among the Aboriginal

As part of the WDRA, AMBS commissioned Philip Hughes to complete a geomorphology / archaeological testing program prior to the commencement of the larger sub-surface investigation program. Hughes (2005) excavated a series of test pits using a combination of hand excavation and a backhoe within various landforms identified by AMBS (2006). The geomorphic testing revealed that while all landforms had the potential to contain artefact-bearing deposits, archaeological evidence for Aboriginal occupation and use of the Pleistocene terraces would be restricted to the Holocene period (AMBS 2006: 176). Artefact bearing deposits across all landforms comprise soft to firm soils and sediment (Hughes 2005: 4). The depth of deposits varies across landforms, with the shallowest sediments occurring on ridges and hill slopes, and the deepest sediments occurring on Holocene terraces. 'Richer' archaeological deposits could be expected within Holocene terraces, but they would be disturbed by floods and perhaps buried in deeper alluvium (AMBS 2006: 177). Artefacts were retrieved from alluvial flats at a maximum depth of 60 to70 centimetres.

Biosis (2009) was commissioned by Connectland Pty Ltd to undertake Aboriginal archaeological and cultural heritage assessment for the proposed Illawarra Employment and Teaching Centre, West Dapto, located

approximately 3.3km North West of the study area. The assessed area encompassed 42.88 hectares to the north of Bong Bong Road and west of Mullet Creek. Archaeological survey was targeted towards areas that will be impacted by the proposed development, and landforms and areas identified in the predictive modelling as having high likelihood for the presence of sites, i.e. ridgelines and waterways. Two Isolated artefacts were identified during the site survey, Bong Bong Road IA1 (AHIMS 52-2-3659) to the immediate north of Bong Bong Road within the exposure around the tree, and Bong Bong Road IA2 (AHIMS 52-2-3660). Comprehensive review of AMBS study (2006) indicated that the newly recorded site 52-2-3660 was most likely already recorded site WDRA_AX_01 (AHIMS 52-2-3289). Both Bong Bong Road IA1 and Bong Bong Road IA2 were assessed as having low scientific significance and they were considered to be a common occurrence within the region (Biosis 2009:42-3). Their presence conforms to the site predictive model for the region where Aboriginal sites are likely to occur on level, well-drained ground adjacent to wetlands and resources. It was recommended that both sites be salvaged and relocated in the event impacts cannot be avoided.

3.2.2 Local overview

A number of Aboriginal cultural heritage investigations have been conducted within the region (within approximately 5 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.

Sefton (1980) undertook an archaeological survey of the proposed transmission line routes in the West Dapto-Yallah Area of the City of Wollongong. During this survey two archaeological sites were identified. Registered site Yallah Site 1 (52-5-0123) consisted of one isolated artefact that was located on the northern bank of a tributary of Duck Creek, made from fossilised wood. Yallah Site 2 (52-5-0122) was located within 150 metres of the Lake Illawarra on a lower slope and is a sparse scatter of seven artefacts made from chert, jasper and rhyolite. This site was located on a gradual slope, and has been previously disturbed by quarrying, erosion and underground services (Sefton 1980: 10). Both sites are approximately 3 kilometres south-east of the study area and are within the close proximity to reliable, permanent sources of water on flat elevated grounds. It was recommended that any excavations in the vicinity of site Yallah 2 be monitored, and no impacts were proposed to site Yallah 1.

Dallas and Navin (1987) conducted an archaeological survey along the Southern Foreshore of Lake Illawarra and on Bevans, Picnic, Berageree and Werrang islands approximately 8 kilometres south east of the current study area. The survey identified five new shell midden sites and one previously recorded midden site (AHIMS 52-5-0119). In their discussion of the survey results Dallas and Navin suggested that the locations of the middens on the islands was not necessarily indicative of preferential use. Rather, they suggest it was more likely that the lack of disturbances on the islands compared to the more heavily disturbed Illawarra Lake foreshore has resulted in the destruction of foreshore middens and the preservation of island middens.

Navin Officer (1997) undertook an archaeological investigation of a proposed residential subdivision at Lot 1 DP253917, Mount Brown Road in South Dapto, approximately 2.5 kilometres west of the current study area. A survey was conducted as part of this assessment, but the survey did not identify any Aboriginal sites. The absence of sites was attributed to a number of factors including the very low ground surface visibility, a lack of specific resources in the area, and shallow soils with an absence of colluvium material adjacent to drainage lines. Previous land use practices also indicated that little material would have remained *in situ* due to disturbances. The results of this survey were consistent with those obtained from other archaeological surveys in the local area and with the regional pattern of sparse site occurrence in the low hilly lands interior of Lake Illawarra and the coastal plain (Navin Officer 1997: 7).

Comber Consultants Pty Ltd (2010) undertook an Aboriginal archaeological assessment for the proposed bike and pedestrian path around Lake Illawarra, which the current study area partly lies within. As part of this assessment Comber undertook basic predictive modelling and developed predictive statements for various

site types. These statements indicated that there was a possibility for middens, burials, open camp sites, axe grinding grooves and isolated finds to be present in the study area.

Following background research, Comber conducted a survey of their study area. No Aboriginal archaeological sites were recorded during this survey, but area 2, which the current study area lies partially in, and area 4 of their study area were identified with a high potential to contain sub surface archaeological deposits.

Considering a high number of previously recorded Aboriginal archaeological sites (13) within the vicinity of the study area and the landform they were in (Lake Illawarra foreshore), it was recommended that archaeological sub-surface testing be undertaken in areas 2 and 4 in order to determine the existence, and then nature and extent of any such deposits.

3.2.3 Previous Aboriginal archaeological test excavations within the study area

Biosis (2010) conducted an Aboriginal Archaeological Assessment of the Tallawarra lands for TRUenergy which encompassed the current study area. Biosis was commissioned to conduct sub-surface testing for a number of areas assessed by Kelleher and Nightingale (2006) as having moderate and high archaeological sensitivity.

A total of 10 areas were excavated across five landform types (Figure 7). These landforms included foreshore, spur line, drainage line, hill slope, and creek line landforms. The excavations identified 24 stone artefacts and one piece of ochre across the 10 excavation areas; the highest number of artefacts were uncovered in the creek line landform (n=13) followed by the drainage line landform (n=10) (Biosis 2010: 134-135). The foreshore and hill slope landforms each contained one artefact and the spur line did not contain any (Biosis 2010: 134-135). The artefact assemblage consisted of a range of raw materials including chert, quartzite, silcrete, basalt, chalcedony and siltstone.

An analysis of the soil profiles within various landform units in the study area indicated that depth of deposit increased with proximity to water (specifically Duck Creek). Disturbances to the soil stratigraphy were found to be limited to the upper (top soil) layer, with lower stratigraphic units showing very low to no evidence of previous disturbance. The soil profiles within TLPD AFT-7 (AHIMS 52-5-0613), TLPD AFT-8 (AHIMS 52-5-0614), TLPD AFT-9 (AHIMS 52-5-0615), were all noted to have three distinct stratigraphic units displaying no evidence of previous disturbance. Testing was not conducted at Tallawara Pipeline PAD3 (AHIMS 52-5-0523)

Biosis concluded that the low number of artefacts indicated that Aboriginal people were using the Tallawarra Lands, with occupation focusing on Duck Creek, but it was likely sporadic or low density (Biosis 2010, p 147).

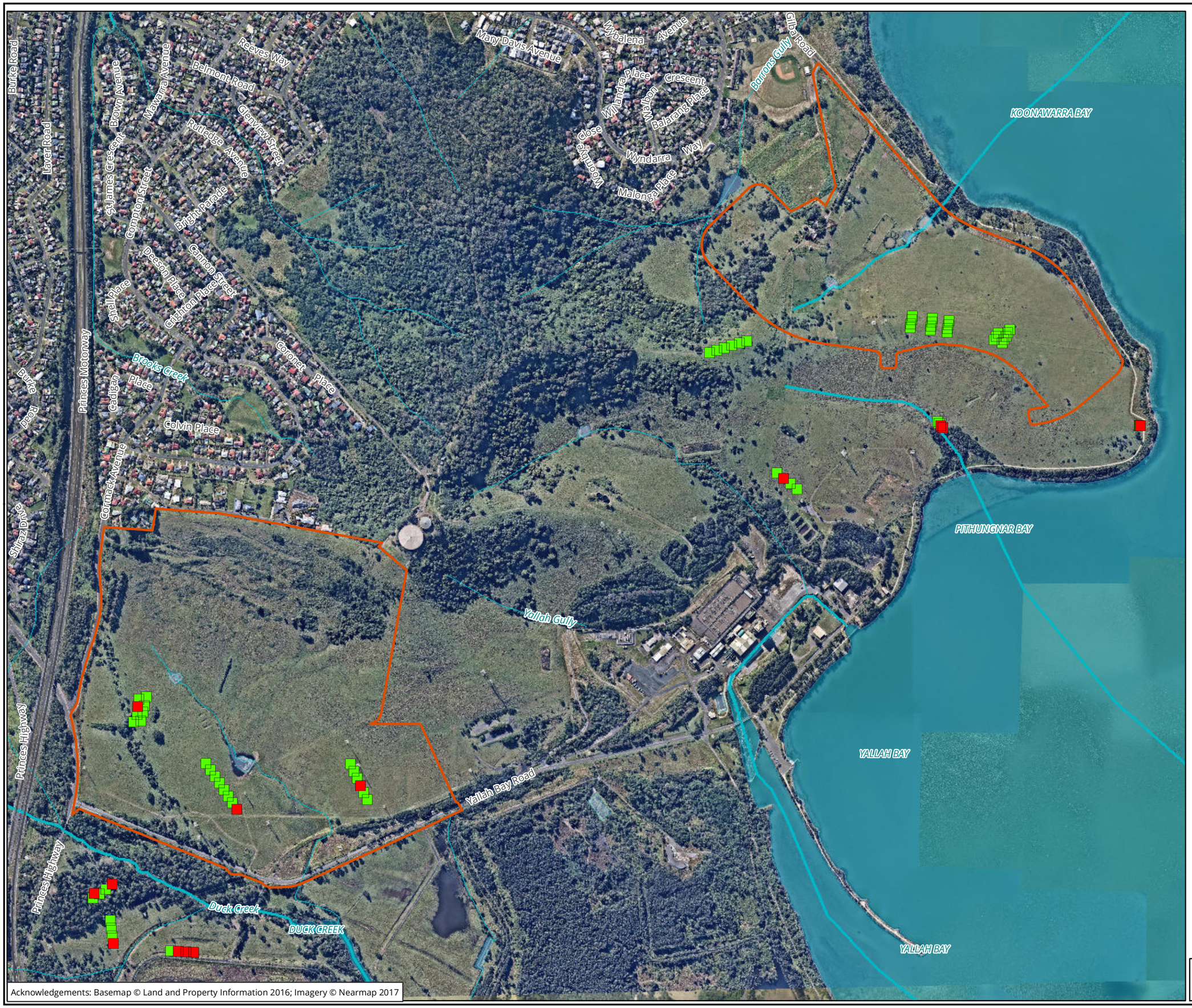
Biosis (2011) were commissioned by the Lake Illawarra Authority to undertake archaeological assessment and test excavations of the Tallawarra recreational shareway based on the recommendations of Comber (2010). The Tallawarra Lands development encompasses parts of the area assessed by Biosis (2011).

As part of this assessment Biosis undertook background research and used it to construct several predictive statements for the study area. These statements indicated that (Biosis 2011: 36-39):

- Midden shell and lithic material have been known to occur on sand bodies such as coastal beach dune systems, elevated ground adjacent to wetlands such as low gradient basal colluvial slopes, terminal spur line crests and alluvial terraces along valley floor drainage corridors.
- Artefact scatters may be identified anywhere within the study area but they are more likely to be identified near water-related landforms and on gently inclined slopes within 100 m of water. Stone artefacts are more likely to consist of sandstone, quartz or volcanics.
- Shelters, grinding grooves and raw materials suitable for stone tool manufacture will not occur within the study area due to a lack of suitable geology.

- Scarred trees may occur anywhere within the study area where mature trees remain.
- A burial was recorded on the shores of Lake Illawarra. Due to alluvial deposits within the study area and previously recorded burial, there is a possibility that unrecorded burials may be located in the area.

The test excavations were undertaken as part of the assessment involved 157 auger holes along the foreshore (Figure 7). The excavations identified one new artefact scatter Tallawarra Point 1 (AHIMS and extended the pre-existing site Tallawarra Power Station Midden (AHIMS 52-5-0070). Two artefacts consisting of a quartz flake fragment and a silcrete geometric microlith were identified at Tallawarra Point 1. It was suggested that this site was likely representative of transient occupation. Six stone artefacts were also excavated in a tidal creek landform directly south of Tallawarra Power Station Midden (AHIMS 52-5-0070). The artefacts consisted of four chert flakes, 1 quartz flake and one silcrete flake. This scatter was identified as part of the Tallawarra Power Station Midden (AHIMS 52-5-0070). Biosis suggested that the Tallwara Power Station Midden was representative of camping activities or frequent travel through the area (Biosis 2011: 61-62). No midden material was encountered during the test excavations.



Acknowledgements: Basemap © Land and Property Information 2016; Imagery © Nearmap 2017

Legend

Study area

Biosis 2010 Test Pits

No artefacts present

Artefact(s) present

Figure 7: Previous test excavations

0 100 200 300 400 500

Metres

Scale: 1:9,000 @ A3

Coordinate System: GDA 1994 MGA Zone 56

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Matter: 24090
Date: 13 July 2017,
Checked by: RAM, Drawn by: LH, Last edited by: lharley
Location:\\bio-data-01\matters$\24000s\24090\Mapping\24090_AR_F7_PrevTestEx

3.2.4 AHIMS site analysis

A search of the OEH Aboriginal Heritage Information Management System (AHIMS) database (Client Service ID: 287109) identified 86 Aboriginal archaeological sites within a 5 square kilometre search area, centred on the proposed study area.

Four AHIMS sites (TLPD AFT-7 (AHIMS 52-5-0613), TLPD AFT-8 (AHIMS 52-5-0614), TLPD AFT-9 (AHIMS 52-5-0615), and Tallawara Pipeline PAD3 (AHIMS 52-5-0523) are located *within* the study area (Figure 8). AHIMS search results are provided in Appendix 1.

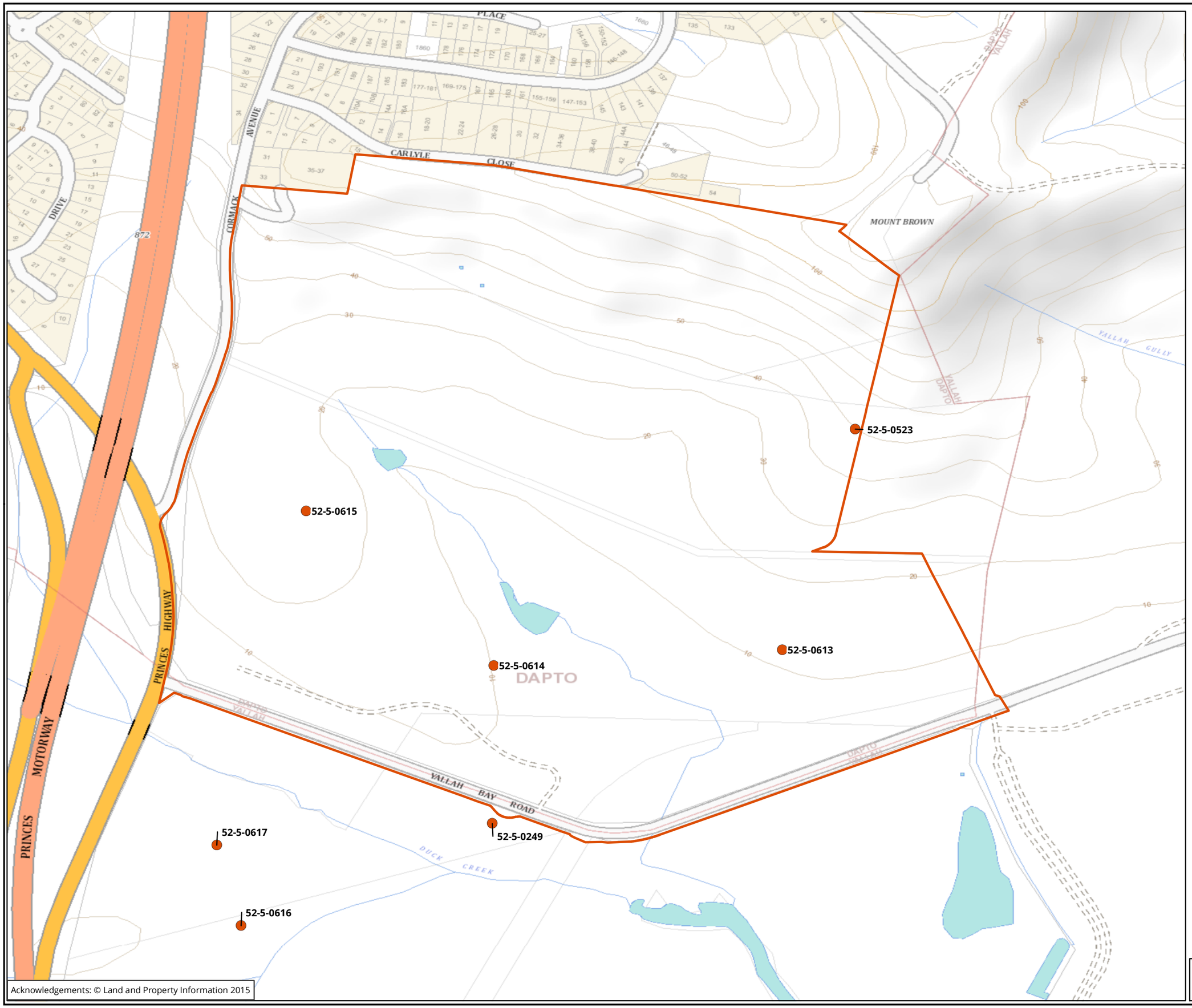
Table 5 following provides the frequencies of Aboriginal site types in the vicinity of the study area. The mapping coordinates recorded for these sites were checked for consistency with their descriptions and location on maps from Aboriginal heritage reports where available. The descriptions and maps were relied upon when notable discrepancies occurred in the locations of sites.

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 102 results presented here, compared to the 86 sites identified in AHIMS.

Table 5 AHIMS site type frequency

Site type	Number of occurrences	Frequency (%)
Aboriginal ceremony and dreaming	2	1.96
Artefact	67	65.69
Modified tree	1	0.98
PAD	13	12.75
Shell	18	17.65
Stone Arrangement	1	0.98
Total	102	100

A simple analysis of the Aboriginal cultural heritage sites registered within the 5 square kilometre buffer of the study area indicates that artefacts are the most commonly recorded site type (n=67, 65.69%). This is followed by shells sites (n=18, 17.6%) and PAD sites (n=13, 12.75%). Aboriginal ceremony and dreaming (n=2, 1.96%), modified tree (n=1, 0.98%) and stone arrangement (n=1, 0.98%) were also recorded in the region.



Legend

- AHIMS Records
- Study area

Figure 8: AHIMS search results

NOT TO BE MADE PUBLIC

0 40 80 120 160 200

Metres

Scale: 1:5,000 @ A3

Coordinate System: GCS GDA 1994

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Date: 22 August 2017,
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24090_AR_F8_AHIMS.mxd

3.3 Discussion

Ethno-historical information regarding the study area indicates that the region was intensively occupied by the Wodi Wodi of the Dharawal language group before European occupation.

The current study area is characterised by the coastal plain landscape, and is situated on the open banks of Lake Illawarra backing onto the slopes of the Mount Brown. The proximity to Lake Illawarra would have provided access to aquatic animals which would have been used by Aboriginal groups in the area as a food source and for tool production. The easy access to aquatic species should result in the potential for shell middens to be present in the study area. This is supported by previous Aboriginal archaeological test excavations conducted in the area (Biosi 2011) and AHIMS data and which showed that middens were the second most common site type in the region. Geology of the Illawarra region also provided access to stone resources useful for tool manufacture. The AHIMS data indicated that stone artefacts are the most common site type in the region so they are likely to be present in the study area

Previous archaeological work within the study area has not only focussed on specific development activities but has recognised the archaeological and cultural landscape values of the locality. The previous studies provide a general overview of Aboriginal archaeological site modelling and predictive behaviour within the current study area. In general, previous archaeological work indicates that areas of archaeological potential will occur where disturbance has been limited, and the most likely site type to be encountered will be middens sites and artefacts.

The previous archaeological test excavations conducted within the study area (Biosis 2010) indicates that low density, undisturbed subsurface archaeological deposits are present within the study area. It is likely that further subsurface archaeological deposits are present in areas not previously tested.

3.3.1 Predictive Statements

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

The statements are 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.

These statements assist in identifying the site types most likely to be encountered during the survey and subsequent sub-surface investigations across the present study area (Table 6). 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 across a wide range of landforms and within the study area. They have high potential to be present in undisturbed areas within the study area.
Shell middens	Deposits of shells accumulated over either singular large resource gathering events or over longer periods of time.	Moderate: Shell midden sites have been recorded within the vicinity of study area. The proximity of the study area to Lake Illawarra indicates a high potential for the presence of shell middens
Quarries	Raw stone material procurement sites.	Low: There is no record of any quarries being within or surrounding the study area.
Potential archaeological deposits (PADs)	Potential sub surface deposits of cultural material.	Moderate: PADs have been recorded in the region across a wide range of landforms. They have the potential to be present in undisturbed landforms of the study area
Modified trees	Trees with cultural modifications	Low: Due to extensive vegetation clearing from of the study area there is low potential for modified trees.
Axe grinding grooves	Grooves created in stone platforms through ground stone tool manufacture.	Low: The geology of the Study Area lacks suitable horizontal sandstone rock outcrops for axe-grinding grooves. Therefore there is low potential for axe grinding grooves to occur in the study area.
Burials	Aboriginal burial sites.	Low: Aboriginal burial sites are generally situated within deep, soft sediments, caves or hollow trees. 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.
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 in the study area.
Aboriginal ceremony and Dreaming Sites	Such sites are often intangible places and features and are identified through oral histories, ethnohistoric data, or Aboriginal	Low: There are currently no recorded mythological stories for the study area.

Site type	Site description	Potential
	informants.	
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.

4 Archaeological survey

A field survey of the study area was undertaken on 29 June 2017. The field survey sampling strategy, methodology and a discussion of results are provided below.

4.1 Archaeological survey objectives

The objectives of the survey were to:

- Attempt to re-identify Aboriginal archaeological sites Tallawarra Pipeline PAD 3 (AHIMS 52-5-0523), TLPD AFT 7 (AHIMS 52-5-0613), TLPD AFT 8 (AHIMS 52-5-0614) and TLPD AFT 9 (AHIMS 52-5-0615) previously identified in the study area.
- Undertake a systematic survey 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 potential archaeological deposits (PADs).

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 these portions of the study area:

- All landforms (including each occurrence of a specific landform type that will be impacted) that will be potentially be impacted.
- Landforms with a higher potential for Aboriginal heritage and justifying the selection of these landforms.

4.2.2 Survey methods

The archaeological survey was conducted on foot with a field team of one member. 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 have 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, ground surface visibility 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 and the Map Grid of Australia (94) coordinate system.

4.3 Archaeological survey results

A total of 5 transects were walked across three landforms (Figure 9). This follows the methodology set out in Burke and Smith (2004: 65) which states that a single person can only effectively visually survey an area of two linear metres. No new Aboriginal sites or PADs were identified in the study area. The results from the field survey have been summarised in Table 7 below.

The Central Precinct consists of a crest on the western boundary associated with a large Fig tree, open drainage depression and simple slope associated with Mount Brown with significant views over the surrounding area. The slope associated with the eastern portion of the study area is steep with the slope varying from 30 to 40 degrees (Table 8).

4.3.1 Constraints to the survey

With any archaeological survey there are several factors that influence the effectiveness (the likelihood of finding sites) of the survey. The factors that contributed most to the effectiveness of the survey within the study area were visibility, exposure and disturbance.

4.3.2 Visibility

In most archaeological reports and guidelines visibility refers to ground surface visibility, 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 (NSW NPWS 1997, Appendix 4). Visibility within the study area was generally poor, with areas of exposure isolated to disturbance associated with the dams and fence lines. Visibility was 80% within these areas (Plate 1).

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 and Smith 2004: 79; NSW NPWS 1997, Appendix 4). Overall, the study area displayed areas of exposure of approximately 5%.

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 large sections of the land surface. The agents include 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; light industrial practices such as creation of artificial dams within the study area. Areas that have gone through disturbance are associated with dams, fence lines and infrastructure associated with the Tallawarra Power Station (Plate 2).

Plate 1 **The study area showing poor surface visibility due to vegetaton cover, facing north**

Plate 2 **Disturbance associated with the construction of dams, facing west**

Plate 3 **Tree line along the southern boundary with fig tree on the right, facing south**

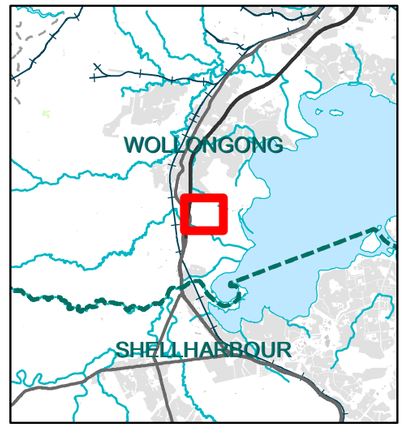
Plate 4 **Simple slope down towards open drainage depression, facing west**

Table 7 Survey coverage

Survey Unit	Landform	Survey unit area (m²)	Visibility (%)	Exposure (%)	Effective coverage area (m²)	Effective coverage (%)
1	Drainage line	169,279	80	5	6,771	3.99
2	Hill slope	180,098	80	5	4,507	2.50
3	Spur line	211,679	80	5	8,467	3.99

Table 8 Landform summary

Landform	Landform area (m²)	Area effectively surveyed (m²)	Landform effectively surveyed (%)	No. of Aboriginal sites	No. of artefacts or features
Drainage line	169,279	6,771	3.99	0	0
Hill slope	180,098	4,507	2.50	0	0
Spur line	211,679	8,467	3.99	0	0



Legend

- Study area
- Transcects

Figure 9: Survey coverage

0 40 80 120 160 200

Metres
Scale: 1:4,000 @ A3
Coordinate System: GDA 1994 MGA Zone 56

N

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Matter: 24090
Date: 21 July 2017,
Checked by: RAM, Drawn by: LH, Last edited by: lharley
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4.4 Discussion of archaeological survey results

The study area is located within a drainage and simple slope landform pattern associated with Ducks Creek to the south of the study area. There are three soil landscapes present within the study area: one erosional soil landscape called the Shellharbour soil landscape, one residual landscape called the Gwynneville soil landscape, and one swamp soil landscape called the Fairy Meadow soil landscape. Erosional soils have a high to very high erodibility rating and would therefore be susceptible to frequent soil movement and result in poor preservation of archaeological material at shallow depths but would potentially lead to exposures of any deeper archaeological deposits where topsoil has eroded away. Residual soils have moderate soil erodability with some soil movement and, combined with the shallow loam soils, the preservation of archaeological material is likely to be poor throughout the study area. Swamp soils have low soil erodability and would therefore preserve any potential sub-surface deposits present, although the susceptibility to flooding and seasonal waterlogging would result in sites only being present on raised landforms within this soil landscape.

The field survey revealed that parts of the study area had been subject to previous ground disturbance due to construction of towers for the Tallawarra Power Station. These areas would have displaced surface cultural material and disturbed deeper buried archaeological deposits. However, most of the study area had only limited disturbance caused by the construction of dams and fence lines, and animal trampling from farming practices. Although these processes would displace surface cultural material, they would not affect deeper buried archaeological deposits.

No previously unrecorded Aboriginal sites or objects were located during the field survey. The four AHIMS sites within the study area were inspected during the survey. The AHIMS site areas were noted to be in moderate to good condition. Disturbances observed at the AHIMS site locations consisted of animal trampling and vegetation clearance.

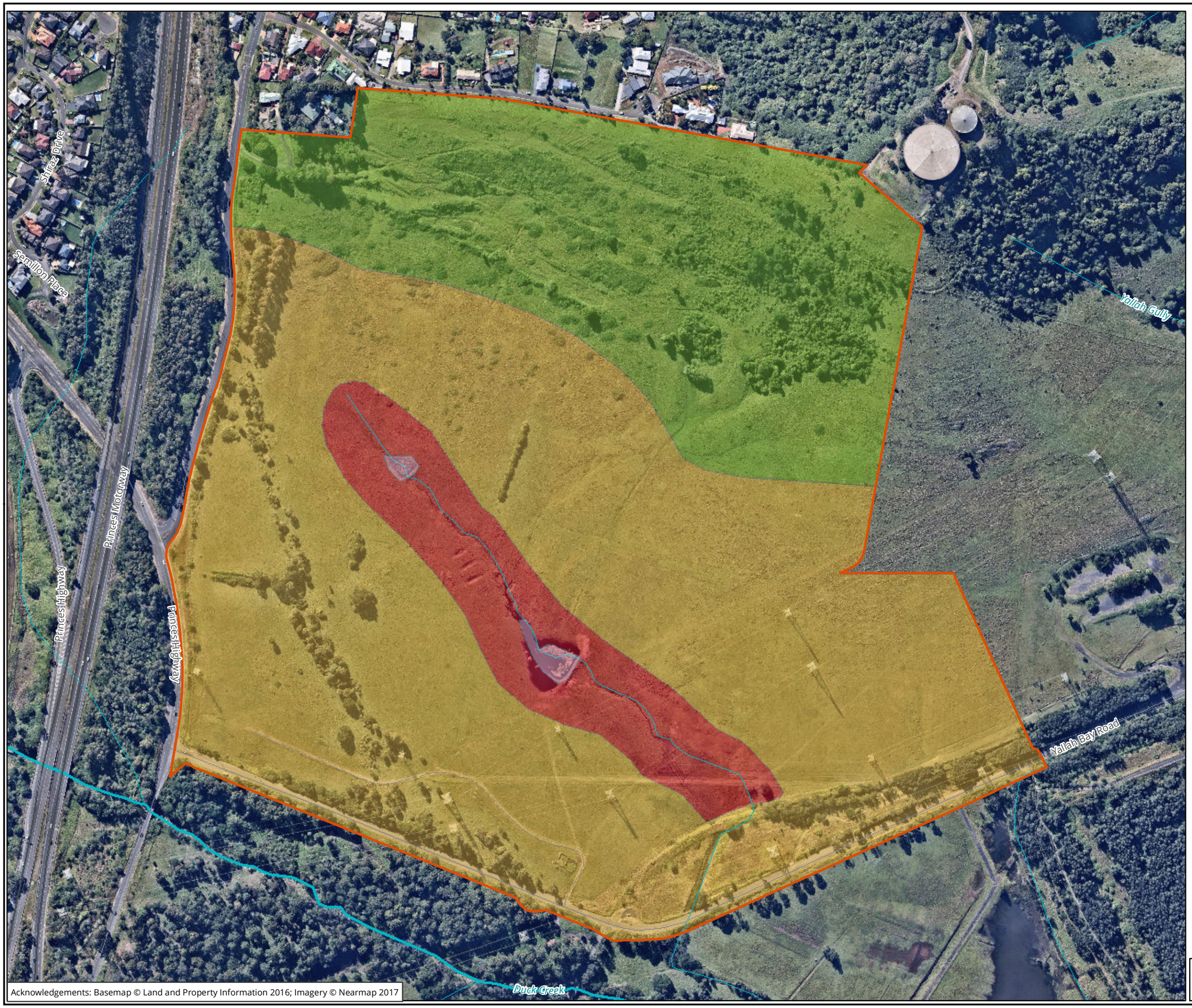
A review of previous archaeological studies, surveys, test excavations and regional predictive modelling indicates that all landforms within the study area were utilised to some degree by Aboriginal people in the past. This has concluded that:

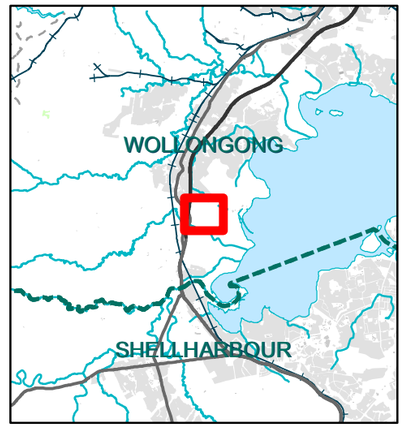
- Majority of the test pits conducted by AMBS (2006) in the WDRA containing artefacts were located within alluvial flats, followed respectively by hillslopes, spur crests, 3rd order, 2nd order, 4th order and at last 1st order creek lines.
- AHMS (2012) in excavations further along Robins Creek determined that alluvial flats had the highest density of artefacts (30.2 per metre square), followed by hillslope (17.3 metre square) and spur crest (16.9 metre square).
- Previous investigations along Robins Creek have determined that the alluvial terraces associated with this landform have the potential to contain cultural material which appears to be well preserved *in situ*. Artefacts within the *Fairy Meadow* soil landscape at this location were retrieved from between 60 to 80 centimetres depth.
- Predictive modelling indicates that of the sites located on stream landforms, the majority were along the 3rd order, followed by 4th, then 2nd and last 1st order creek lines.

Based on the site survey and previous assessments the drainage line that runs through the study area and into Ducks Creek was assessed as having high archaeological potential to contain further subsurface cultural deposits. The proximity of this area to useful resources and fresh water indicates it would have been a valuable occupation area. The ridgeline in the study area was assessed as having moderate potential as previous research had determined that the landform is likely to contain low density or isolated artefacts that were discarded as Aboriginal people travelled along them. Areas that have undergone significant previous disturbance would have removed sub-surface deposits from their original contexts and were assessed as low

potential as a result. Hillslopes were also assessed as low potential as they tended to be sloped and at the time of survey were heavily waterlogged and unsuitable for occupation or travel (Figure 10).

A fig tree located near the western boundary of the study area is of cultural value as they are the main trees used for either men's business or women's business, as meeting places, and are known to be used in the area as birthing trees. The fig tree is associated with site TLPD AFT 9 (AHIMS 52-5-0615) was identified as being culturally important in previous assessments.





Legend

Study area

Archaeological potential

High

Moderate

Low

Acknowledgements: Basemap © Land and Property Information 2016; Imagery © Nearmap 2017

Figure 10: Archaeological potential

0 40 80 120 160 200

Metres

Scale: 1:4,000 @ A3

Coordinate System: GDA 1994 MGA Zone 56

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5 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 Aboriginal Cultural Heritage Assessment Report will detail the cultural values of Aboriginal sites in the study area.

5.1 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, OEH and the Heritage Branch, NSW Department of Planning 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 OEH Guide (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.

5.2 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 and Smith 2004: 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: 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. The site content ratings used for archaeological sites are provided in Table 9. Site condition refers to the degree of disturbance to the contents of a site at the time it was recorded. The site condition ratings used for archaeological sites are provided in Table 10.

Table 9 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 10 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 note that Aboriginal archaeological sites are generally of high research potential because 'they are the major source of information about Aboriginal prehistory' (1995: 149). 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 and Smith 2004: 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. . The representativeness ratings used for archaeological sites are provided in Table 11.

Table 11 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 12.

Table 12 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 is given a score on the basis of these criteria – the overall scientific significance is determined by the cumulative score. This scoring procedure has been applied to the Aboriginal archaeological sites identified during the sub-surface testing. The results are in Table 13.

5.2.1 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 each site was determined. The results of the archaeological significance assessment are given in Table 13 and Table 14 below.

Table 13 Scientific significance assessment of archaeological sites recorded within the study area.

Site name	Site content	Site condition	Representativeness	Scientific significance
Tallawarra Pipeline Pad 3 52-5-0523	-	2	-	Unknown
TLPD AFT 7 52-5-0613	1	2	1	4 - Moderate
TLPD AFT 8 52-5-0614	1	2	1	4 - Moderate
TLPD AFT 9 52-5-0615	1	2	1	4 - Moderate

Table 14 Statements of scientific significance for archaeological sites recorded within the study area.

Site name	Statement of significance
Tallawarra Pipeline PAD 3 52-5-0523	This PAD site was registered by the Wadi Wadi Coomaditchie following the completion of a field survey for a proposed pipeline easement. The PAD area is situated on a mid slope ridge on a moderate slope. It overlooks a small drainage feature to the south west and Duck Creek to the south. PAD sites represent a common example of a site within the Illawarra region. However; archaeological testing has not been conducted at this site, therefore the site content and representativeness of the site cannot be adequately assessed. The site has no direct historical or aesthetic associations. This site has been assessed as having unknown scientific significance. The site displays low levels of disturbance and represents a common example of a site within the area. The site also has no direct historical or aesthetic associations and has a low scientific potential. The scientific significance of this site has been assessed as moderate.
TLPD AFT 7 52-5-0613	Site was recorded as a stone artefact scatter following test excavations conducted at the site. The excavations identified one chert core and one silcrete flake. The site was located on a drainage feature in an upper slope landform. The site displays low levels of disturbance and represents a common example of a site within the area. The site has no direct historical or aesthetic associations. The scientific significance of this site has been assessed as moderate.
TLPD AFT 8 52-5-0614	Site was recorded as a stone artefact scatter located on a moderate slope north or Yallah Bay Road. Two artefacts were identified during test excavations of the site, consisting of one chert flake and one chert flake fragment. The site displays low levels of disturbance and represents a common example of a site within the area. The site has no direct historical or aesthetic associations. The scientific significance of this site has been assessed as moderate.
TLPD AFT 9 52-5-0615	The site was recorded as an isolated artefact and was located on a spurline in a hillcrest landform. The artefact was uncovered during test excavations of the site and one piece of debitage was identified. A fig tree associated with TLPD AFT 9 (52-5-0615) was identified as being culturally important in previous assessments (Biosis 2010). The fig tree is of cultural value as they are the main trees used for either men's business or women's business, as meeting places, and are known to be used in the area as birthing trees. The site displays low levels of disturbance and represents a common example of a site within the area. The site has no direct historical or aesthetic associations. The scientific significance of this site has been assessed as moderate.

6 Impact assessment

As previously outlined, the Project proposes to modify the existing concept approval for the Central Precinct (MP 09_0131 MOD 1) to allow an increased residential lot yield. The development of the Central Precinct will comprise commercial, retail, industrial, open space and associated civil works. The modification to the concept approval seeks to increase the footprint and residential yield for the Central Precinct from 350 lots to 588 lots.

6.1 Predicted physical impacts

The proposed works will include earthworks, the construction of new residential dwellings and associated infrastructure including roads, underground piping and cabling, and associated earthworks.

The proposed development will involve the following activities that have the potential to impact on Aboriginal archaeological sites or objects:

- earthworks
- subdivision
- new housing stock
- public open space areas
- new recreation facilities
- environmental management and conservation areas and riparian corridors
- new internal roads
- new pedestrian and cycle pathways
- landscaping
- power station buffer areas
- installation of services (water, gas, power)

Within the study area, there are four recorded Aboriginal sites that may be subject to harm. It is expected that the potential of harm to Aboriginal archaeological sites Tallawarra Pipeline PAD 3 (52-5-0523), TLPD AFT 7 (52-5-0613), TLPD AFT 8 (52-5-0614), and TLPD AFT 9 (52-5-0615) from the proposed development will be direct, with a total loss of value.

Strategies to avoid or minimise harm to Aboriginal heritage in the study area are discussed below. A summary of impacts is provided below in Table 15.

Table 15 Summary of potential archaeological impacts

AHIMS site no.	Site name	Significance	Type of harm	Degree of harm	Consequence of harm
52-5-0523	Tallawarra Pipeline PAD 3	Moderate	Direct	Total	Total loss of value

AHIMS site no.	Site name	Significance	Type of harm	Degree of harm	Consequence of harm
52-5-0613	TLPD AFT 7	Moderate	Direct	Total	Total loss of value
52-5-0614	TLPD AFT 8	Moderate	Direct	Total	Total loss of value
52-5-0615	TLPD AFT 9	Moderate	Direct	Total	Total loss of value

6.2 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 and Walker 1994: 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.

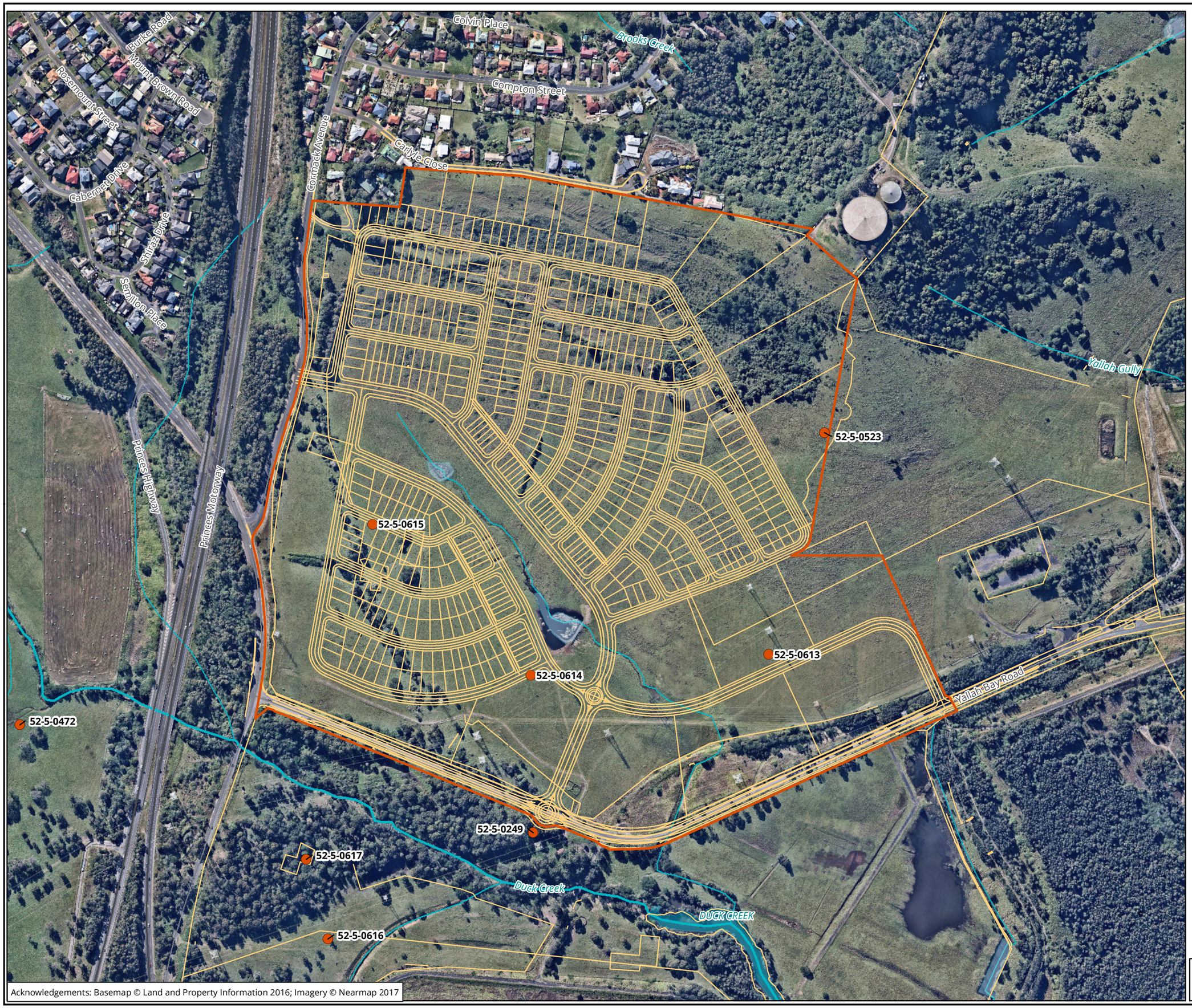
Avoidance of impact to archaeological and cultural heritage sites through design of the development is the primary mitigation and management strategy, and should be implemented where practicable.

Tallawarra Pipeline PAD 3 (52-5-0523) has been assessed as having unknown archaeological significance. The proposed development cannot avoid impacts to Tallawarra Pipeline PAD 3 (52-5-0523). Further archaeological assessment in the form of subsurface investigations (archaeological test excavations) will be required in order to mitigate any development impacts.

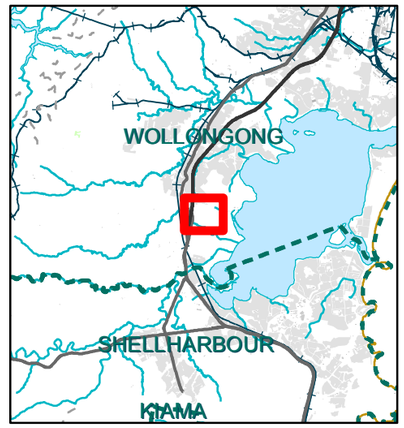
TLPD AFT 7 (52-5-0613), TLPD AFT 8 (52-5-0614), and TLPD AFT 9 (52-5-0615) have been assessed as having moderate archaeological significance. TLPD AFT 7 (52-5-0613), TLPD AFT 8 (52-5-0614), and TLPD AFT 9 (52-5-0615) are located within the proposed development area and impacts on them cannot be avoided (Figure 11). TLPD AFT 7 (52-5-0613), TLPD AFT 8 (52-5-0614), and TLPD AFT 9 (52-5-0615) should be salvaged under an AHIP prior to development in order to mitigate impacts to the AHIMS sites.

Previous assessments, including a limited archaeological test excavation program conducted by Biosis (2010), identified areas of high and moderate subsurface archaeological potential within the study area. Further testing is therefore recommended in the areas of high and moderate subsurface archaeological potential prior to development, to fully identify the nature and extent of Aboriginal occupation within the study area.

Furthermore, the conservation and integration of the Fig Tree associated with TLPD AFT 9 (52-5-0615) should be incorporated into the modification of the concept approval.



Acknowledgements: Basemap © Land and Property Information 2016; Imagery © Nearmap 2017



Legend

- Study area
- AHIMS Records
- Proposed development

Figure 11: Proposed development showing AHIMS sites

0 50 100 150 200 250

Metres

Scale: 1:5,000 @ A3

Coordinate System: GDA 1994 MGA Zone 56

N

Biosis Pty Ltd

Ballarat, Brisbane, Canberra, Melbourne, Newcastle, Sydney, Wangaratta & Wollongong

Matter: 24090
Date: 23 August 2017,
Checked by: RAM, Drawn by: LH, Last edited by: lharley
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7 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

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

Recommendation 1: Further archaeological assessment is required in areas of moderate and high archaeological potential

Areas identified as having high and moderate archaeological potential should be avoided wherever possible (Figure 10). If impact to these areas cannot be avoided subsurface investigations (test excavations) will be required prior to the commencement of works as a condition of the DA or concept approval. Test excavations should be conducted in accordance with the *Code of Practice for archaeological investigation for Aboriginal objects in NSW* (DECCW 2010b) and *Aboriginal cultural heritage consultation requirements for proponents in New South Wales* (DECCW 2010a).

Recommendation 2: Further archaeological assessment is required at Tallawarra Pipeline PAD 3 (AHIMS 52-5-0523)

If impacts to Tallawarra Pipeline PAD 3 (AHIMS 52-5-0523) cannot be avoided, subsurface investigations (test excavations) will be required prior to the commencement of works as a condition of the DA or concept approval. Test excavations should be conducted in accordance with the *Code of Practice for archaeological investigation for Aboriginal objects in NSW* (DECCW 2010b) and *Aboriginal cultural heritage consultation requirements for proponents in New South Wales* (DECCW 2010a).

Recommendation 3: Conservation of Fig Tree associated with TLPD AFT 9 (AHIMS 52-5-0615)

If possible the Fig Tree associated with TLPD AFT 9 (AHIMS 52-5-0615) should be conserved and incorporated into the modification of the concept approval.

Recommendation 4: No further archaeological assessment is required in areas of low archaeological potential

No further archaeological work is required in areas identified as having low archaeological potential except in the event that unexpected Aboriginal sites, objects or human remains are unearthed during development (refer to Recommendations 8 and 9 below).

Recommendation 5: Fencing of AHIMS sites

AHIMS sites or PAD areas located within 30 metres of the area of proposed works should be clearly marked and fenced in order to avoid unintentional impacts during construction.

Recommendation 6: Aboriginal cultural heritage induction for workers and contractors

The locations of each AHIMS site and PAD area located within the Tallawarra Lands development should be clearly mapped. Workers and contactors working at, or visiting the site should be made aware of the location of all AHIMS sites and PAD areas within the Tallawarra Lands development through an Aboriginal cultural heritage induction.

Recommendation 7: Application for an Aboriginal heritage impact permit (AHIP)

Should the Development Application (DA) be approved, it is recommended that Cardno apply to OEH for an AHIP to destroy the listed Aboriginal sites within the study area which are currently protected under the NSW *National Parks and Wildlife Act 1974*. **The AHIP should be for a term of ten (10) years.** The sites that will be impacted by the proposed works are as follows

- TLPD AFT 7 (AHIMS 52-5-0613)
- TLPD AFT 8 (AHIMS 52-5-0614)
- TLPD AFT 9 (AHIMS 52-5-0615)
- Tallawarra Pipeline PAD 3 (AHIMS 52-5-0523)

For information about AHIPs and their preparation, see below.

Advice preparing AHIPs

An AHIP is required for any activities likely to have an impact on Aboriginal objects or Places or cause land to be disturbed for the purposes of discovering an Aboriginal object. The Office of Environment and Heritage (OEH) issues AHIPs under Part 6 of *the National Parks and Wildlife Act 1974* (NPW Act).

AHIPs should be prepared by a qualified archaeologist and lodged with the OEH. Once the application is lodged processing time can take between 8-12 weeks. It should be noted that there will be an application fee levied by the OEH for the processing of AHIPs, which is dependent on the estimated total cost of the development project.

Recommendation 7: Discovery of Unanticipated Aboriginal Objects

All Aboriginal objects and Places are protected under the *NSW National Parks and Wildlife Act 1974*. It is an offence to knowingly disturb an Aboriginal site without a consent permit issued by the Office of Environment and Heritage (OEH). Should any 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 the OEH and Aboriginal stakeholders.

Recommendation 9: Discovery of Aboriginal Ancestral Remains

Aboriginal ancestral remains may be found in a variety of landscapes in NSW, including middens and sandy or soft sedimentary soils. 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 the NSW Police and OEH's 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 OEH.

Recommendation 10: Continued consultation with the registered Aboriginal stakeholders

As per the *Aboriginal cultural heritage consultation requirements for proponents 2010* (DECCW 2010a), it is recommended that the proponent provides a copy of this report to the Aboriginal stakeholders and considers all comments received. The proponent should continue to inform these groups about the management of Aboriginal cultural heritage sites within the study area throughout the life of the project.

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Appendices

Appendix 1 AHIMS results

THE FOLLOWING APPENDIX IS NOT TO BE MADE PUBLIC

AHIMS site no.	Site name	Site type
52-5-0246	Yallah Gully 3	Artefact, Shell
52-5-0247	Yallah Gully 2	Artefact
52-5-0248	Yallah Gully 1	Artefact
52-5-0249	Ash Pond 1	Artefact
52-5-0122	Yallah (Yallah Site2)	Artefact
52-5-0123	Yallah Site 1	Artefact
52-5-0221	Kurrura point	Shell, Artefact
52-5-0222	Mogurah Point	Shell, Artefact
52-5-0062	Yallah	Modified Tree (Carved or Scarred)
52-5-0070	Tallawarra Power Station	Shell, Artefact
52-5-0223	Boomberry Pt 1	Shell, Artefact
52-5-0224	Boomberry Point 2	Shell, Artefact
52-5-0225	Elizabeth Point	Artefact
52-5-0226	Mullet Creek	Shell, Artefact
52-5-0227	Macquarie Rivlet 1	Artefact
52-5-0229	Macquarie Rivlet 3	Artefact
52-5-0230	Macquarie Rivlet 4	Artefact
52-5-0231	Haywards Bay	Shell, Artefact
52-5-0237	Wollingurry Point	Shell, Artefact
52-5-0398	TEST PITTING AREA 19	Artefact
52-5-0412	Test Pitting area 19	Artefact
52-5-0523	Tallawara Pipeline PAD3	Potential Archaeological Deposit (PAD)
52-5-0516	Tallawara Canal Midden 1	Artefact, Potential Archaeological Deposit (PAD)
52-5-0524	KPAD1 Wyndarra Way	Potential Archaeological Deposit (PAD)
52-5-0622	Cleveland Road AFT-7	Artefact
52-5-0623	Cleveland Road AFT-8	Artefact
52-5-0610	TLPD AFT-1	Artefact
52-5-0611	TLPD AFT-5	Artefact

AHIMS site no.	Site name	Site type
52-5-0612	TLPD AFT-6	Artefact
52-5-0613	TLPD AFT-7	Artefact
52-5-0614	TLPD AFT-8	Artefact
52-5-0615	TLPD AFT-9	Artefact
52-5-0619	Cleveland Road AFT-6	Artefact
52-5-0616	TLPD AFT-10b	Artefact
52-5-0617	TLPD AFT-10c	Artefact
52-2-3831	Cleveland Road FT 1	Aboriginal Ceremony and Dreaming
52-2-3832	Cleveland Road FT 2	Aboriginal Ceremony and Dreaming
52-5-0642	Gilba Road 1	Artefact
52-5-0643	Gilba Road 2 Fill	Artefact
52-5-0823	Yallah to Oak Flats PAD 8 (YTOF PAD 8)	Potential Archaeological Deposit (PAD)
52-2-4209	Fowlers Road 01	Artefact, Potential Archaeological Deposit (PAD)
52-2-4208	Fowlers Road 01	Potential Archaeological Deposit (PAD), Artefact
52-2-1159	Karro Bay Albion Park	Shell, Artefact
52-2-1802	Wollingurry Creek 3	Artefact
52-2-1803	Haywards Bay 2	Shell, Artefact
52-2-1688	WD1-1	Artefact
52-2-1809	Wollingurry Ck 2	Artefact
52-2-1810	Wollingurry Ck 1	Artefact
52-5-0433	West Dapto Release Area PAD	Potential Archaeological Deposit (PAD), Artefact
52-5-0527	Wyndarra Way Isolated Find 1	Artefact
48-5-0065	Haywards Bay 2 (see site number 52-2-1803)	Potential Archaeological Deposit (PAD)
48-5-0066	Woolingurry Creek 1 (same as 52-2-1810)	Stone Arrangement
48-5-0067	Wollingurry Creek 2 (same as 52-2-1809)	Artefact
48-5-0068	Wollingurry Creek 3 (see site number 52-2-1802)	Artefact
52-5-0532	WWIF1 (Wyndarra Way Isolated Find 1)	Artefact
48-5-0126	Tallawarra Point 1	Artefact
48-5-0127	Tallawarra Power Station Midden	Artefact
52-5-0766	AHUGC001	Shell
52-5-0791	YTOF AS 7	Artefact

AHIMS site no.	Site name	Site type
52-5-0763	Yallah to Oak Flats AS 2	Artefact
52-5-0409	Test Pitting Area 20	Artefact
52-5-0492	WDRA_AX_36	Artefact
52-5-0481	Larkins Lane Site 8 (LLS8)	Artefact, Shell
52-5-0482	Larkins Lane Site 7 (LLS7)	Artefact, Shell
52-5-0483	WDRA_AS_10 same as 52-5-0513	Artefact
52-5-0484	WDRA_AS_09 same as 52-5-0512	Artefact
52-5-0507	WDRA_AX_02	Artefact
52-5-0478	Larkins Lane Site 6 (LLS6)	Artefact
52-5-0479	Larkins Lane Site 9 (LLS9)	Shell
52-5-0480	Larkins Lane Site 10 (LLS10)	Artefact
52-5-0512	WDR_AS_09 same as 52-5-0484	Artefact
52-5-0513	WDR_AS_10 same as 52-5-0483	Artefact
52-5-0473	Larkins Lane site 1 (LLS1)	Artefact
52-5-0474	Larkins Lane Site 2 (LLS2)	Shell
52-5-0475	Larkins Lane Site 3 (LLS3)	Shell
52-5-0476	Larkins Lane Site 4 (LLS4)	Shell
52-5-0477	Larkins Lane Site 5 (LLS5)	Shell
52-5-0471	Tallawarra Pipeline 1	Artefact
52-5-0472	Tallawarra Pipeline 2	Artefact
52-5-0500	WDRA_AX_27	Artefact
52-5-0501	WDRA_AX_28	Artefact
52-2-3765	Cleveland Road PAD 3	Potential Archaeological Deposit (PAD)
52-5-0585	Cleveland Road PAD 4	Potential Archaeological Deposit (PAD)
52-5-0586	Cleveland Road PAD-4	Potential Archaeological Deposit (PAD)
52-5-0583	Cleveland Road PAD 1	Potential Archaeological Deposit (PAD)
52-5-0584	Cleveland Road PAD 2	Potential Archaeological Deposit (PAD)