

1030-1048 and 1050-1064 Mamre Road, Kemps Creek: Archaeological Report

FINAL REPORT

Prepared for ESR Developments (Australia) Pty Ltd

3 November 2023

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- Registered Aboriginal Parties

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- Astrid Mackegard, Jen Townsend and Henri Liswoyo (mapping)

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Contents

Glossary.....	VI
Summary	VIII
1 Introduction	1
1.1 Project background	1
1.2 Response to project SEARs requirements.....	1
1.3 Study area.....	1
1.4 Planning approvals	2
1.4.1 Mamre Road Precinct Development Control Plan 2021	2
1.5 Objectives of the investigation.....	3
1.6 Investigators and contributors	4
2 Proposed development	8
3 Desktop assessment	10
3.1 Landscape context.....	10
3.1.1 Topography and hydrology	10
3.1.2 Soil landscapes	11
3.1.3 Landscape resources	15
3.1.4 Land use history	16
3.2 Previous archaeological work	19
3.2.1 Regional overview	20
3.2.2 Local overview.....	23
3.2.3 AHIMS site analysis	26
3.2.4 AHIMS sites within vicinity of the study area	27
3.3 Discussion.....	30
3.3.1 Predictive statements.....	30
4 Archaeological survey	33
4.1 Archaeological survey objectives.....	33
4.2 Archaeological survey methodology	33
4.2.1 Survey methods.....	33
4.3 Archaeological survey results.....	34
4.3.1 Visibility.....	34
4.3.2 Exposure	35
4.3.3 Disturbances	37
4.4 Discussion of archaeological survey results	39
5 Test excavation.....	42
5.1 Test excavation objectives	42
5.2 Test excavation methodology	42
5.3 Test excavation results	43

5.3.1	PAD 1.....	44
5.3.2	PAD 2.....	45
5.3.3	PAD 3.....	46
5.3.4	PAD 4.....	47
5.3.5	PAD 5.....	48
5.3.6	PAD 6.....	50
6	Analysis and discussion.....	52
6.1	Artefact analysis	52
6.2	Artefact composition and distribution	52
6.3	Comparative analysis	53
6.4	Discussion of results	53
6.5	Aboriginal site identified by the assessment.....	54
6.5.1	AHIMS 45-5-5634/Mamre Road PAD 1	54
7	Scientific values and significance assessment.....	59
7.1	Introduction to the assessment process	59
7.2	Archaeological (scientific significance) values.....	60
7.2.1	Statements of archaeological significance	62
8	Impact assessment	64
8.1	Predicted physical impacts	64
8.2	Ecologically Sustainable Development	64
8.2.1	Collection of archaeological information.....	65
8.3	Assessment of impacts to the study area	66
9	Conclusions and Recommendations.....	69
9.1	Conclusions	69
9.2	Recommendations	69
Appendix 1	AHIMS results.....	76
Appendix 2	Test excavation results and test pit drawings.....	77
Appendix 3	Artefact data	78

Tables

Table 1	Site details.....	VIII
Table 2	Response to project SEARs requirements	1
Table 3	Investigators and contributors.....	4
Table 4	AHIMS search results.....	27
Table 5	Aboriginal site prediction statements	31
Table 6	Survey coverage	34
Table 7	Landform summary	34

Table 8	Test excavation results by PAD	43
Table 9	Grid reference for AHIMS 45-5-5634/Mamre Road PAD 1 (GDA94/MGA56) (approximate centre point of site)	54
Table 10	Site contents ratings used for archaeological sites	60
Table 11	Site condition ratings used for archaeological sites.....	61
Table 12	Site representativeness ratings used for archaeological sites	62
Table 13	Scientific significance ratings used for archaeological sites	62
Table 14	Scientific significance assessment of archaeological sites recorded within the study area	62
Table 15	Statements of scientific significance for archaeological sites recorded within the study area	63
Table 16	Summary of potential archaeological impact	64
Table 17	Summary of sub-surface impacts of proposed works (SSD-46983729)	66
Table 18	Summary of potential archaeological impacts to the study area	67

Figures

Figure 1	Location of the study area	6
Figure 2	Study area detail	7
Figure 3	Proposed works	9
Figure 4	Geological units in the vicinity of the study area.....	12
Figure 5	Hydrology and topography in the vicinity of the study area.....	13
Figure 6	Soil landscapes in the vicinity of the study area	14
Figure 7	AHIMS within the vicinity of the study area.....	29
Figure 8	Survey results and coverage	40
Figure 9	Landforms.....	41
Figure 10	Test excavation coverage and results	51
Figure 11	Aboriginal sites in the study area	58
Figure 12	Impact assessment.....	68

Photos

Photo 1	Mamre Road Precinct DCP 2021 archaeological potential (study area in red) (Source: NSW Planning portal)	3
Photo 2	Diagram showing Strahler stream order (Ritter et al. 1995, p.151)	11
Photo 3	Historical aerial imagery dated to 1947, with the study area outlined in blue (Source: NSW Spatial Services)	17
Photo 4	Historical aerial imagery dated to 1965, with the study area outlined in blue (Source: NSW Spatial Services)	17
Photo 5	Historical aerial imagery dated to 1975, with the study area outlined in blue (Source: NSW Spatial Services)	18
Photo 6	Historical aerial imagery dated to 1986, with the study area outlined in blue (Source: NSW Spatial Services)	19

Photo 7	Historical aerial imagery dated to 2005, with the study area outlined in blue (Source: NSW Spatial Services)	19
Photo 8	AHIMS 45-5-5503/Abbot's Rd Kemps Creek IF1	27
Photo 9	AHIMS 45-5-5504/Abbot's Rd Kemps Creek IF2	28
Photo 10	AHIMS 45-5-5505/Abbot's Rd Kemps Creek IF3	28
Photo 11	General visibility in the study area, facing south-east	35
Photo 12	General visibility within the study area showing extensive grass coverage, facing east	35
Photo 13	Exposure within the study area	36
Photo 14	Exposure within vehicle access, photo facing east.....	36
Photo 15	Disturbances within the study area associated with residential construction, facing south.....	37
Photo 16	Disturbances within the study area associated with residential and agricultural construction, installation of fencing and transmission line, facing south	38
Photo 17	Area of disturbance within the study area as a result of geotechnical testing	38
Photo 18	PAD 1 T1 TP3 showing representative soils	44
Photo 19	PAD 1 T1 TP1 section drawing showing representative soils	44
Photo 20	PAD 2 T1TP1 showing representative soils	45
Photo 21	PAD 2 T2TP4 section drawing showing water in base	46
Photo 22	PAD 3 T1 TP1 showing representative soils	47
Photo 23	PAD 3 T2 TP3 section drawing showing representative soils	47
Photo 24	PAD 4 T2 TP 3 showing representative soils	48
Photo 25	PAD 4 T2 TP2 section drawing showing representative soils	48
Photo 26	PAD 5 T3 TP 1 showing representative soils	49
Photo 27	PAD 5 T1 TP3 section drawing showing representative soils	49
Photo 28	PAD 6 T1 TP1 showing representative soils	50
Photo 29	PAD 6 T1 TP1 section drawing showing representative soils	50
Photo 30	East facing view of AHIMS 45-5-5634/Mamre Road PAD 1	55
Photo 31	Silcrete proximal flake dorsal surface.....	56
Photo 32	Silcrete angular fragment	56
Photo 33	Silcrete proximal flake dorsal surface.....	57

Glossary

ACHA	Aboriginal Cultural Heritage Assessment
ACHMP	Aboriginal Cultural Heritage Management Plan
AHIMS	Aboriginal Heritage Information Management System
Consultation requirements	<i>Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010</i> (DECCW 2010a)
DA	Development Application
DCCEW	Department of Climate Change, Energy, the Environment and Water (now Heritage NSW)
DP	Deposited Plan
DPE	Department of Planning and Environment
ESR Australia	ESR Developments (Australia) Pty Ltd
EP&A Act	<i>Environmental Planning and Assessment Act 1979</i>
GDA	Geocentric Datum of Australia
GPS	Global Positioning System
GSV	Ground Surface Visibility
GFA	Gross Floor Area
Heritage NSW	Heritage NSW, Department of Planning and Environment
ICOMOS	International Council on Monuments and Sites
LALC	Local Aboriginal Land Council
LEP	Local Environmental Plan
LGA	Local Government Area
Mamre Road DCP	<i>Mamre Road Precinct Development Control Plan 2021</i>
MGA	Map Grid of Australia
NHL	National Heritage List
NPW Act	<i>National Parks and Wildlife Act 1974</i>
NPWS	National Parks and Wildlife Service
NSW	New South Wales
NTSCORP	Native Title Services Corporation
PAD	Potential Archaeological Deposit

RAP	Registered Aboriginal Parties
SEARs	Secretary Environmental Assessment Requirements
SEPP	State Environmental Planning Policy
SSD	State Significant Development
Study area	1030-1048 and 10450-1064 Mamre Road, Kemps Creek (Lot 3 and 4 DP 250002)
the Code	<i>Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW</i> (DECCW 2010b)

Summary

Biosis Pty Ltd (Biosis) was commissioned by ESR Developments (Australia) Pty Ltd (ESR Australia) to undertake an Aboriginal Cultural Heritage Assessment (ACHA) of a proposed industrial development at 1030 - 1048 and 1050 - 1064 Mamre Road, Kemps Creek, New South Wales (NSW) (Lot 3 and 4 DP 250002) (the study area). This Archaeological Report (AR) documents the findings of the archaeological investigations conducted as part of the ACHA. As required under Section 2.3 of The *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (DECCW 2010a) (the Code), the AR provides evidence about the material traces of Aboriginal land use to support the conclusions and management recommendations in the ACHA. The project is to be assessed as a State Significant Development (SSD) application (SSD-46983729 (Westlink Industrial Estate – Stage 2)) under Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). Secretary Environmental Assessment Requirements (SEARs) (10 August 2022) have requested that an ACHA is prepared for the project.

The study area is located within Lot 3 and 4 DP 250002 and is approximately 22 kilometres south of Penrith and approximately 53 kilometres west of the Sydney central business district (CBD). It encompasses 10.4 hectares of private and the adjacent road reserves.

There are 93 Aboriginal cultural heritage sites registered with the Aboriginal Heritage Information Management System (AHIMS) register in the vicinity of the study area (AHIMS search date: 25 July 2023, Client Service ID: 803412). Site types in the vicinity of the study area include artefacts, Potential Archaeological Deposits (PADs), modified trees, and grinding grooves.

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

An archaeological survey was conducted on 18 February and 31 May 2022. 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 (GSV) combined with a low amount of exposures. In total five PADs were identified.

Test excavations were undertaken as a part of this assessment from 2 to 5 August 2022. A total of 41 test pits were excavated across the study area. Three artefacts were identified as part of the testing program and one Aboriginal site was identified. The Aboriginal site identified as part of the project is outlined in Table 1 below.

Table 1 Site details

Site name	Site type	Significance	Type of harm before mitigated	Consequence of unmitigated harm	Site specific recommendations
AHIMS 45-5-5634/Mamre Road PAD 1	Sub-surface artefact deposit	Low	Direct	Total loss of value	Avoidance is not possible as part of the development. This site should be managed under an Aboriginal Cultural Heritage Management Plan (ACHMP) following SSD approval.

There is potential for development activities to impact Aboriginal sites and the identified sites or areas of (archaeological) sensitivity.

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

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

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

Management recommendations

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

Recommendation 1: Development of an Aboriginal Cultural Heritage Management Plan

As per Section 4.41 of the EP&A Act an Aboriginal Heritage Impact Permit (AHIP) under the *National Parks and Wildlife Act 1974* (NPW Act) is not required for SSD projects authorised by a development consent. All works must be conducted in accordance with the SSD consent conditions.

It is recommended an ACHMP be developed in order to appropriately manage Aboriginal cultural heritage identified within the study area. This will identify how to properly manage Aboriginal heritage for the project and would include unanticipated finds protocols and a heritage induction to be undertaken by the site personnel prior to works. The ACHMP should also detail the long term care and control of AHIMS 45-5-5634/Mamre Road PAD 1.

The ACHMP must be prepared by a suitably qualified archaeologist in consultation with the Registered Aboriginal Parties (RAPs) for the project.

Recommendation 2: Long term care and control agreement

The establishment of a long term care agreement via the ACHMP in consultation with RAPs should be developed in order to ensure the artefacts identified as part of this assessment are adequately cared for. Several management options are possible depending on the wishes of RAPs. Artefacts recovered from the excavations can be given back to the Aboriginal community through a care and control agreement where they can then be used to teach subsequent generations about Aboriginal culture or can be reburied in a culturally appropriate place.

This approach considers the principles of Ecologically Sustainable Development (ESD) and intergenerational equity and more importantly ensures that recovered artefacts are managed according to the wishes of RAPs.

Recommendation 3: Continued consultation with the RAPs

As per the consultation guidelines it is recommended that the proponent provides a copy of this report to the RAPs 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. The RAPs should be consulted in regards to the resting place of the artefacts.

Recommendation 4: Native landscaping

Consultation with Kamilaroi Yankuntjatjara Working Group has also recommended that native landscaping be implemented for the project. ESR Australia are to consult with the landscape architect for the project.

Recommendation 5: Discovery of unanticipated Aboriginal objects

All Aboriginal objects and Places are protected under the NSW NPW Act. It is an offence to disturb an Aboriginal site without a consent permit issued by Heritage NSW, Department of Planning and Environment (DPE) (Heritage NSW) or SSD approval issued by DPE. 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 Heritage NSW and RAPs.

Recommendation 6: Discovery of unanticipated historical relics

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

Recommendation 7: Discovery of human remains

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

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

1 Introduction

1.1 Project background

Biosis was commissioned by ESR Australia to undertake an ACHA of the proposed subdivision at 1030-1048 and 1050-1064 Mamre Road (Lot 3 and 4 DP 250002), Kemps Creek, NSW (the study area) (Figure 1 and Figure 2). This AR documents the findings of the archaeological investigations conducted as part of the ACHA. The AR provides evidence about the material traces of Aboriginal land use to support the conclusions and management recommendations in the ACHA.

The project is to be assessed as a SSD application (SSD-46983729 (Westlink Industrial Estate – Stage 2)) under Part 4 of the EP&A Act. This ACHA has assessed 1030-1048 and 1050-1064 Mamre Road, Kemps Creek, NSW (Lot 3 and 4 DP 250002) only.

The project will be put forward as a SSD, therefore this investigation has been carried out under Part 4 of the NPW Act. This AR has been prepared in accordance with the Code. The Code has been developed to support the process of investigating and assessing Aboriginal cultural heritage by specifying the minimum standards for archaeological investigation undertaken in NSW under the NPW Act. The archaeological investigation must be undertaken in accordance with the requirements of the Code.

1.2 Response to project SEARs requirements

This ACHA has been prepared in response to the SEARs requirements (SSD-46983729) (Table 2). This ACHA identifies, describes and documents Aboriginal cultural heritage values that exist within the study area in accordance with the Code, consultation requirements and the *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (OEH 2011). This ACHA details the investigation, consultation and assessment of Aboriginal cultural heritage undertaken for the study area.

Table 2 Response to project SEARs requirements

SEAR No.	Heading	Issue and Assessment requirements	Documentation	Section of report responding to SEARs
18	Aboriginal Cultural Heritage	Provide an Aboriginal Cultural Heritage Assessment Report prepared in accordance with relevant guidelines, identifying, describing and assessing any impacts for any Aboriginal cultural heritage values on the land.	Aboriginal Cultural Heritage Assessment Report	Refer to the ACHA and Sections 3, 4, 5, 6, 7, 8 of this report.

1.3 Study area

The study area is located within Lot 3 and 4 DP 250002 and is approximately 22 kilometres south of Penrith and approximately 53 kilometres west of the Sydney CBD (Figure 3.1 and Figure 3.2). It encompasses 21.8 hectares of private and the adjacent road reserves.

The study area is within the:

- Penrith Local Government Area (LGA).
- Parish of Melville.
- County of Cumberland.

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

1.4 Planning approvals

The proposed development will be assessed against Part 4 of the EP&A Act. Other relevant legislation and planning instruments that will inform this assessment include:

- Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).
- NPW Act.
- NSW *National Parks and Wildlife Amendment Act 2010*.
- *State Environmental Planning Policy (SEPP) (Industry and Employment) 2021*.
- SEPP (Precincts – Western Parkland City) 2021.
- *Penrith Local Environmental Plan 2010* (LEP).
- *Penrith Development Control Plan 2014* (DCP).
- *Mamre Road Precinct Development Control Plan 2021* (Mamre Road DCP).

1.4.1 Mamre Road Precinct Development Control Plan 2021

The Mamre Road Precinct DCP aims to ensure that Aboriginal heritage values are managed appropriately in order to produce conservation outcomes. This includes archaeological and culturally significant areas. The DCP has mapped areas of high and moderate Aboriginal archaeological potential along Mamre Road; however, it was noted by Heritage NSW in their review of the DCP that the designations of potential were primarily based on a desktop assessment and predictive modelling with very limited field survey. The study area contains areas of moderate-high Aboriginal potential in the north-western and south-eastern corners of the study area (Photo 1).

The DCP has a list of controls for completing assessments for Aboriginal heritage. For ground disturbing works this includes completing an Aboriginal Due Diligence Assessment for areas that have not yet been mapped or areas of low potential as a first step. If land is within or adjacent to land that contains a known Aboriginal cultural heritage site, assessments must consider and comply with the requirements of the NPW Act.

The DCP determines that an ACHA is required as the study area contains areas of moderate-high Aboriginal archaeological potential and that these areas would be impacted by the proposed development. The DCP also states that an AHIP will be required if impacts to Aboriginal heritage cannot be avoided. This project is a SSD and as such an AHIP will not be required. This is due the overall assessment of State significant projects that addresses all heritage issues and is subject to the consent authority of the Minister for Planning or delegates. Therefore these projects do not require an AHIP under the NPW Act.

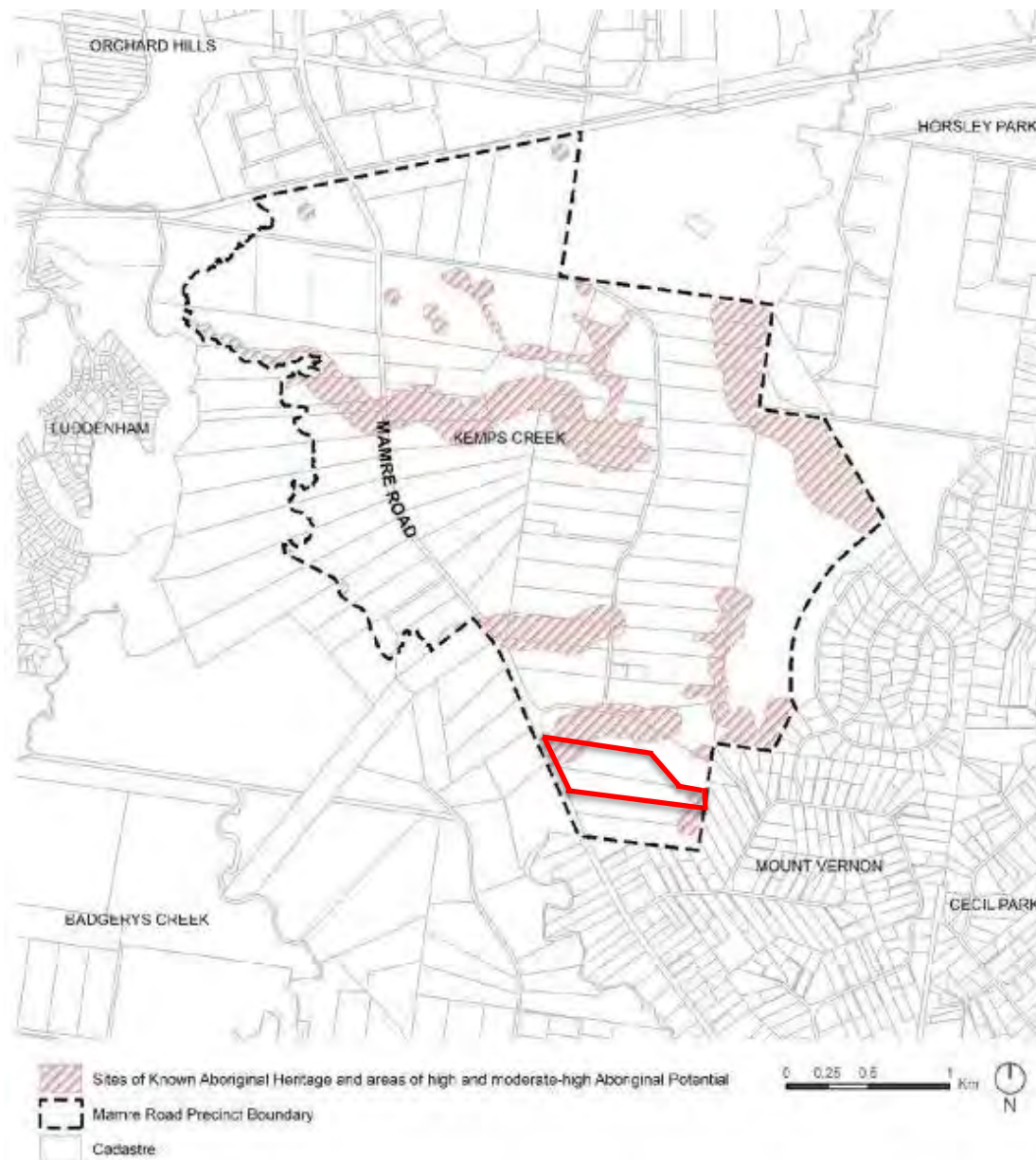


Photo 1 Mamre Road Precinct DCP 2021 archaeological potential (study area in red) (Source: NSW Planning portal)

1.5 Objectives of the investigation

The objectives of the investigation can be summarised as follows:

- To identify and consult with any registered Aboriginal stakeholders and the Deerubbin Local Aboriginal Land Council (LALC).
- To conduct 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.

1.6 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 3.

Table 3 Investigators and contributors

Name and qualifications	Project relevant experience summary	Project role
Joshua Madden BA (Hons) (Archaeology) Grad Certificate (Environmental management and sustainability)	Joshua is a Senior Heritage Consultant with over 12 years' experience providing expert heritage management advice to clients. He is experienced in managing large complex urban, greenfield and linear projects. His project experience includes transport infrastructure and urban development in NSW. Josh has a highly developed understanding of the legislative frameworks and approval pathways within which projects operate. He is experienced in the delivery of heritage and archaeological assessments, managing fieldwork and excavation programs and the delivery of post fieldwork reporting to a high standard and within project timeframes.	<ul style="list-style-type: none"> • Quality assurance
Mathew Smith BA/BSc (Hons)	Mathew is a Senior Heritage Consultant with over six years of experience in consulting and has successfully completed numerous projects throughout NSW. Mathew has extensive experience in undertaking Aboriginal archaeological assessments, archaeological surveys, and large scale archaeological testing and salvage excavation programs across NSW. Mathew has participated in and managed a number of long term archaeological programs and is an expert lithic analyst.	<ul style="list-style-type: none"> • Technical advice • Field investigation • Quality assurance
Anthea Vella B.Arch M.AHM	Anthea is a Heritage Consultant with over five years experience. Anthea has experience in conducting	<ul style="list-style-type: none"> • Project management • Client liaison

Name and qualifications	Project relevant experience summary	Project role
	Aboriginal and historical heritage assessments, surveys and archaeological test excavations for a variety of projects throughout NSW. Anthea has experience in undertaking desktop assessments, project management, and reporting.	<ul style="list-style-type: none"> • Field investigation • Test excavations • Reporting
Molly Crissell BA Archaeology	Molly is a Heritage Consultant with over three years of experience. Molly has worked in Western Australia and NSW gaining experience in Aboriginal and historical excavations and surveys. Molly has experience in reporting, community consultation, artefact analysis and project managing.	<ul style="list-style-type: none"> • Test excavations • Background research
Hannah Mills BA, MA Cultural Heritage Studies	Hannah is a Heritage Consultant based in the Biosis Wollongong office. She completed her Masters in Cultural Heritage Studies in 2020 and undertaken fieldwork across the south coast of NSW. Since joining Biosis, Hannah has gained experience in background research, Aboriginal consultation practices, field investigations and report preparation.	<ul style="list-style-type: none"> • Background research • Aboriginal consultation
Lauren Harley Gcert EnvMgt BA IntSt, BSc EnvBio, AUSRIVAS Accreditation (modules 1,2 & 4)	<p>Lauren has over nine years' experience in the field of GIS and has worked on a diverse range of projects within both the private and public sectors.</p> <p>Prior to joining Biosis in 2015, Lauren worked within local government as a GIS Officer in the Land and Property Services Branch at Hornsby Council. In this role, Lauren was responsible for maintaining Council's GIS and Property Management Systems. Lauren also provided technical and expert advice for a wide range of land and property information matters and trained staff in the use of GIS and related systems. Major projects undertaken at Council included the development and compilation of metadata for all of Council's GIS datasets and an organisation-wide GIS file audit and introduction of GIS best practice procedures for staff.</p> <p>Since joining Biosis, Lauren's experience with the preparation and production of high quality maps and plans and her proficiency across a wide range of technical skills including data conversion, digitising, spatial analysis and data management has been demonstrated.</p>	<ul style="list-style-type: none"> • GIS mapping

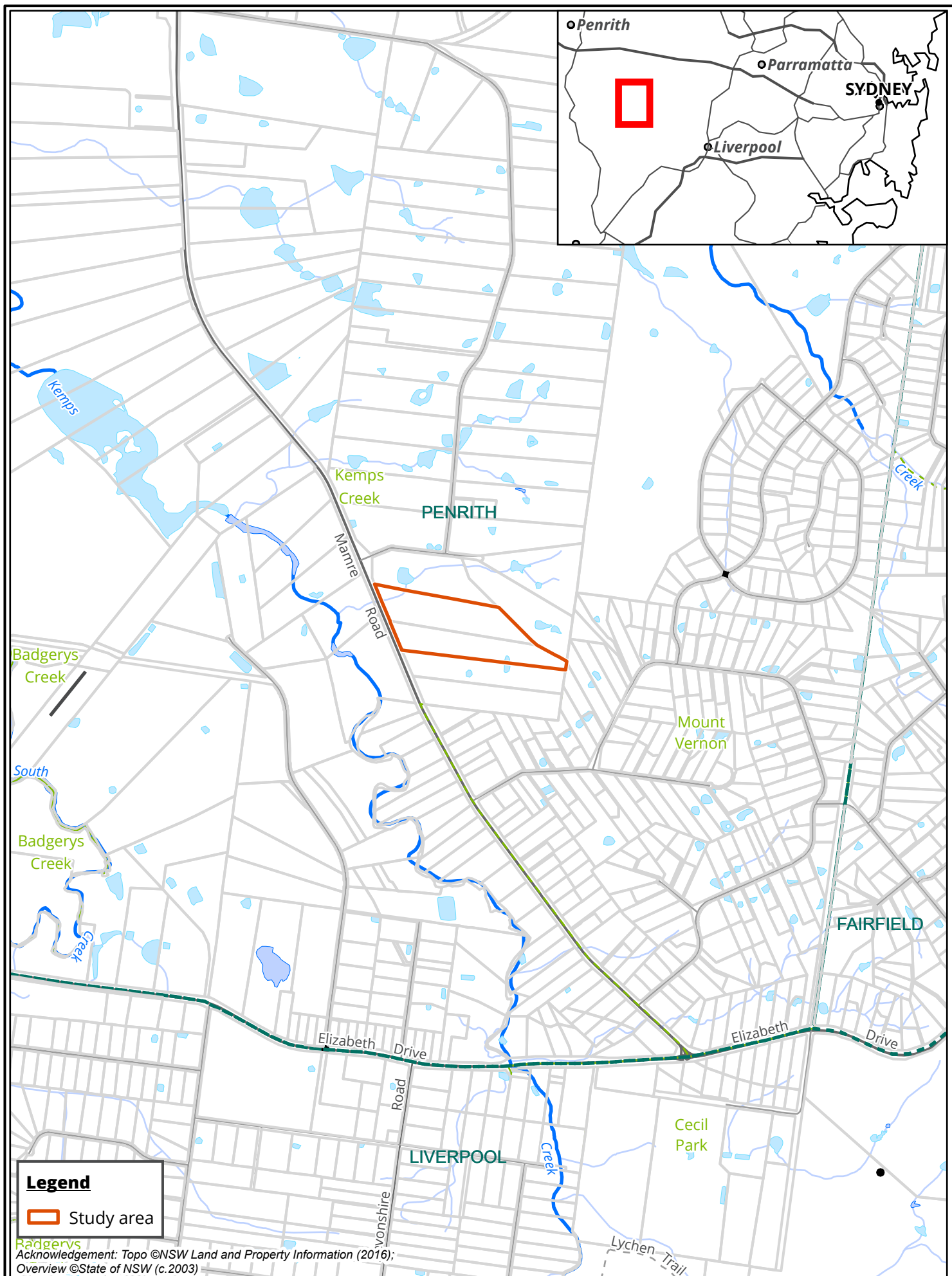
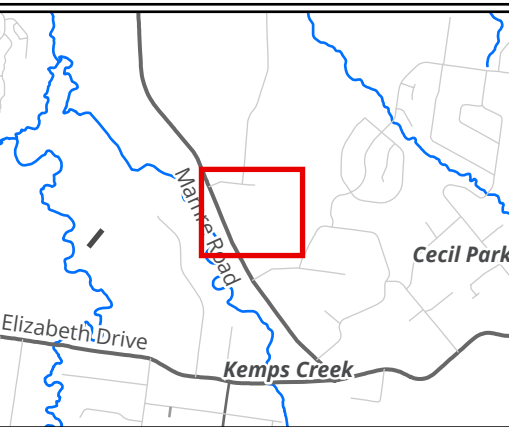


Figure 1 Location of the study area

Matter: 37009
Date: 02 June 2022,
Drawn by: JET, Checked by: MC, Last edited by: jtowndsend
Location: P:\37000s\37009\Mapping\37009_MamreRd, Layout: 37009_ACHA_F1_Locality

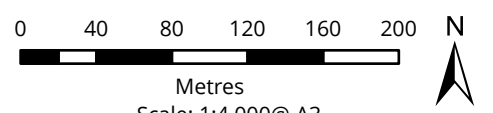
0 200 400 600 800 1,000
Metres
Scale 1:25,000@ A4, GDA 1994 MGA Zone 56





- Legend**
- Study area
 - Lot

Figure 2 Study area detail



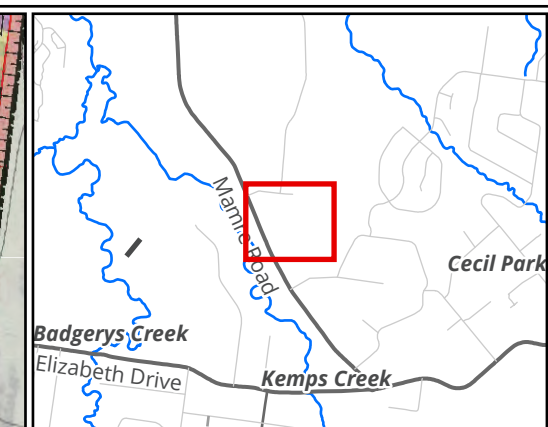
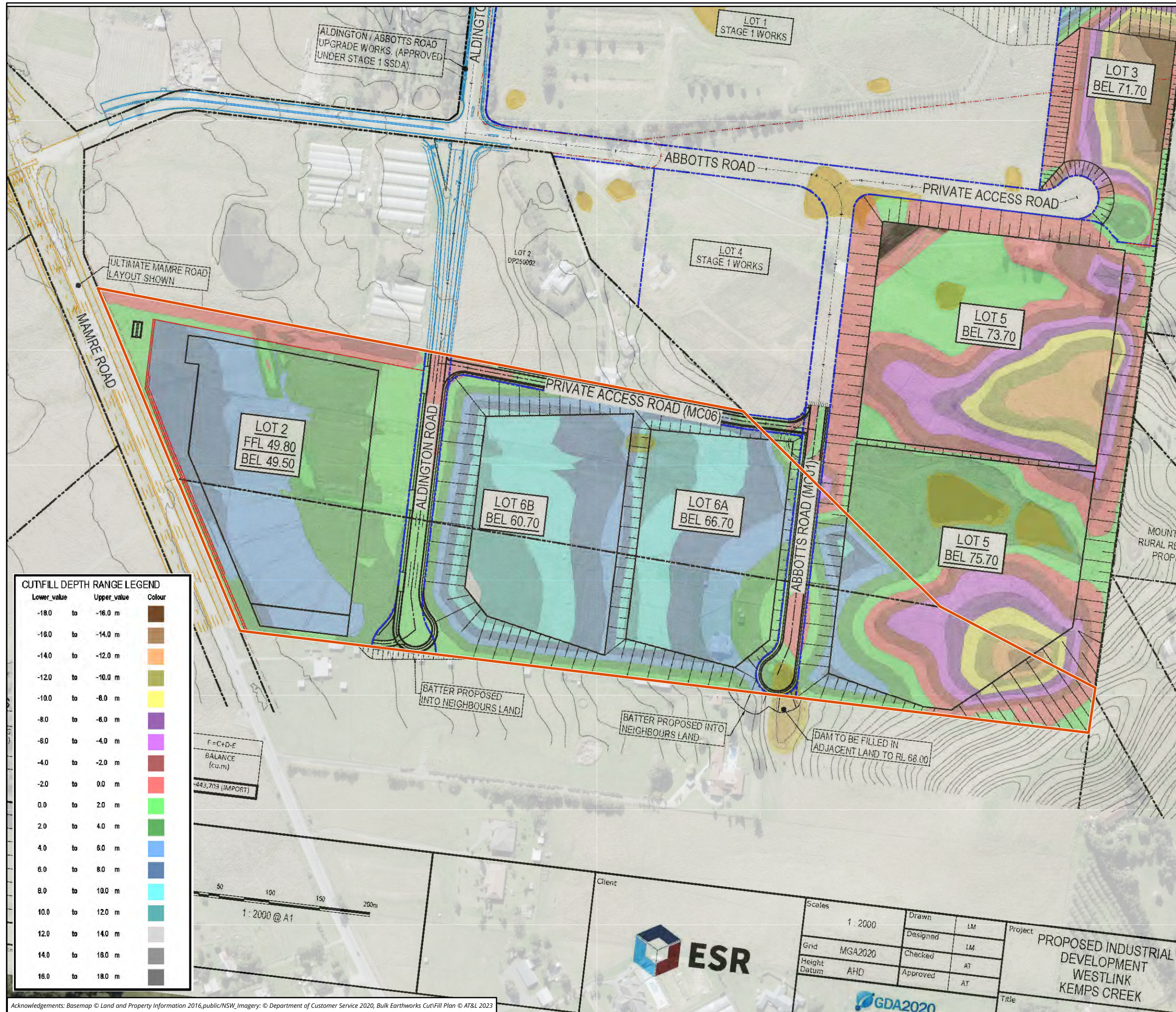
Scale: 1:4,000@ A3
Coordinate System:
GDA 1994 MGA Zone 56

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2 Proposed development

The proposal is for a warehouse and distribution centre with ancillary office space with a total gross floor area (GFA) of approximately 38,500 m² (Figure 3). Specifically, the proposal seeks approval for:

- Site preparation works, including demolition, clearing of all vegetation, bulk earthworks and retaining walls, construction of new internal roads and stormwater and drainage works.
- Subdivision of the site.
- Construction of an industrial warehouse buildings with ancillary office space comprising a total GFA of approximately 38,500m², including:
 - Loading docks and hardstand area, on-lot car parking and internal accessways.
 - Associated landscaping and signage.
 - Hours of operation of 24 hours, 7 days a week.



Legend

Study area

CUT/FILL DEPTH RANGE LEGEND

Lower value	Upper value	Colour
-18.0	to -16.0 m	Dark Brown
-16.0	to -14.0 m	Light Brown
-14.0	to -12.0 m	Orange
-12.0	to -10.0 m	Yellow
-10.0	to -8.0 m	Light Green
-8.0	to -6.0 m	Green
-6.0	to -4.0 m	Dark Green
-4.0	to -2.0 m	Light Blue
-2.0	to 0.0 m	Blue
0.0	to 2.0 m	Light Blue
2.0	to 4.0 m	Blue
4.0	to 6.0 m	Light Blue
6.0	to 8.0 m	Blue
8.0	to 10.0 m	Light Blue
10.0	to 12.0 m	Blue
12.0	to 14.0 m	Light Blue
14.0	to 16.0 m	Blue
16.0	to 18.0 m	Light Blue

F=C+D+E
BALANCE
(cu.m)
-443,703 (IMPORT)

1:2000 @ A1



Scales	1:2000	Drawn	LM	Project
Grid	MGA2020	Designed	LM	
Height Datum	AHD	Checked	AT	
		Approved	AT	Title

PROPOSED INDUSTRIAL DEVELOPMENT WESTLINK KEMPS CREEK

0 20 40 60 80 100

Metres

Scale: 1:3,500@ A3
Coordinate System:
GDA 1994 MGA Zone 56



Matter: 39590, Date: 01 November 2023,
Prepared for: AV, Prepared by: HL, Last edited by: hliswoyo
Location: P:\39500s\39590\Mapping\
39590_Mamre-rd_Kemps-Creek_ACHA-and-HIS-updates, Layout:
39590_HIS_F3_ProposedWorks

3 Desktop assessment

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

3.1 Landscape context

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

3.1.1 Topography and hydrology

The study area is located within the Cumberland Lowlands physiographic region that consists of low lying, gently undulating plains and low hills, with a dense drainage net of predominantly northward flowing channels (Bannerman & Hazelton 1990a, p.2). Topographically, the study area is characterised by steep slopes within the eastern portion of the study area. This landscape is situated on the Bringelly Shale formation and alluvial floodplain deposit (Figure 4). The Bringelly Shale formation is part of the Wianamatta group, and consists of shale, carbonaceous claystone, laminate, lithic sandstone and rare coal. Artefact scatters are common in this geological unit, as are PADs. The presence of underlying shale deposits suggests that sites commonly found within sandstone formations, such as grinding grooves and rock shelters/rock art, are less likely to be present. Alluvial floodplain deposits consist of alluvium, and this is comprised of gravel, sand, silt, and clay from sandstone and shale that overlies buried estuarine sediments (Hazelton 1992, p.68). Alluvial floodplains are deposited when flooding breaks through the river bank, with deposited materials varying depending on the energy of the river (Nanson, & Croke 1992).

Stream order is recognised as a factor which assists the development of predictive modelling in Sydney Basin Aboriginal archaeology, and has seen extensive use in predictive modelling for the Sydney region, most notably by Jo McDonald Cultural Heritage Management (JMCHM) (JMCHM 2000, JMCHM 2005a, JMCHM 2005b, JMCHM 2008). These predictive models have a tendency to favour higher order streams as the locations of campsites and therefore archaeological deposits. Larger water sources would have been more likely to provide a stable source of water and by extension other resources which would have been used by Aboriginal groups.

The stream order system used for this assessment was originally developed by Strahler (1952). It functions by adding two streams of equal order at their confluence to form a higher order stream, as shown in Photo 2. As stream order increases, so does the likelihood that the stream would be a perennial source of water.

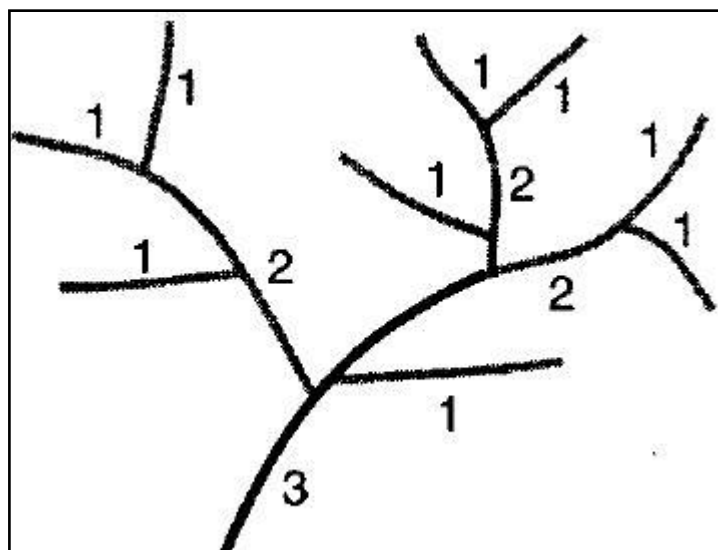


Photo 2 Diagram showing Strahler stream order (Ritter et al. 1995, p.151)

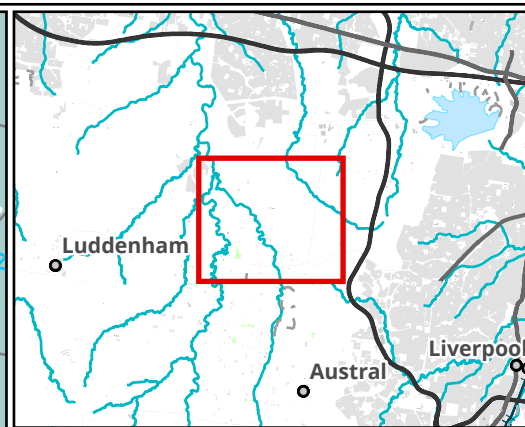
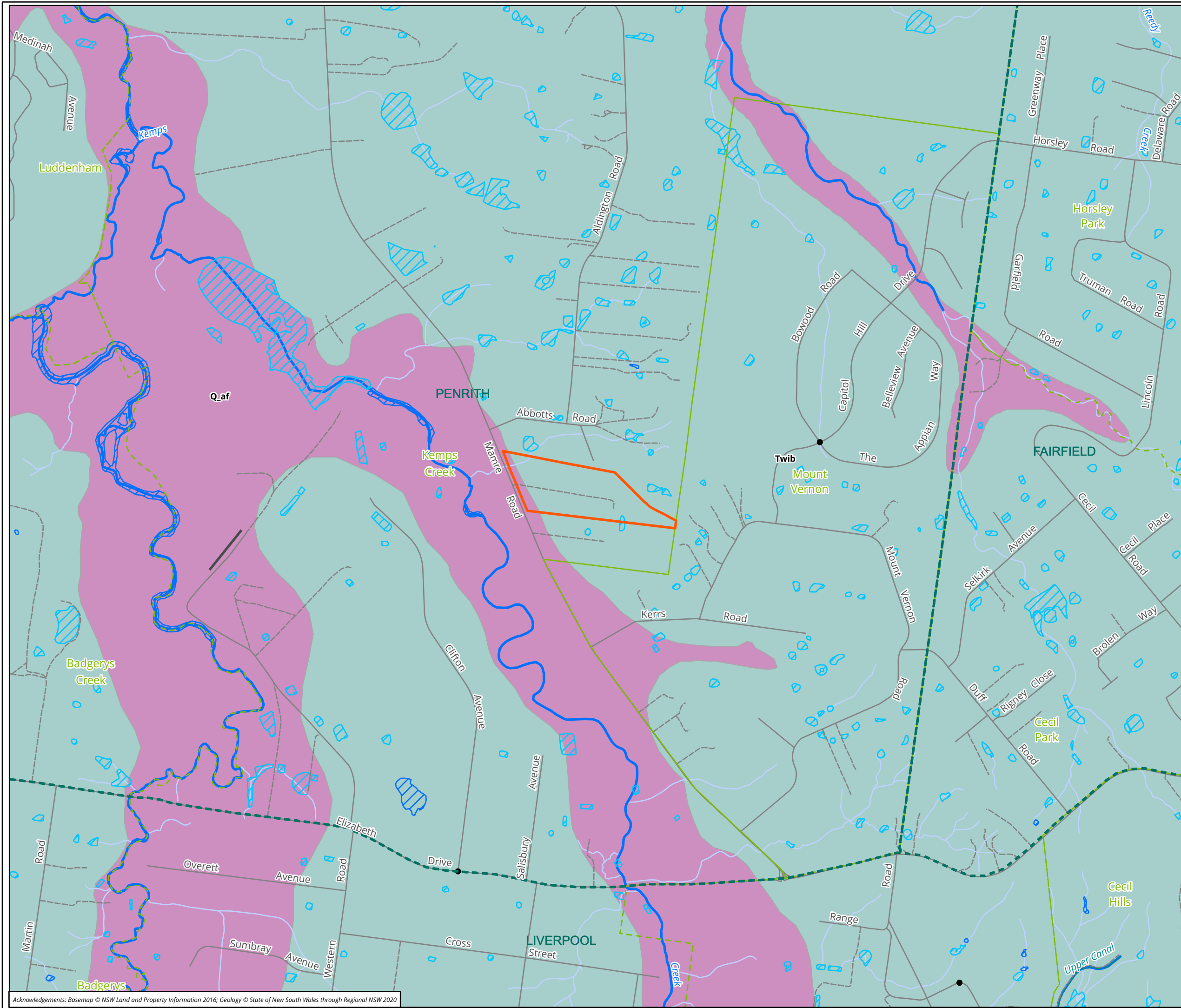
There is one creek line in the north-western corner of the study area (Figure 5). This is a non-perennial second order water course, which is a tributary of Kemps Creek, a perennial fourth order creekline. Kemps Creek is located approximately 247 metres west of the study area. There is one dam located in the south-eastern portion of the study area. Proximity to a permanent water source is considered a positive indicators for past Aboriginal land use.

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 is located within two soil landscapes, the Luddenham and Blacktown soil landscapes (Figure 6). The Luddenham soil landscape consists of low rolling to steep low hills with local reliefs of 50-120 metres, slopes of 5-20%, convex narrow ridges and hillcrests with moderately inclined slopes containing drainage lines (Bannerman & Hazelton 1990a, p.63). The Luddenham soil landscape is considered erosional, and because of lateral movement, especially on inclined landforms, is unlikely to preserve archaeological material on the surface or in situ as this material is removed by these forces.

The Blacktown soil landscape comprises gently undulating rises, broad rounded crests and gently inclined slopes, of less than 5% (Bannerman & Hazelton 1990b, p.28). The Blacktown soil landscape is a residual landscape which develops slowly, allowing geomorphic processes to preserve Aboriginal objects as they are deposited on the surface. Because of a lack of erosional forces, there is little lateral movement on the surface or below, and thus may preserve archaeological material in-situ provided ground disturbances have not occurred.



Legend

Study area

Geological units

Q_af, Alluvial floodplain deposits

Twib, Bringelly Shale


Figure 4 Geological units in the vicinity of the study area

0 160 320 480 640 800

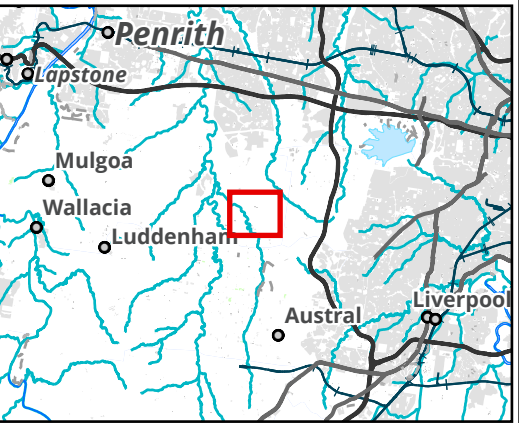
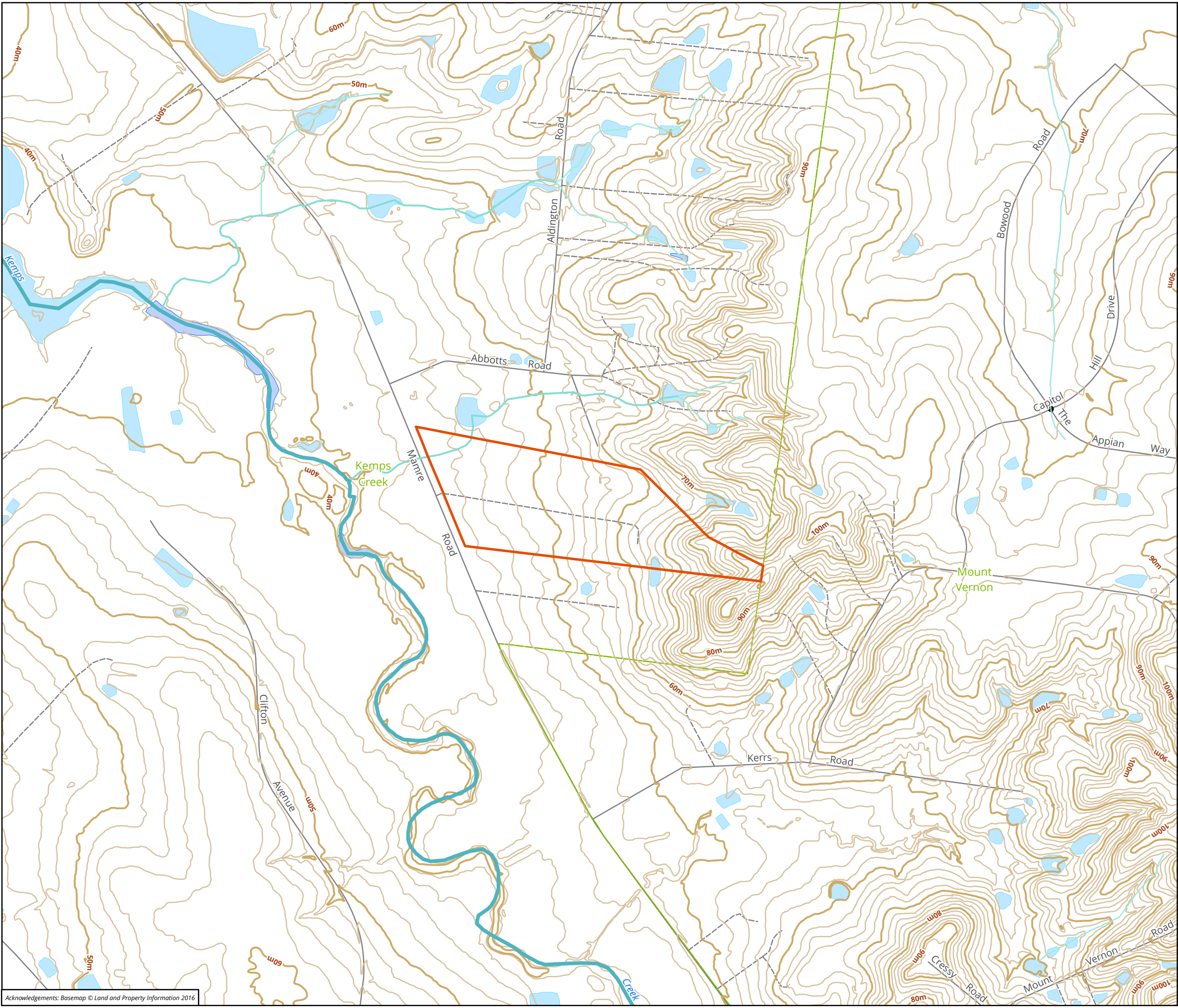
Metres

Scale: 1:20,000@ A3



Coordinate System: GDA 1994 MGA Zone 56



Matter: 37009, Date: 02 June 2022,
Drawn by: JET, Checked by: MC, Last edited by: jtownsend
Location: P:\37000s\37009\Mapping\37009_MamreRd, Layout: 37009_ACHA_F4_Geology



Legend

-  Study area
-  Contour (2m)

Strahler Order




-  1
-  2
-  4

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

0 80 160 240 320 400

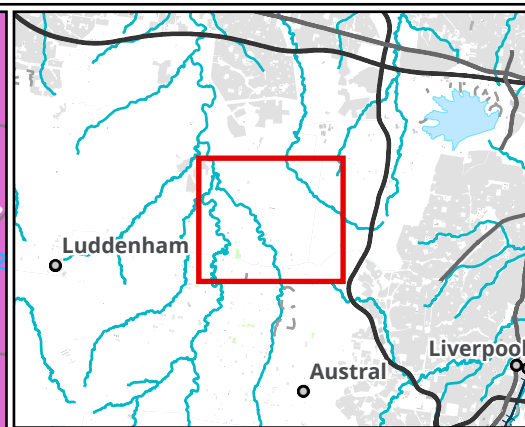
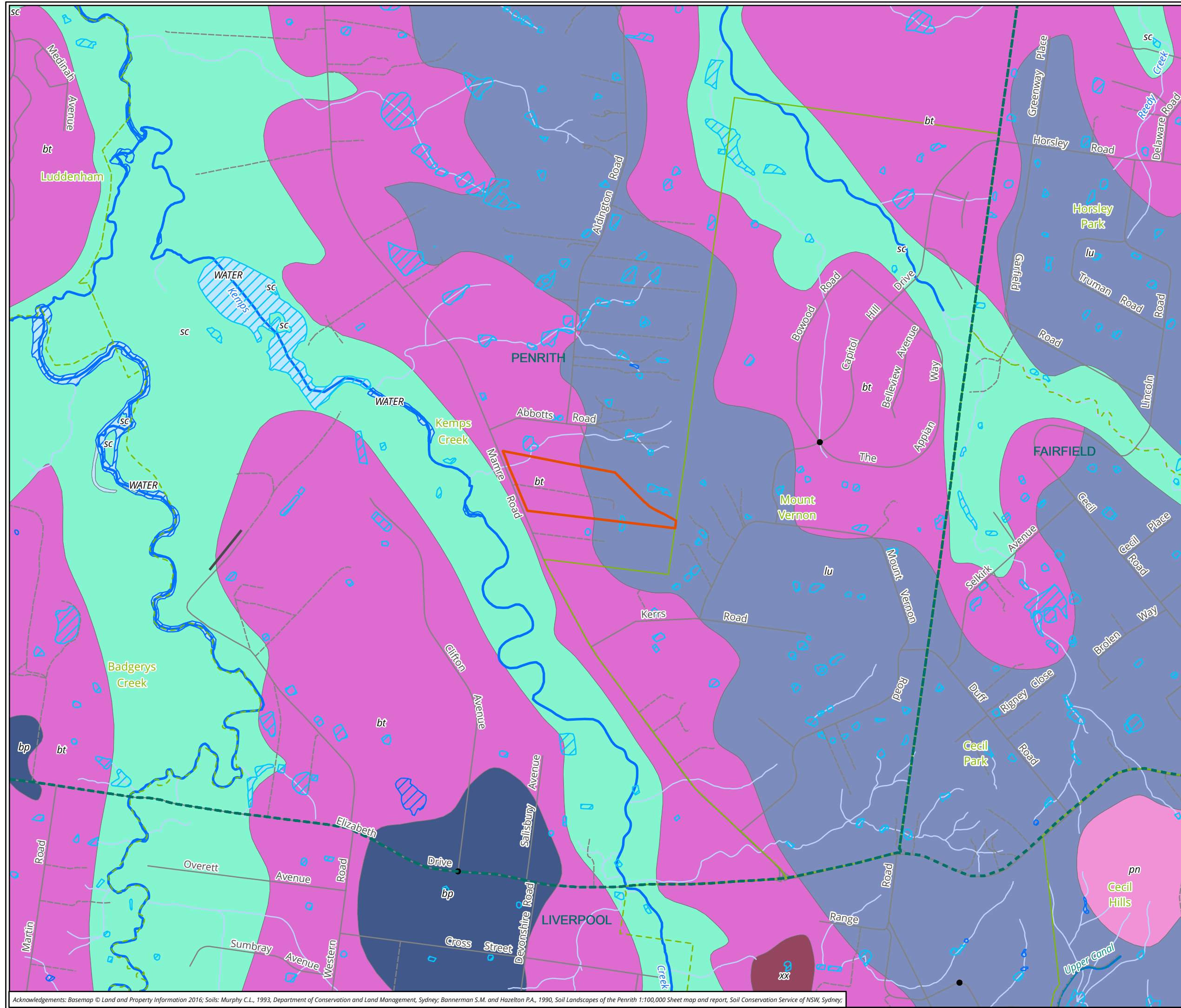
Metres

Scale: 1:10,000@ A3

Coordinate System:
GDA 1994 MGA Zone 56



Matter: 37009, Date: 02 June 2022,
Drawn by: JET, Checked by: MC, Last edited by: jtowndsend
Location: P:\37000s\37009\Mapping\
37009_MamreRd, Layout:37009_ACHA_F5_Hydrology



Legend

Study area

Soil Landscape units

- bp - BERKSHIRE PARK
- bt - BLACKTOWN
- lu - LUDDENHAM
- pn - PICTON
- sc - SOUTH CREEK
- WATER - WATER
- xx - DISTURBED TERRAIN

Figure 6 Soil landscapes in the vicinity of the study area

0 160 320 480 640 800

Metres

Scale: 1:20,000@ A3

Coordinate System: GDA 1994 MGA Zone 56

biosis

Matter: 37009Date: 02 June 2022,
Drawn by: JET, Checked by: MC, Last edited by: jtownsend
Location: P:\37000s\37009\Mapping\37009_MamreRd, Layout: 37009_ACHA_F6_Soils

Acknowledgements: Basemap © Land and Property Information 2016; Soils: Murphy C.L., 1993, Department of Conservation and Land Management, Sydney; Bannerman S.M. and Hazelton P.A., 1990, Soil Landscapes of the Penrith 1:100,000 Sheet map and report, Soil Conservation Service of NSW, Sydney;

3.1.3 Landscape resources

Aboriginal people used plant resources in a variety of ways. Fibres were twisted into string, which was used for many purposes, including the weaving of nets, baskets and fishing lines. String was also used for personal adornment. Bark was used in the provision of shelter; a large sheet of bark being propped against a stick to form a gunyah (Attenbrow 2002).

Within the Cumberland subregion of the Sydney Basin Bioregion a variety of vegetation types are present, with Grey Box *Eucalyptus microcarpa*, Forest Red Gum *E. tereticornis*, Narrow-leaved Ironbark *E. crebra* woodland, and Spotted Gum *Corymbia maculata* present on shale hills. Hard-Leaved Scribbly Gum *E. sclerophylla*, Rough-Barked Apple *Angophora floribunda*, and Old Man Banksia *Banksia serrata* are identified on alluvial sands and gravels. Broad-Leaved Apple *Angophora subvelutina*, Cabbage Gum *E. amplifolia*, Forest Red Gum *E. tereticornis*, and Swamp Oak *Casuarina glauca* are present on river flats. Tall Spike Rush *Eleocharis sphacelata*, and *Juncus effusus* and Parramatta Red Gum *E. parramattensis* are noted around lagoons and swamps (NPWS 2003, p.193).

The type of vegetation found within the Luddenham soil landscape includes extensively cleared open dry sclerophyll forest (Bannerman & Hazelton 1990a, p.64). The dominant tree species include Spotted Gum *E. maculata* and Grey Box *E. moluccana*. Broad-leaved Iron Bark *E. fibrosa*, Narrow Leaved Ironbark *E. crebra*, Forest Red Gum *E. tereticornis* and Woollybutt *E. longifolia* are also present. The understory shrub species include Blackthorn *Bursaria spinose*, Coffee Bush *Breynia oblongifolia*, Forest Oak *Alocasuarina torulosa*, Hickory *Acacia implexa* and *Clerodendrum tomentosum*. While common grasses include Speargrass *Aristida vagans*, Bordered Panic Grass *Entolasia marginate* and Paddock Lovegrass *Theineta australis* (Bannerman & Hazelton 1990a, p.64).

Common tree species include Broad-leaved Apple *Angophora subvelutina*, Cabbage Gum *E. amplifolia* and Swamp Oak *Casuarina glauca*. On elevated stream banks a tall shrubland of Paperbark *Melaleuca spp.* and Tea Tree *Leptospermum spp.* may occur.

The Blacktown soil landscape typically supports dry sclerophyll forest; predominantly species of eucalypt, including Forest Red Gum *E. tereticornis*, Narrow Leaved Ironbark *E. crebra*, and Grey Box *E. moluccana* (Bannerman & Hazelton 1990a, p.29). Broad Leaved Ironbark *E. fibrosa* and White Stringy Bark *E. globoidea* are also occasionally present.

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

Native fauna that would have been present in the vicinity of the study area include Australian Wood Duck *Chenonetta jubata*, White-Faced Heron *Egretta novaehollandiae*, Eastern Long-Necked Tortoise *Chelodina longicollis*, Eastern Water Skink *Eulamprus quoyii*, Garden Skink *Lampropholis guichenoti*, Welcome Swallow *Hirundo neoxena*, Western Swampphen *Porphyrio porphyrio*, as well as arboreal fauna including owls *Strigiformes*, Ringtailed Possum *Pseudocheirus peregrinus* and Brushtailed Possums *Trichosurus vulpecula*, and gliders *Petauridae*.

The presence of the landscape resources listed above would have increased the inhabitability of the study area and may have meant that the study area was used as a resource gathering zone.

3.1.4 Land use history

The earliest European exploration of the Penrith region was led by Captain Watkin Tench, an officer in the Marine Corps, accompanied by Mr Lowe (surgeon's mate of the *Sirius*), Mr Arndell (assistant surgeon to the Colony), two other marines, and a convict, in 1789. The group reached the Nepean River on 28 June 1789 (Oehm, A. 2006, Paul Davies Pty Ltd 2007a, p.11). Later that year, the Penrith Ford was crossed, and in 1791 the course of the Nepean had been explored from the ford to Grose River. By 1791, it had been confirmed that the Hawkesbury and Nepean rivers were the same watercourse; however, each of the names were kept, transitioning from one to the other at the junction with the Grose River (Thorpe 1986, p.12). From 1803, Charles Grimes and James Meehan surveyed areas of the eastern bank of the Nepean following the sanctioning of settlement in this area by Governor Philip Gidley King, likely in part for the fertile soils associated with the Nepean River floodplain. The portions of land ranged from 40 to 200 acres (approximately 16.2 to 81 hectares), with several of 1,000 acres (404.6 hectares) and above. These were granted to officials, free settlers and military staff (Paul Davies Pty Ltd 2007a, p.11, Thorpe 1986, p.12). Over time, around 1,699 Europeans had settled in the Nepean region, most of whom were of Irish and English heritage and were emancipists or convicts assigned to free settlers or those associated with the government or military (Paul Davies Pty Ltd 2007b). Until the establishment of the Great Western Road around 1815, there was no official passage to the Nepean area. In the same year, Governor Lachlan Macquarie conducted his inspection tour of the region (Thorpe 1986, p.12). The Great Western Road had developed into a main route for travel and communication for the Nepean region by 1817, and in this year the government town of Penrith was also established which remained a small, roadside settlement into the 1830s (Thorpe 1986, p.12).

The development of the region was centred around agricultural and pastoral land use, which evolved from the 1830s to the mid-twentieth century. Historical aerial photography provides a record of development within the study area during the 20th century. The earliest aerial dating to 1947 (Photo 3) displays the study area has undergone the initial vegetation clearing, with Mamre Road already established on the western boundary of the study area. The aerial from 1965 depicts minimal change, with 1975 displaying the emergence of residential housing to the south-east of the study area and a dam on the southern boundary (Photo 4, Photo 5).



Photo 3 Historical aerial imagery dated to 1947, with the study area outlined in blue (Source: NSW Spatial Services)



Photo 4 Historical aerial imagery dated to 1965, with the study area outlined in blue (Source: NSW Spatial Services)



Photo 5 Historical aerial imagery dated to 1975, with the study area outlined in blue (Source: NSW Spatial Services)

By 1986, the southern portion of the study area has been further developed, with a residential structure constructed (Photo 6). Land use remains agricultural. Aerial imagery dating to 2005 shows little further construction, but landscaping works have been undertaken in the northern portion of the study area with the establishment of access tracks and hedging (Photo 7). Current aerial imagery shows the extension of the residential property in the south of the study area (Figure 2).



Photo 6 Historical aerial imagery dated to 1986, with the study area outlined in blue (Source: NSW Spatial Services)



Photo 7 Historical aerial imagery dated to 2005, with the study area outlined in blue (Source: NSW Spatial Services)

3.2 Previous archaeological work

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

The study area falls within the Sydney Basin. Aboriginal occupation of the region extends well back into the Pleistocene period (i.e. prior to 10,000 years before present (BP)). This is evidenced by radiocarbon dates retrieved from excavated sites at Shaw's Creek K2 (14,700 years BP) (Attenbrow 2010, p.18), at Windsor with 33,000 BP (Karskens et al. 2019) as well as sites in Parramatta (approximately 25,000–30,000 BP and 14,000 BP) (JMCHM 2005a, 2005c, Williams et al. 2021).

Consequently, the archaeology of the Sydney Basin has been well documented through a large number of academic and heritage assessment investigations over the past three decades (e.g. (Haglund, L. 1980, Kohen, J. 1986, Smith 1989, McDonald, J. & Rich, E. 1993, White & McDonald 2010, Australian Museum Consulting 2014, Doelman et al. 2015). In the Cumberland Plain area of the Sydney Basin, rapid urban development during the past 30 years has resulted in a significant number of archaeological studies which have been used to inform the current study.

3.2.1 Regional overview

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

Brayshaw McDonald (1994) completed the Liverpool Rural Lands Study which included a broad predictive study relating to Aboriginal sites in rural areas to the west of Liverpool, located approximately 12 kilometres south-east of the current study area. The report identified that the distribution of sites was mostly dependent on topography and the bedrock formation of the area, or geology. Background research supported predictive models 10 kilometres from the study area.

It identified that shelter sites, art sites, and grinding grooves were likely to occur on overlying sandstone formations where the appropriate topography was present. Sites over the remainder of the Cumberland Plain were likely to consist of open artefact scatters, quarries, modified trees, and stone arrangements. The report noted that occupation within the area was likely to be similar to the northern Cumberland Plain, as the landscape and geology were extremely similar. As such, predictive site modelling was summarised from an assessment which included test excavations completed by Rich and McDonald (1993):

- *“Most of the areas tested [either with sparse or no surface manifestations] contained subsurface archaeological deposits.*
- *Sites which are on permanent water are more complex [ie they represent foci for larger groups or are used repeatedly by smaller groups over a long period of time] than sites on ephemeral or temporary water lines. Major confluences are prime site locations. Sparse sites also occur on major creeklines and not all confluences are locations of prime sites.*
- *Alluvial terraces [and other depositional environments] contain the best potential for intact archaeological remains. Some hillslope zones may also be intact and have good potential. In areas where there is deep alluvium many sites also have intact material below the plough zone. These sites often have artefact bearing deposit to a depth of 70-90 centimetres; the plough zone is [max] 25 centimetres deep.*
- *Temporary and minor gullies tend to have one-off or occasionally repeated Aboriginal visits in prehistory and hence low density sites.*
- *Few ridgetop sites were located by the testing programme mostly because the associated development was located close to the creeklines, but also because of the higher levels of destructive disturbance in the more elevated locations, e.g. housing and ploughing of shallower deposit.*

- *While much of the Rouse Hill study area had been severely disturbed over the last 200 years, the areas tested on the whole revealed intact patterns in the archaeological material.” (Brayshaw McDonald Pty Ltd 1994, pp.20–21).*

JMCHM (1997) conducted an archaeological investigation of the Australian Defence Industries (ADI) Site, at Saint Marys, for ADI-Lend Lease Joint Venture, located approximately 6.5 kilometres north-west of the study area. The investigation included the refinement of existing Aboriginal site predictive models, by developing a framework for assessing Aboriginal site representativeness (JMCHM 1997, pp.1–2). A model was presented for the ADI site that predicted the character of Aboriginal sites in relation to landscape features; particularly water permanence, lithic resources and landscape unit. The study concluded that the model is applicable to the Cumberland Plains region, and provides a framework for which the correlation between sites and permanent water can be tested. The model predicts the following (JMCHM 1997, pp.56–57):

- The frequency and density of Aboriginal sites located in the headwaters of upper tributaries (first order watercourse) is likely to be low, and such sites are likely to represent a background scatter.
- The frequency and density of Aboriginal sites located in the middle reaches of minor tributaries (second order watercourses) is likely to be low, and such sites are likely to represent single events, for example, one-off camping locations or knapping episodes.
- The frequency and density of Aboriginal sites located in the lower reaches of tributary creeks (third order watercourses) is likely to be greater, and such sites are likely to represent repeated occupation, knapping events and more concentrated activities.
- The frequency and density of Aboriginal sites located on major creek lines is likely to be greater, and such sites are likely to represent or more permanent occupation and consequently will be more complex.
- The junctions of creeks may have been a focus of Aboriginal activity.
- The frequency and density of Aboriginal sites located on ridge tops between drainage lines is likely to be low, and such sites are likely to represent single event.
- Outcrops of silcrete would have been exploited if known.
- The general size of stone artefacts is likely to decrease the further they are located from the quarry from which they were obtained. Similarly, the presence of cortex on artefacts is less likely to be present, or occur as smaller percentages that further artefacts are located from the quarry from which they were obtained due to the continued reduction sequence.
- Sandstone outcrops may have been the focus of camping and art production for sandstone overhangs as well as axe production/sharpening for sandstone platforms.

JMCHM (2001) undertook an assessment at West Hoxton, approximately 12 kilometres south from the study area, in aid of the South Hoxton Park Aerodrome Master Plan. The background research for the area suggested that artefact scatters would likely be associated with streams, with the size and number of sites increasing with stream order. It also noted that smaller scatters and isolated finds have the potential to be identified across a variety of landforms within the landscape, including hillslopes and ridges away from water (JMCHM 2001, p.9).

Survey efforts were hampered by land access issues, as the majority of the land in the area studied was privately owned; however a total of two artefact scatters and nine PADs were identified by the investigation, with one previously identified site (also an artefact scatter) being relocated. The majority of the PADs were assessed as having low to moderate potential, with JMCHM noting that the true potential of sites was difficult to assess in the absence of test excavations.

White & McDonald (2010) undertook a review of previous work in the Rouse Hill development area, discussing lithic artefact distribution in previous excavations carried out by JMCHM, approximately 20 kilometres north-east from the study area. The study considered a number of factors including stream order, distance from water, landform, aspect, and distance to silcrete sources. As a result of the assessment, the following statements were made:

- Stream Order: water supply was a significant factor influencing Aboriginal land use and habitation in the area. There was a correlation between increasing stream order and larger numbers and higher densities of artefacts (from a comparison of first, second, and fourth order streams).
- Distance from water: the results showed that an assumption that sites would be clustered within 50 metres of water sources was not entirely correct from the data available. In first order stream landscapes, there was no significant correlation between artefact distribution and distance to water. In second order landscapes, artefact density was highest within 50 metres of water, and then declined with increasing distance. In fourth order landscapes, density was highest between 51-100 metres from water.
- Landform: Artefact density was considered to be lowest on upper slopes and ridgetops, with density increasing on mid and lower slopes. Density was highest in terrace landforms, and lower on creek flats, likely due to repeated flooding events and the erosion this caused.
- Distance to silcrete sources: the results of the study showed no significant difference between sites located closer to or further away from silcrete sources. However, 6 kilometres was the maximum tested distance from silcrete sources, so the sample is only representative of a limited area.
- Aspect: only appeared to have an influence on sites in the lower parts of valley. Locations may have been sited to take advantage of constant factors such as the rising/setting sun and wind direction. Sites in higher parts of valleys may have been influenced by weather and other factors.

The study concluded that landform and distance from water had an impact on site distribution, with artefacts becoming more numerous closer to creeks, and along higher order creeks. The study also found that although artefacts are found on all landforms, landform type influences artefact distribution, with the preference being for slightly elevated, well-drained areas in the lower parts of valleys.

Kelleher Nightingale Consulting (2011) undertook an assessment of a 10 kilometre strip of Bringelly Road, approximately 12 kilometres south of the study area, in advance of a proposed upgrade (taking the road from two to four lanes in size). Predictive modelling employed by KNC suggested that artefact scatters and isolated finds were the site types most likely to be identified, where exposure and visibility were high. These sites were considered most likely to be identified in close proximity to water sources, on either flat or gently sloping landforms. A total of 44 sites were identified in the design corridor of the proposed upgrade, all of which were either artefact scatters or isolated finds.

AMBS (2012) conducted a wide ranging report, assessing the entirety of the Austral and Leppington North precincts, approximately 11 kilometres south-east from the study area. Although surveys were targeted at specific properties, which at the time represented accessible properties, the results of the survey were combined with the existing regional model and a review of studies within the local area in order to produce sensitivity mapping for the entirety of the Austral and Leppington North precincts.

Regionally, trends noted as influencing this sensitivity model include the following statements:

- Sites are most frequently located in close proximity to permanent water courses on creek banks, alluvial flats, or high ground.
- Large artefact scatters may be identified up to 200 – 250 metres away from water courses.

- Additional factors need to be considered than just the presence or absence of surface artefacts when characterising an archaeological site.

The predictive model employed by AMBS stated that the most common site type occurring in the area would be stone artefacts scatters, and that undisturbed alluvial soils have the potential to be associated with stratified archaeological deposits (AMBS 2012, p.56). The results of the survey largely confirmed this predictive model, with AMBS identifying seven new sites including six isolated finds and one artefact scatter/PAD.

GML (2016) conducted an archaeological excavation and assessment of Stockland's land in East Leppington approximately 12 kilometres south-east of the study area, prior to the development of the residential estate Willowdale. Predictive modeling of the area has shown that Aboriginal people occupied East Leppington for over 5,000 years. Areas along Bonds Creek were used as camping sites meanwhile areas of tool manufacture and procurement was resource specific. Both survey and hand excavation were used to understand the area. In total, 12 locations were excavated over a total of 487 square metres. Of these, 7,956 lithic artefacts and 21 features were identified. Features included eight ground ovens, hearths, clay extraction pits and modified trees. Dominant material types were silcrete, mudstone (IMSTC) and quartz, comprising 66%, 25% and 8% of finds respectively. Tool types included anvils, hammers and a possible grindstone fragment. Backing was visible in artefacts from all but two excavation areas (OA4 and OA11). A total of 253 cores and core fragments were also recovered, mostly of silcrete.

Overall, GML identified an area of domestic activity (associated with hearths and ovens), and an area of ceremonial activity associated with red paint pits, culturally modified trees and unusual stone arrangements. Pits at the base of these trees suggest evidence of landscape use unique to this particular area of the site.

3.2.2 Local overview

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

JMCHM (2000) undertook a survey in advance of a proposed light industrial subdivision on Mamre Road, Erskine Park, 1.5 kilometres north-west of the current study area. The predictive modelling undertaken primarily identified the potential for sites to be present in association with water sources, with the size and density increasing with stream order. It was also noted that creek junctions provide a focus for activity. Other locations such as ridgetops between drainage lines may provide evidence of occupation (JMCHM 2000). The area surveyed contained first and second order creeks, and so it was predicted that background scatters of artefacts may be associated with first order creeks, and that higher density sites may be identified in association with the second order creek.

The survey identified nine sites, including six artefact scatters and three isolated finds. Six of the identified sites were located on lower hillslopes, two on creek bank/lower hillslopes, and one on a creek bank/floodplain. The majority of sites were identified between 50 and 200 metres from water sources. Subsequently, sensitivity mapping was developed and it was recommended that subsurface investigation take place in areas of higher sensitivity within the study area.

Excavations of the site were subsequently carried out by JMCHM (2008). These salvage excavations retrieved a total of 8,867 lithics from 298 square metres, indicating a density of 29.8 artefacts per square metre. It was identified that the pattern of artefact distribution within the Austral Land site was typical for the Cumberland Plain and was likely higher due to the presence of second and third order streams (which indicates a permanent or semi-permanent water source).

Based on the review of previous work undertaken, a number of predictive statements were formulated for the study area, including the following (JMCHM 2008):

- There may be evidence of long or short term occupation with sporadic use and re-use of locations.
- Occupation may date to the pre-Bondaian period (30,000 – 9,000BP), but is more likely to date to the Bondaian period (9,000 BP – European Contact).
- A variety of activities are likely to have been carried out within the study area and discrete knapping floors may have been present in association with both creeks and the area of their confluence.
- The proximity of the salvage locations adjacent to second order streams and the confluence of these creeks (where they become a third order stream) would have suggested that there would be evidence for sparse, but focussed activity and potentially repeated occupation by small groups, knapping floors and evidence for more concentrated activities.

In addition to these predictions, a number of more general statements about the Cumberland Plain were made, including that large scale patterning of sites is identifiable based on environmental patterns, particularly stream order, with permanent sources of water being associated with more complex sites than ephemeral sources. Most sites will be dated to the mid to late Holocene, as geomorphic conditions necessary for the preservation of earlier sites are not common on the Cumberland Plain, most areas contain subsurface deposits, regardless of the presence or absence of surface artefacts, and that where silcrete outcrops are present, there will be evidence for quarrying (JMCHM 2008).

The excavations consisted of testing followed by open area salvage at two locations, EP6+7/1 and EP6+7/2 (a total of 145 square metres and 153 square metres at each location). Both locations were located relatively close (within 100 metres) of creeklines in the study area. The dominant material identified from the analysis

It was concluded that the site patterning in the area was typical of the Cumberland Plain, however artefact density was influenced by a number of landscape and resource features in the area, with it being noted that artefact density decreases with stream order and use of silcrete as a raw material decreases with increasing distance from silcrete sources. As a whole, the site displayed a higher than average artefact density, likely due to the presence of nearby sources of silcrete (JMCHM 2008 p. i).

DSCA (2003) undertook test excavation at Wallgrove Road, Eastern Creek approximately 8 kilometres north-east of the study area. The assessment built on a number of previous surveys conducted between 1980 and 2002 within the study area. The assessment included predictive statements determined by JMCHM study from (1997), which stated that surface artefacts were not an effective way to characterise archaeological sites, and that at the time of writing:

- 17 out of the 61 excavated sites on the Cumberland Plain had no artefacts present on the surface prior to excavation however, most areas with sparse or no surface manifestations contained considerable archaeological deposits.
- The ratio of recorded surface to excavated artefacts is 1:25 across the Cumberland Plain.
- None of the excavated sites could be properly characterised on the basis of their surface artefacts alone.
- Open campsites are located in all landscapes on the Cumberland Plain. The predominance of sites recorded along creek banks is likely to be indicative of surface visibility conditions and taphonomic factors, rather than the human distribution of artefacts across the landscape (DSCA 2003, pp.19–20).

This statement notes a number of issues with predictive models that base their assessment of subsurface potential based entirely on the presence or absence of surface artefacts. Steele also reviewed previous work carried out in the Rouse Hill area to create a predictive model for the nature and extent of subsurface deposits (DSCA 2003, pp.20–21). Some of the key factors noted include:

- Sites along permanent water courses tended to be more complex than those along ephemeral water courses, and the ideal site locations were at major confluences.
- Within the Rouse Hill area, alluvial areas along with intact hillslopes had the greatest potential to retain intact archaeology, with artefact deposits extending from 70 to 90 centimetres, while the typical plough zone extended to 30 centimetres.
- Hillslopes and ephemeral water courses which revealed sites typically showed evidence of limited occupation, with few producing artefact densities of greater than 20 artefacts per square metre.
- Sites located at the interface of sandstone and shale geologies tended to demonstrate evidence of single occupations by large groups, or multiple occupations by smaller groups.
- There is greater potential for complex archaeological sites to be located subsurface than is demonstrated by surface artefacts, with knapping floors, backed blade manufacturing sites, and other complex sites have been identified.
- There may be a correlation between artefact density and site function.

A total of 20 1 by 1 metre squares were excavated using a backhoe, and sieved through nested 5 and 2.5 millimetre sieves. The deposit encountered tended to be relatively shallow, with most pits not exceeding 20 centimetres. A total of 38 artefacts were identified by surface survey and excavation, with a density characterised by Steele as extremely low. The area was interpreted as being visited sporadically, and not the site of any sort of knapping or camping, but rather a general background scatter.

The deposit consisted primarily of silcrete, with quartz, tuff, and volcanic rock present in much lesser quantity. The vast majority of the deposit was identified as manuport, with some flake and core fragments present, and one potential broken axe.

Navin Officer Heritage Consultants (2005) conducted machine testing at the CSR lands, Erskine Park, approximately 2 kilometres to the north-west of the current study area. A total of 256 test pits were excavated, with 285 artefacts being identified across 88 of these pits. It is noted (JMCHM 2008, p.14) that only a sample of the excavated deposit was sieved, and that this may be a contributing factor to the relatively low number of artefacts identified at the site relative to other excavations in the area.

The assemblage was primarily comprised of silcrete and silicified tuff, making up about 81% of the total assemblage, and contained a range of artefact types, including microblades, Bondi points, and backed artefacts. Based on the results of this testing, Navin Officer characterised the site as having been used as a transient camp, or for peripheral activities in relation to a larger camping area, and stated that it had been subject to low intensity occupation (Navin Officer Heritage Consultants Pty Ltd 2005).

Biosis (2017, 2018) completed an Aboriginal heritage assessment of the Mamre West Precinct located approximately 3 kilometers north-west of the study area. The initial assessment recorded three areas of potential within low rises adjacent to depressions (OA1, OA2, and OA3). Test excavations were conducted within these areas with OA1 and OA2 located the furthest distance from water and both containing low density artefact deposits, while a high density artefact deposit was identified at OA3 which was located closer to South Creek. OA1 contained 16 artefacts over a total of 37 test pits and was dominated by angular fragments making up 56% of the OA1 assemblage. The dominant raw material was silcrete (93.8%) and one artefact was composed of IMT (6.2%). OA2 contained nine artefacts over a total of 79 test pits and was also dominated by angular fragments (55.6%). The remained of the artefacts were complete flakes (22.2%), longitudinal (11.1%) and proximal flakes (11.1%). Silcrete was again the dominant raw material (55.6%) with IMT and quartz at 22.2% each. OA3 was located closer to South Creek and contained 666 artefacts over a total of 158 test pits. Angular fragments again dominated at 55.9% of the assemblage, followed by flakes (35.3%) while a total of 4.2% of the assemblage consisted of cores or core fragments. Eight raw materials were

identified at OA3, dominated by silcrete (82.9%) followed by IMT (7.1%) and chert (4.5%). Other material types included quartz, siltstone, quartzite, petrified wood and tuff.

Biosis found that the dominance of material types differed to those of the surrounding region. At MWP-AD3, chert and mudstone artefacts were found in higher proportions to silcrete, which is seen in higher proportions other sites in the region. The assemblage at OA3 contained a varied artefact deposit including a number of backed artefacts which placed it within the Middle Bondaian phase of occupation, approximately 4,000 to 1,000 years before present. Further investigation through salvage excavations was recommended.

Biosis (2019) carried out an ACHA as part of a two stage industrial development along Mamre Road, Kemps Creek, that incorporated Lots 210–215 DP 1013539, and Lots 1 and 2 DP 1233392, located approximately 3.5 kilometres north-west of the study area. The ACHA included archaeological survey and test excavations in an area of high subsurface archaeological potential. The results of the test excavations identified one subsurface archaeological deposit (AHIMS 41-5-0016/MNPAD01) consisting of 14 artefacts dispersed across an area of 105 metres by 17 metres of a gently sloping plain landform.

Biosis (2020) completed a ACHA of 160- 228 Aldington Road, Kemps Creek, located approximately 2.5 kilometers north-east of the study area. The ACHA included archaeological survey of the study area and test excavations in three areas of moderate archaeological potential. The areas of moderate archaeological potential were located on creek terraces and hill crests in proximity to water sources within Blacktown and Luddenham soil landscapes. A total of 248 artefacts were identified across the three areas of potential.

In Area 1 located on a hill crest, soils consisted of loam to loamy clay deposits of moderate to high compaction, with little disturbance identified. Test excavations within this portion of the study area encountered a low density archaeological deposit, with 19 artefacts identified.

In Area 2 on a creek terrace, soils consisted of to loamy clay deposits of moderate to high compaction, with little disturbance identified. Test excavations within this portion of the study area encountered a low density archaeological deposit, with 28 artefacts identified.

Area 3 consisted of loosely to moderately compacted sandy to clay loamy soils on a creek terrace landform. A high density, intact subsurface archaeological deposit within 70 metres of Ropes Creek and 25 metres of a tributary of Ropes Creek was identified within Area 3 with a total of 201 artefacts recovered. The results of the test excavation supported predictive modelling within the local region.

3.2.3 AHIMS site analysis

A search of the AHIMS database on 25 July 2023 (Client Service ID: 803412) identified 93 Aboriginal archaeological sites within a 3.5 by 3.5 kilometre search area, centred on the proposed study area (Table 4). One site that has been identified by this assessment is located within the study area (AHIMS 45-5-5634/Mamre Road PAD 1) (Figure 7). This site has been described in section 6.5.1. There are also three AHIMS sites located within 160 metres of the northern boundary of the study area, and have been described below (section 3.2.4). AHIMS search results have been provided in Appendix 1. Table 4 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.

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 93 sites identified in AHIMS.

Table 4 AHIMS search results

Site type	Number of occurrences	Frequency (%)
Artefact	78	76.47
PAD	22	21.57
Modified tree	1	0.98
Grinding Groove	1	0.98
Total	102	100.00%

A simple analysis of the Aboriginal cultural heritage sites registered within the 3.5 by 3.5 kilometre radius of the study area indicates that artefact sites are the most dominant, representing 76.47% (n=78) of the sites, with PAD representing 21.57% (n=22) of sites. Modified trees and grinding groove representing 0.98% each (n=1 each).

3.2.4 AHIMS sites within vicinity of the study area

There are three AHIMS sites located within 160 metres of the study area. These are AHIMS 45-5-5503/Abbot's Rd Kemps Creek IF1, AHIMS 45-5-5504/Abbot's Rd Kemps Creek IF2 and AHIMS 45-5-5505/Abbot's Rd Kemps Creek IF3. These sites are all isolated finds identified in July 2021 by Barrett Owen of Urbis Pty Ltd. An outline of each site has been provided below.

AHIMS 45-5-5503/Abbot's Rd Kemps Creek IF1



AHIMS 45-5-5503/Abbot's Rd Kemps Creek IF1 is located 105 metres from the north-east corner of the study area on a steep hillslope. The site consists of a single grey silcrete proximal flake, identified on a vehicle track through a market garden (see Photo 8).

Photo 8 AHIMS 45-5-5503/Abbot's Rd Kemps Creek IF1

AHIMS 45-5-5504/Abbot's Rd Kemps Creek IF2

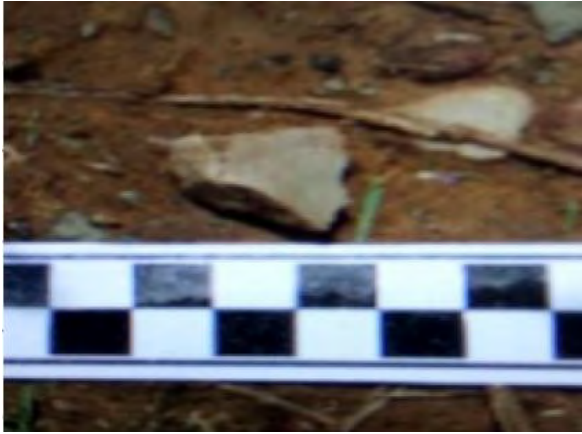


Photo 9 AHIMS 45-5-5504/Abbot's Rd Kemps Creek IF2

AHIMS 45-5-5504/Abbot's Rd Kemps Creek IF2, also located on an exposed vehicle track, is an isolated artefact find consisting of a single grey silcrete angular fragment (Photo 9). The artefact was identified on a slope within an undulating landform unit, 30 metres from water. The site is located approximately 115 metres from the northern boundary of the study area.

AHIMS 45-5-5505/Abbot's Rd Kemps Creek IF3



Photo 10 AHIMS 45-5-5505/Abbot's Rd Kemps Creek IF3

AHIMS 45-5-5505/Abbot's Rd Kemps Creek IF3 was similarly located on an unsealed vehicle track on a slope, within a rolling hills landform. The artefact is a grey silcrete medial fragment, 67 metres from water (Photo 10).

3.3 Discussion

The study area is situated within the Cumberland Lowlands which features undulating plains and low hills with dense drainage lines. The study area itself reflects this, possessing undulating hills with steeply to moderately inclined upper to mid slopes, moderately to gently inclined lower slopes, and crests atop the Bringelly Shale formation. Artefact sites and PADs are the most commonly occurring Aboriginal site type within the local region, with suitable sandstone exposures unlikely to be present in the Bringelly Shale geological unit, indicating an absence of grinding groove and rock shelter sites.

A review of the local hydrology indicates that there is one creek line in the north-western corner of the study area. This is a non-perennial second order water course, which is a tributary of Kemps Creek, a perennial fourth order creekline. Kemps Creek is located approximately 247 metres west of the study area. There is one dam located in the south-eastern portion of the study area. Proximity to a permanent water source is considered a positive indicator for past Aboriginal land use.

The study area contains two soil landscapes; the Luddenham soil landscape in the east, and the Blacktown soil landscape in the west. The Luddenham soil landscape is considered erosional, and because of lateral movement, especially on inclined landforms, is unlikely to preserve archaeological material on the surface or in situ as this material is removed by these forces. The Blacktown soil landscape is a residual landscape which develops slowly, allowing geomorphic processes to preserve Aboriginal objects as they are deposited on the surface. Because of a lack of erosional forces, there is little lateral movement on the surface or below, and thus may preserve archaeological material in-situ provided ground disturbances have not occurred.

European history of the Kemps Creek region is largely one of rural development. Early exploration and movement into the region accompanied early land grants which were subdivided and sold, not often developed.

A review of regional and local archaeological assessments has shown that the size and extent of water sources is the greatest predictor of the types of archaeological sites to be identified within the region (White, B & McDonald, J 2010, McDonald, J. & Rich, E. 1993, Brayshaw McDonald Pty Ltd 1994, AMBS 2012). Large archaeological assemblages indicative of open campsites have been found proximity to streams of second order or greater, with focus points for Aboriginal occupation at creek junctions (JMCHM 2000, KNC 2011, AMBS 2012). Alluvial deposits (sediments moved via water) have also been found to contain archaeological deposits (Brayshaw McDonald Pty Ltd 1994), although artefacts have been found on all landforms in the region, in particular on undisturbed crests and gentle slopes near creek lines, in lower densities (DSCA 2003, Biosis 2019, Biosis 2020).

The presence of fresh water sources and suitable landforms such as hill crests and gentle slopes within the study area therefore suggests that there is potential for Aboriginal sites to be present. However, these sites are likely to be low density sites representative of background scatter or as a result of resource gathering within the local region. Despite the disturbance resulting from agricultural activities, there is also potential for *in situ* archaeological deposits to be found below the 25 centimetre plough zone established by Brayshaw McDonald (1994) where deeper deposits may be present.

3.3.1 Predictive statements

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

These 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.

Table 5 indicates the site types most likely to be encountered across the present study area. The definition of each site type is described firstly, followed by the predicted likelihood of this site type occurring within the study area.

Table 5 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.	Moderate: Stone artefact sites have been previously recorded in the region across a wide range of landforms including alluvial landforms, crests and gentle slopes, they have moderate potential to be present in undisturbed areas within the study area.
PADs	Potential sub surface deposits of cultural material.	Moderate: PADs have been previously recorded in the region across a wide range of landforms including alluvial flats, gentle slopes, terraces and crests. The presence of gentle slopes and crests in the study area therefore suggests there is moderate potential for PAD sites.
Modified trees	Trees with cultural modifications	Low: The study areas has been extensively cleared of vegetation.
Axe grinding grooves	Grooves created in stone platforms through ground stone tool manufacture.	Low: There has been no previously recorded grinding grooves within the vicinity of the study area. There is low potential for axe grinding grooves to be present as suitable sandstone exposures are unlikely to occur within the study area due to the underlying geology.
Shell middens	Deposits of shells accumulated over either singular large resource gathering events or over longer periods of time.	Low: Shell midden sites have not been recorded within proximity to the study area. There are no perennial water sources within the study area therefore the potential for shell midden sites is considered low.
Aboriginal ceremony and Dreaming Sites	Such sites are often intangible places and features and are identified through oral histories, ethnohistoric data, or Aboriginal informants.	Low: There are currently no recorded mythological stories for the study area.

Site type	Site description	Potential
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.
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.
Quarries	Raw stone material procurement sites.	Low: There is no record of any quarries being within or surrounding the study area.
Rock shelters with art and / or deposit	Rock shelter sites include rock overhangs, shelters or caves, and generally occur on, or next to, moderate to steeply sloping ground characterised by cliff lines and escarpments. These naturally formed features may contain rock art, stone artefacts or midden deposits and may also be associated with grinding grooves.	Low: The sites will only occur where suitable sandstone exposures or overhangs possessing sufficient sheltered space exist, which are not present in the study area.

4 Archaeological survey

A field survey of the study area was undertaken on 18 February 2022 by Mathew Smith (Biosis, Senior Heritage Consultant) and 31 May 2022 by Anthea Vella (Biosis, Heritage Consultant). 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:

- 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 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 Survey methods

The archaeological survey was conducted on foot with a field team of one member per day. 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, GSV and the recording of soil information for each survey unit were possible. Any potential Aboriginal objects observed during the survey were documented and photographed. The location of Aboriginal cultural heritage and points marking the boundary of the landform elements were recorded using a hand-held Global Positioning System (GPS) and the Map Grid of Australia (MGA) (94) coordinate system.

4.3 Archaeological survey results

A total of two transects were walked across the extent of the study area (Figure 8). Five PADs were identified in the study area. The results from the field survey have been summarised in Table 6, Table 7, Figure 8, and Figure 9 below.

Table 6 Survey coverage

Landform	Survey unit area (m ²)	Visibility (%)	Exposure (%)	Effective coverage area (m ²)	Effective coverage (%)
Crest	4,538	10	5	598.041	13.17
Flat	68,446	10	5	2,153.75	3.15
Mid-slope	24,426	10	5	2,098.50	8.59
Upper Slope	6,546	10	5	852.13	13.02
Lower slope	113,436	10	5	6,136.61	5.41

Table 7 Landform summary

Landform	Landform area (m ²)	Area effectively surveyed (m ²)	Landform effectively surveyed (%)	No. of Aboriginal sites	No. of artefacts or features
Crest	4,538	598	13.17	0	0
Flat	68,446	2,153	3.15	0	0
Mid-slope	24,426	2,098	8.59	0	0
Upper Slope	6,546	852	13.02	0	0
Lower slope	113,436	6,136	5.41	0	0

4.3.1 Visibility

In most archaeological reports and guidelines visibility refers to Ground Surface Visibility (GSV), and is usually a percentage estimate of the ground surface that is visible and allowing for the detection of (usually stone) artefacts that may be present on the ground surface (DECCW 2010a). GSV across the site was low (10%), hindered by extensive grass coverage and waterlogging (Photo 11 and Photo 12).



Photo 11 General visibility in the study area, facing south-east



Photo 12 General visibility within the study area showing extensive grass coverage, facing east

4.3.2 Exposure

Exposure refers to the geomorphic conditions of the local landform being surveyed, and attempts to describe the relationship between those conditions and the likelihood the prevailing conditions provide for the exposure of (buried) archaeological materials. Whilst also usually expressed as a percentage estimate, exposure is different to visibility in that it is in part a summation of geomorphic processes, rather than a simple observation of the ground surface (Burke & Smith 2004, p.79, DECCW 2010a). Overall, the study area displayed very few areas of high exposure, mainly present around vehicle access areas. Low areas of exposure were due to the extensive grass coverage. Approximately 5% of the study area was subject to exposure (Photo 13 and Photo 14).



Photo 13 Exposure within the study area



Photo 14 Exposure within vehicle access, photo facing east

4.3.3 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. Examples of human agents can 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; and agricultural practices.

The study area as a whole has been subject to disturbance by human activity. Historic and recent aerials (provided in Section 3.1.4) show that the study area has been subject to historical vegetation clearance, landscaping works, and the construction of buildings and access tracks. These disturbances were noted during the archaeological survey and are shown in Photo 15 and Photo 16. Areas of ground disturbance likely associated with geotechnical works were also observed (Photo 17).



Photo 15 Disturbances within the study area associated with residential construction, facing south



Photo 16 Disturbances within the study area associated with residential and agricultural construction, installation of fencing and transmission line, facing south



Photo 17 Area of disturbance within the study area as a result of geotechnical testing

4.4 Discussion of archaeological survey results

The archaeological survey consisted of two meandering transects walked across the entire study area. The results of the field survey have been summarised below and in Figure 8.

Background research suggested that the study area is located within the Bringelly Shale geological unit commonly associated with Aboriginal artefact scatter sites and PADs. The study area is underlain by the residual Blacktown and erosional Luddenham soil landscapes. While erosional soils have lower potential to contain preserved archaeological material on the surface or in situ, residual soils such as the Blacktown landscape are slowly accumulated, deep sediment with the potential to preserve archaeological sites. However, this slow accumulation when combined with disturbances (such as extensive land clearing and land use usually associated with pastoral and civic development) will result in an increased likelihood that soils will have been disturbed. This results in poor preservation of archaeological material in these locations.

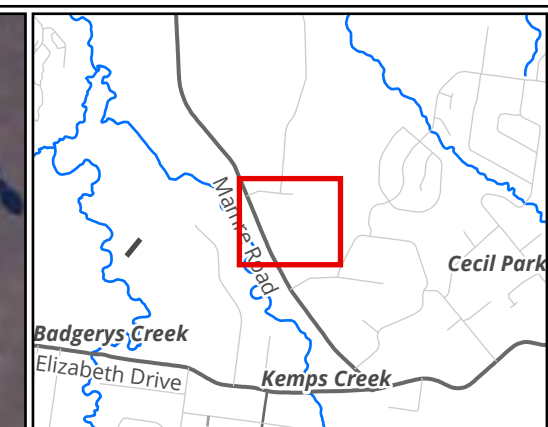
The study area is characterised by steep slopes within the eastern portion of the study area, with the nearest permanent watercourse located approximately 247 metres to the west of the study area. A search of the AHIMS registered 119 sites within a 3 kilometre radius of the study area. While three of these sites are within 160 metres, none are located within the study area.

A review of historical aerial photographs shows significant development has occurred within the study area. Disturbances include historical vegetation clearance and cropping, the construction of several buildings and driveways, and associated subsurface infrastructure.

Although the field investigation demonstrated that the study area has been subject to disturbance, five areas of moderate potential were identified. No additional Aboriginal objects were located within the study area. The areas of potential were identified as they are located within relative proximity to a second-order watercourse to the north of the study area and have remained relatively undisturbed. Therefore it is likely that soils in these locations are intact. The field investigation also identified that the remainder of the study area has low potential to contain archaeological deposits.

Predictive modelling developed by Rich and McDonald would indicate that “hillslope zones may also be intact and have good potential” (McDonald & Rich 1993). Later predictive modelling by JMCHM for the area primarily identified the potential for sites to be present in association with water sources, with the size and density increasing with stream order. It was also noted that creek junctions provide a focus for activity. Other locations such as ridgetops between drainage lines may provide evidence of occupation (JMCHM 2000).

These models correlate with the results of the archaeological survey, with the five areas of PAD identified at the northern boundary, closest to the watercourse, and in south-east portion of the site, where the slope and crest landforms are present.



- Legend**
- Study area
 - Lot
 - Survey tracks
 - PAD
 - Archaeological potential**
 - Low
 - Moderate

Figure 8 Survey results and coverage

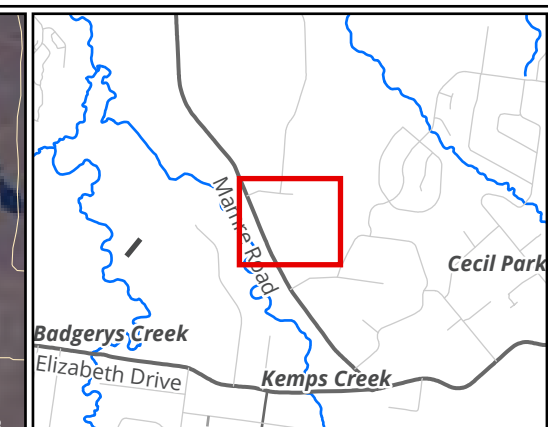
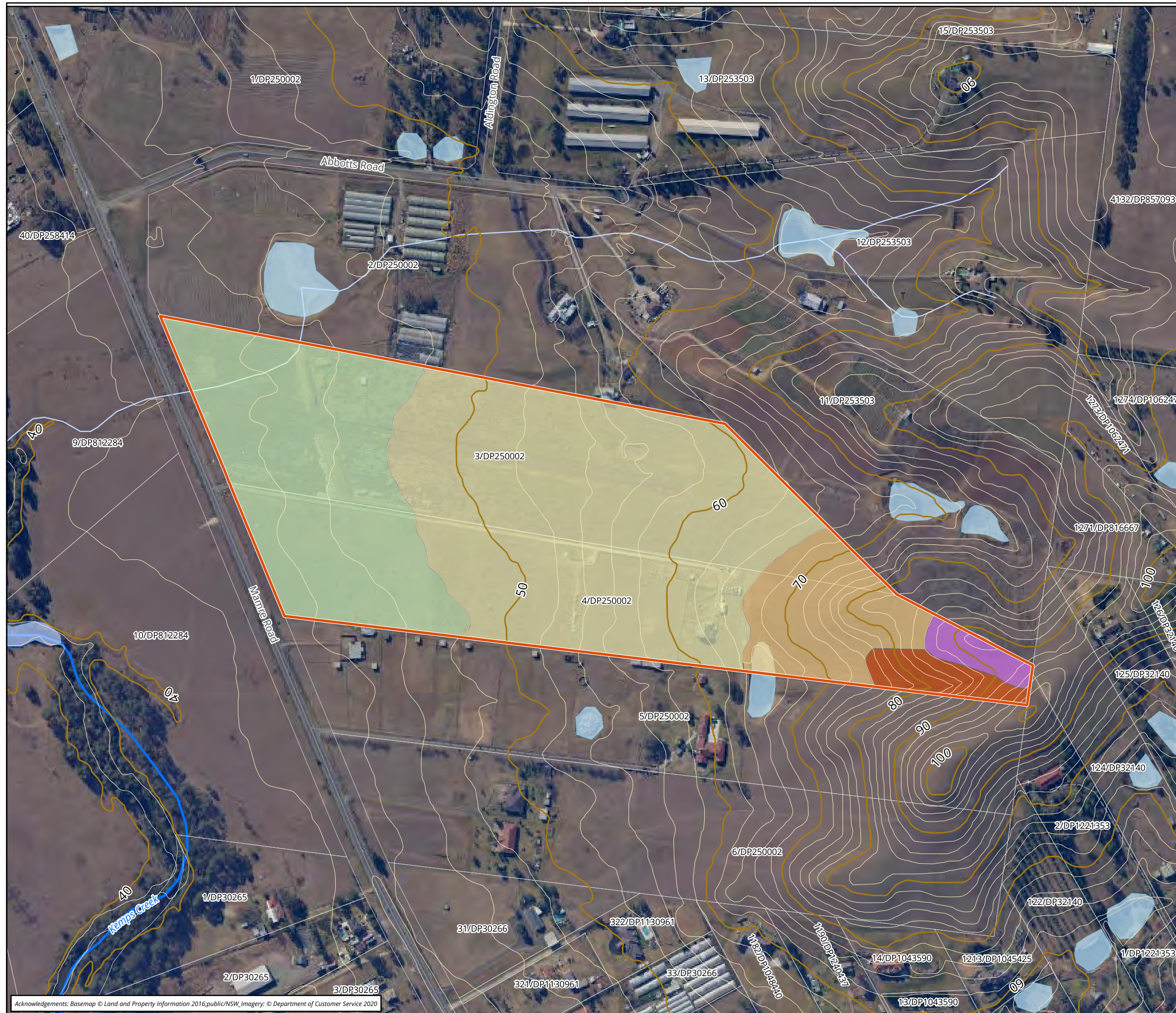
0 30 60 90 120 150

Metres

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



Matter: 37009, Date: 10 August 2022,
Drawn by: JET, Checked by: MC, Last edited by: jtownsend
Location: P:\37000s\37009\Mapping\
37009_MamreRd, Layout: 37009_ACHA_F8_SurveyResults



Legend

- Study area
- Index contour
- Contour (2m)

Landform

- Flat
- Gentle slope
- Mid-slope
- Steep slope
- Crest

Figure 9 Landforms

0 30 60 90 120 150

Metres

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



Matter: 37009, Date: 02 June 2022,
Drawn by: JET, Checked by: MC, Last edited by: jtownsend
Location: P:\37000s\37009\Mapping\
37009_MamreRd, Layout: 37009_ACHA_F9_Landforms

5 Test excavation

Following the results of the field survey a test excavation program was undertaken to characterise the extent, nature and archaeological (scientific) value of Aboriginal cultural heritage within areas of PAD. Test excavations were undertaken from 2 to 5 August 2022 by:

- Anthea Vella (Biosis, Heritage Consultant)
- David O'Brien (Archaeologist)
- Dominic Wilkins (Darug Custodian Aboriginal Corporation, Cultural Sites Officer)
- Jamie Carroll (Kamilaroi Yankuntjatjara Working Group, Cultural Sites Officer)
- Molly Crissell (Biosis, Heritage Consultant)
- Steven Hickey (A1 Indigenous Services, Cultural Sites Officer)
- Adam Gunther (Waawaar Awaa Aboriginal Corporation, Cultural Sites Officer)
- Todd King (Waawaar Awaa Aboriginal Corporation, Cultural Sites Officer)

The sampling strategy, methodology and results of the test excavation program are discussed below.

5.1 Test excavation objectives

The objectives of the sub-surface investigation were to characterise the extent, nature and archaeological (scientific) value of Aboriginal cultural heritage within the areas of PAD identified by Biosis' archaeological survey on 18 February and 31 May 2022.

5.2 Test excavation methodology

- Test excavations were conducted in 50 by 50 centimetre units.
- The test pits were excavated by hand (inclusive of trowels, spades and other hand tools) along transects at intervals of between 10 and 20 metres or other justifiable and regular spacing (being no smaller than five metres).
- The first test pit within a site or PAD area was excavated in five centimetre spits; the subsequent test pits conducted within the site or PAD area were then excavated in either 10 centimetre spits or stratigraphic units (whichever is smaller) to the base of Aboriginal object-bearing units being the removal of the A-horizon soil deposit down to the sterile clay or bedrock layer (B-horizon).
- If the depth of deposit prevents reaching sterile deposits within the 50 by 50 centimetre test pit, additional 50 by 50 centimetre test pits may be excavated adjacent to the original test pit (for example expanding the test pit to 50 by 100 centimetres) to reach the sterile deposits.
- Test pits may be combined and excavated as necessary in 50 by 50 centimetre units for the purposes of further understanding site characteristics. Note that under the Code, the maximum area that can be excavated in any one continuous area is three metres squared (3 m²).
- The Code dictates that the maximum surface area of all test excavation units must be no greater than 0.5% of the PAD or area being investigated.
- All excavated soil was wet sieved in 5 millimetre sieves.
- All cultural material was collected, bagged and clearly labelled. They are temporarily stored in the Biosis Sydney office for analysis (14/17–27 Power Avenue, Alexandria NSW 2015).

- For each test pit that is excavated, the following documentation was taken:
 - Unique test pit identification number.
 - GPS coordinate of each test pit.
 - Munsell soil colour and texture.
 - Amount and location of cultural material within the deposit.
 - Nature of disturbance where present.
 - Stratigraphy.
 - Archaeological features (if present).
 - Photographic records.
 - Spit records.
- Test excavation units were backfilled as soon as practicable.
- An AHIMS Site Impact Recording form will be completed and submitted to the AHIMS Registrar for any sites impacted during test excavations.
- In the event that suspected human remains are identified works will immediately cease and the NSW Police and Heritage NSW will be notified.
- Test excavations ceased when enough information* has been recovered to adequately characterise the objects present with regard to their nature and significance.

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

5.3 Test excavation results

A total of 41 test pits were excavated within six PADs (Figure 10). Individual test pit and soil analysis results are provided in Appendix 2. Results by PADs are shown in Table 8 and a detailed discussion of results is provided below.

Table 8 Test excavation results by PAD

PAD	Landform	PAD area (m ²)	Area tested (m ²)	PAD effectively tested (%)	No. of sites	No. of artefacts
1	Gentle slope	2,414	1	0.04	0	0
2	Gentle slope and mid-slope	9,942	2.75	0.02	1	3
3	Gentle slope	4,348	1.50	0.03	0	0
4	Mid-slope	2,885	1.75	0.06	0	0
5	Mid-slope and crest	6,776	3	0.04	0	0
6	Gentle slope	1	0.25	0.25	0	0

5.3.1 PAD 1

A total of four test pits along two transects were excavated within PAD 1, which is located on a gentle slope landform. Transects were spaced at 20 metre intervals with test pits placed at 40 metre intervals in order to determine the nature of subsurface deposits in this area. A 40 metre spacing was chosen as excavations in other PADs had not identified artefacts. A dam was located approximately 10 metres south of PAD 1. No artefacts were identified within PAD 1.

Soils across PAD 1 were relatively consistent and featured moderately compacted dark brown (7.5YR 3/2) clayey loam A horizon with a maximum depth of 250 millimetres. Baked clay inclusions were noted in two test pits across PAD 1. The A horizon overlaid a top of a moderately compacted brown (7.5YR 4/3) to reddish brown (7.5YR 4/4) clay B horizon (Photo 18 and Photo 19).



Photo 18 PAD 1 T1 TP3 showing representative soils

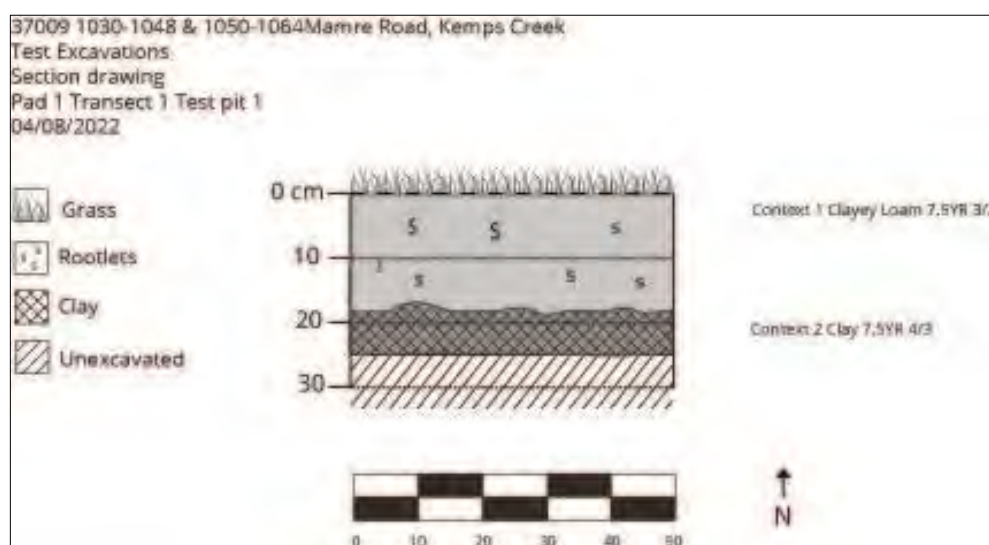


Photo 19 PAD 1 T1 TP1 section drawing showing representative soils

5.3.2 PAD 2

A total of 11 test pits across two transects were excavated across PAD 2, which is located on gentle slope and mid-slope landforms. Transects were spaced at 20 metre intervals with test pits placed at 40 metre intervals in order to determine the nature of subsurface deposits in this area. A 40 metre spacing was chosen as excavations in other PADs had not identified artefacts. Three artefacts were identified from three test pits along Transect 1 (T1TP1, T1TP1.1, and T1TP2). All three artefacts were identified within 0-100 millimetres (Spit 1). Test pit 1.1 was placed halfway (20 metres) between test pit 1 and test pit 2 after artefacts had been identified in each test pit.

Soils across PAD 2 were relatively consistent and featured moderately compacted dark brown (7.5YR 3/2) to reddish brown (7.5YR 4/4) clayey loam to loamy clay A horizon with a maximum depth of 200 millimetres. Gravel inclusions of 2-5 millimetres were noted across eight test pits. Transect 2 test pit 4 was excavated to a depth of 500 millimetres before it began to fill with water. This test pit was not completed as a result of the water. Overall, the A horizon overlaid a top of a moderately compacted strong brown (7.5YR 4/6) to reddish brown (7.5YR 4/4) to dark brown (7.5YR 3/2) clay B horizon (Photo 20 and Photo 21)



Photo 20 PAD 2 T1TP1 showing representative soils

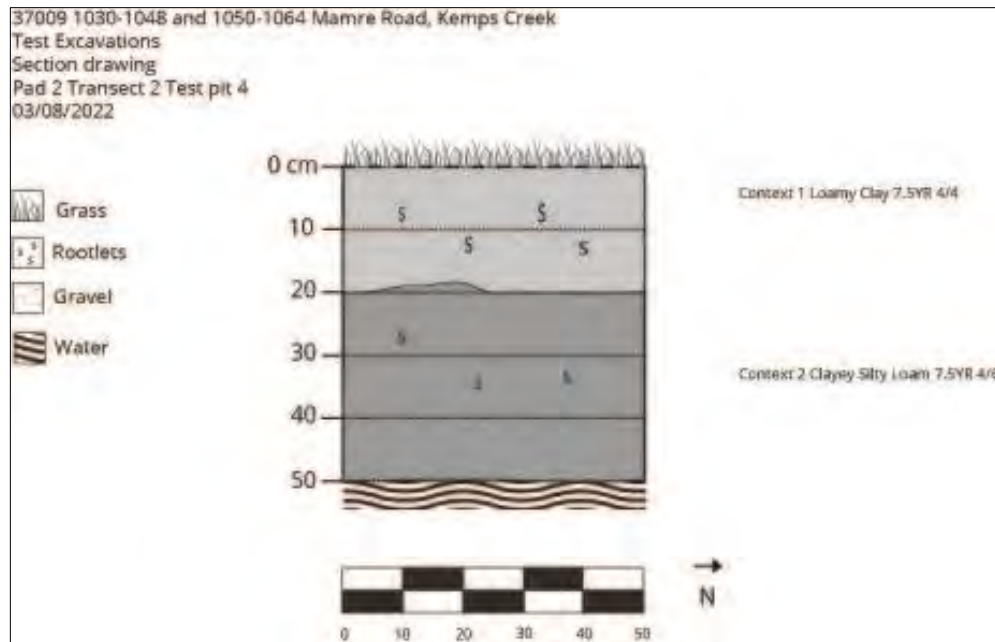


Photo 21 PAD 2 T2TP4 section drawing showing water in base

5.3.3 PAD 3

A total of six test pits were excavated along two transects within PAD 3, which is located on a gentle slope landform. Transects were spaced at 20 metre intervals with test pits placed at 20 metre intervals. PAD 3 was excavated on the second day and 20 metre intervals were chosen to gauge the nature of subsurface deposits in this area. No artefacts were identified within PAD 3.

Soils across PAD 3 were relatively consistent and featured moderately compacted dark brown (7.5YR 3/2 and 3/3) loamy clay A horizon with a maximum depth of 220 millimetres. The A horizon overlaid a top of a moderately compacted dark brown (7.5YR 3/3) and very dark brown (7.5YR 2.5/2) loamy clay B horizon (Photo 22 and Photo 23).



Photo 22 PAD 3 T1 TP1 showing representative soils

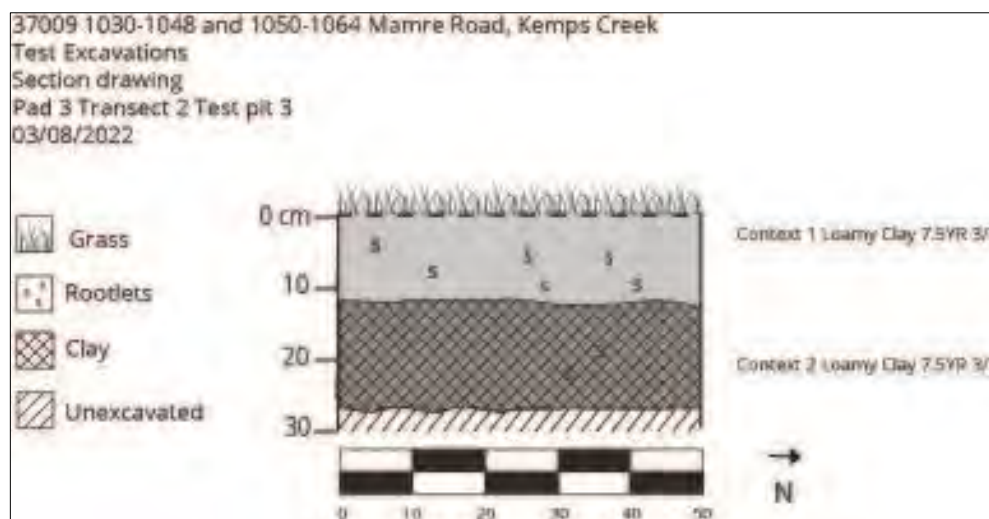


Photo 23 PAD 3 T2 TP3 section drawing showing representative soils

5.3.4 PAD 4

A total of seven test pits were excavated along two transects within PAD 4, which is located on a mid-slope landform. Transects were spaced at 20 metre intervals with test pits placed at 20 metre intervals. PAD 4 was excavated on the first day and 20 metre intervals were chosen to gauge the nature of subsurface deposits in this area. A dam was located approximately 18 metres south of PAD 4. No artefacts were identified within PAD 4.

Soils across PAD 4 were relatively consistent and featured moderately compacted dark brown (7.5YR 3/2) loamy clay A horizon with a maximum depth of 190 millimetres. The A horizon overlaid a top of a moderately compacted dark brown (7.5YR 3/3) and reddish brown (7.5YR 4/4) clay B horizon (Photo 24 and Photo 25).



Photo 24 PAD 4 T2 TP 3 showing representative soils

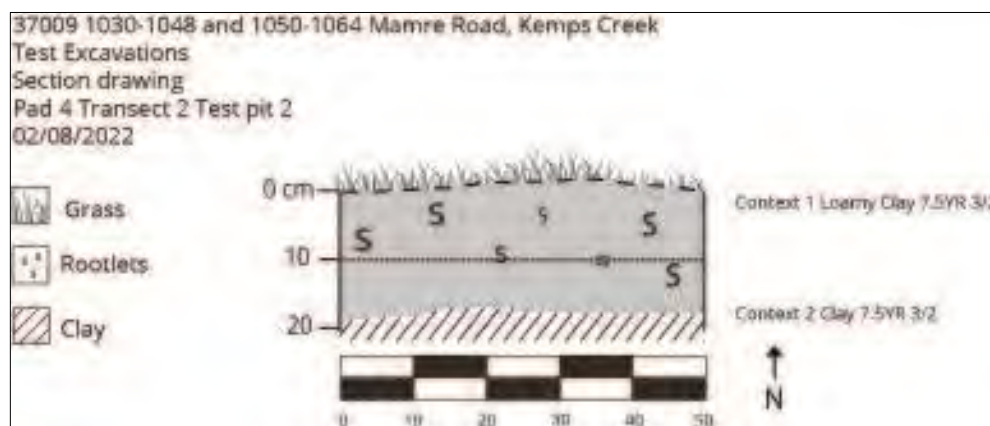


Photo 25 PAD 4 T2 TP2 section drawing showing representative soils

5.3.5 PAD 5

A total of twelve test pits were excavated across three transects within PAD 5, which is located across mid-slope and crest landforms. Transects were spaced at 20 metre intervals with test pits placed at 40 metre intervals in order to determine the nature of subsurface deposits in this area. A 40 metre spacing was chosen as excavations in other PADs had not identified artefacts. No artefacts were identified within PAD 5.

Soils across PAD 5 were relatively consistent and featured moderately compacted very dark brown (7.5YR 2.5/2) to dark brown (7.5YR 3/2, 3/3, 3/4), and dark reddish brown (7.5YR 3/3) clayey loam to loamy clay A

horizon with a maximum depth of 330 millimetres. Inclusions within PAD 5 featured gravel of 2 to 5 millimetres, sandstone rubble, sandstone, and dried orange clay. The A horizon overlaid a top of a moderately compacted dark brown (7.5YR 3/2) to dark reddish brown (7.5YR 3/3) to reddish brown (7.5YR 4/4) and brown (7.5YR 4/3) clay B horizon (Photo 26 and Photo 27).



Photo 26 PAD 5 T3 TP 1 showing representative soils

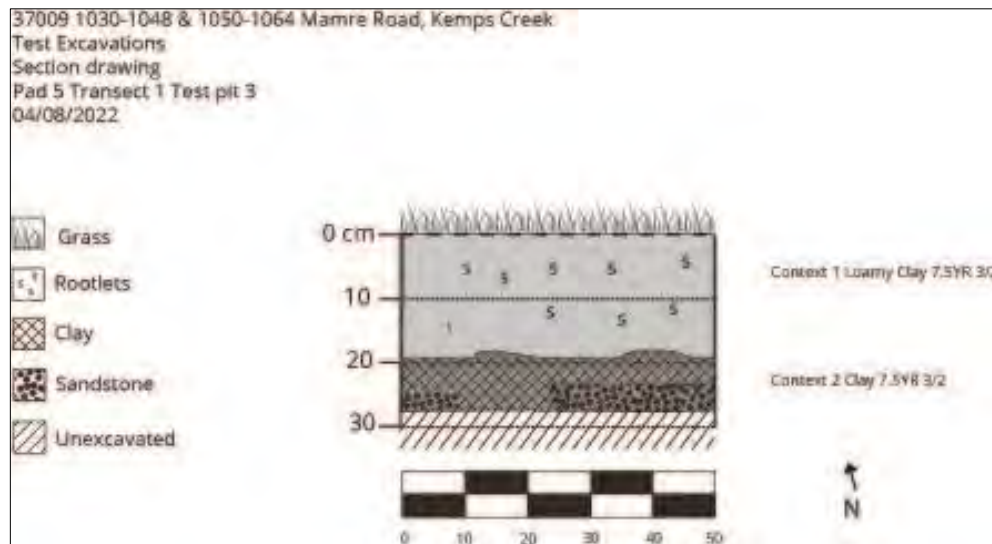


Photo 27 PAD 5 T1 TP3 section drawing showing representative soils

5.3.6 PAD 6

One test pit was excavated within PAD 6 (an additional PAD area) at the request of the RAPs onsite. This test pit was located within the gentle slope landform, approximately 20 metres north-east of the house. No artefacts were identified within PAD 6.

Soils within PAD 6 were relatively consistent with the five other PADs and featured moderately compacted dark brown (7.5YR 3/) clayey loam A horizon with a maximum depth of 130 millimetres. The A horizon overlaid a top of a moderately compacted reddish brown (7.5YR 4/4) clay B horizon (Photo 28 and Photo 29).



Photo 28 PAD 6 T1 TP1 showing representative soils

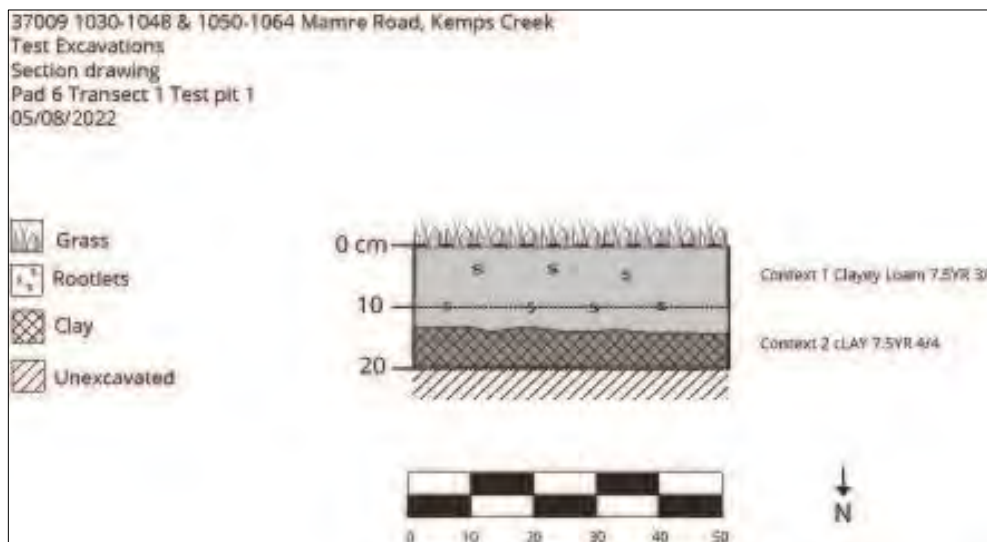
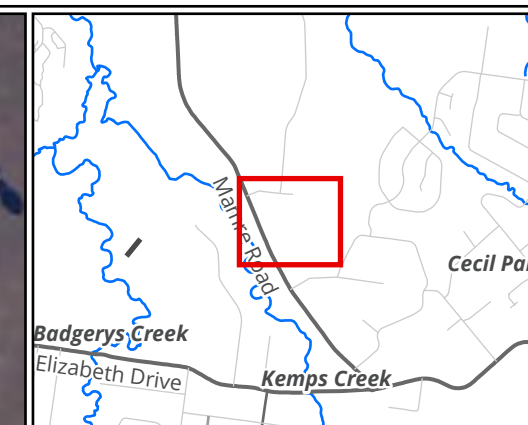


Photo 29 PAD 6 T1 TP1 section drawing showing representative soils



Legend

- Study area
- Lot
- PAD
- Test pit**
- 1 Artefact found
- 0 Artefacts found

Figure 10 Test excavation coverage and results

0 30 60 90 120 150

Metres

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



Matter: 37009, Date: 10 August 2022,
Drawn by: JET, Checked by: AV, Last edited by: jtowndsend
Location: P:\37000s\37009\Mapping\
37009_MamreRd, Layout: 37009_ACHA_F10_TestExResults

6 Analysis and discussion

The test excavation program resulted in the identification of one subsurface archaeological deposits, AHIMS 45-5-5634/Mamre Road PAD 1. Three artefacts were recovered from three test pits of the 41 test pits excavated.

6.1 Artefact analysis

The following analysis has been undertaken for the sub-surface assemblage of the study area excavated as part of the test excavation program. Three Aboriginal artefacts were identified and recorded as a result of the program of test excavations completed between 2 and 5 August 2022.

The artefacts collected from the test excavations were labelled by transect, pit and spit to locate it vertically and horizontally within the study area. The artefacts were collected and then individually analyzed by a suitably qualified Biosis archaeologist. The recording form prompts the user to record all relevant artefact attributes; this enabled a typological, technological and metrical (size) analysis of the assemblage to be undertaken. Analysis was undertaken using a standard set of digital Vernier caliper and scale. All measurements were recorded in millimeters to two decimal places. Appendix 3 contains the detailed sub-surface lithics recording.

The collected artefacts have been transported to a temporary storage location consisting of a locked storage cabinet in the Biosis Sydney Office at Unit 14, 17-27 Power Avenue, Alexandria 2015, until a care and control agreement or method for reburial can be determined in consultation with RAPs.

6.2 Artefact composition and distribution

An analysis of artefact attributes and the composition of an assemblage can allow us to determine what types of activities may have been occurring on site, and may contribute to our understanding of Aboriginal occupation within the region. However, due to the small size of the assemblage (three artefacts), limited information can be gathered regarding the spatial distribution and composition of the artefact assemblage identified in the study area.

A silcrete proximal flake (ID no. 1) was located in PAD 2, transect 1, test pit 1, in spit 1 (0-100 millimetres). It measures 19.68 millimetres long, 16.62 millimetres wide, and 4.65 millimetres thick. A silcrete angular fragment (ID no. 2) was located in PAD 2, transect 1, test pit 1.1, in spit 1 (0-100 millimetres). It belongs to a size class of 10-15 millimetres. A silcrete proximal flake (ID no. 3) was located in PAD 2, transect 1, test pit 2, in spit 1 (0-100 millimetres). It measures 33.22 millimetres long, 16.91 millimetres wide, and 7.9 millimetres thick.

Two of the artefacts had cortex (ID no. 1 with 20%, and ID. No 2 with 5%), which demonstrates the theory that it may be a remnant of a highly reduced assemblage. The amount of cortex on an artefact can often indicate the distance artefacts were transported from the source (Hiscock & Mitchell 1993, pp.12-17). A high percentage of cortex on an artefact can indicate that the source of stone was nearby; while artefacts with less or no cortex were transported further from the source. As cores are transported away from the source they are typically highly reduced and the flakes from these cores are smaller. The amount of cortex present in an assemblage also provides information on the potential uses of a site, as cores and flakes with high cortex are often found at sites where raw material extraction was occurring, whilst small flakes with lower percentages of cortex often dominate faunal and floral resource processing areas further from a raw material source (Odell

et al. 2004). The amount of cortex does not indicate that this area was, or was near a raw mineral extraction site. No edge retouch or use wear was noted, which can indicate that the artefacts were possibly discarded without being utilised.

6.3 Comparative analysis

Given the low sample size, the artefact analysis was unable to determine any firm patterns in raw material use or typology. However some comparative analysis can be undertaken. Biosis undertook excavations approximately 3 kilometres north-west from the study area in 2018 (2017, 2018) for the Mamre West Precinct. Three areas were excavated, two close to Mamre Rd and one closer to South Creek. OA1 and OA2 had similar low densities to the study area, OA1 had a density of 0.11 artefacts per square metre and OA2 had a density of 0.03 artefacts per square metre. OA3 however contained 1.05 artefacts per square metre, over 10 times the amount identified at OA1 and 35 times the amount of artefacts identified at OA2. This distribution across the landscape was attributed to the distance to South Creek, a sixth order perennial water course.

This distribution in relation to water sources is also reflected by JMCHM (2008) excavations located approximately 5 kilometres north-west of the study area. The majority of sites were identified between 50 and 200 metres from water sources. Sites were also identified across different landforms including lower hillslopes, two on creek bank/lower hillslopes, and on a creek bank/floodplain JMCHM (2008). These salvage excavations retrieved a total of 8,867 lithics from 298 square metres, indicating a density of 29.8 artefacts per square metre. It was identified that this was likely higher due to the presence of second and third order streams (which indicates a permanent or semi-permanent water source).

There is one creek line within the study area, a non-perennial, second order natural water course tributary of Kemps Creek, a perennial fourth order creekline, crossing the north-west corner of the study area. Kemps Creek is located approximately 247 metres west of the study area. The density of the artefact distribution within the study area indicates that this was likely a transitory area, with groups camping closer to the permanent water source located approximately 247 metres to the west of the study area.

6.4 Discussion of results

Test excavations within the study area resulted in the identification of one subsurface archaeological deposit, consisting of three isolated artefacts: AHIMS 45-5-5634/Mamre Road PAD 1. An analysis of this site, its location within the landscape, and its representativeness of Aboriginal site types within the local region has been completed in order to contribute to our understanding of Aboriginal occupation within the local region.

Previous predictive modelling conducted for the Cumberland Plain indicates that the most important factor for site distribution in this landscape is distance to water (White, B & McDonald, J 2010, McDonald, J. & Rich, E. 1993, Brayshaw McDonald Pty Ltd 1994). Isolated artefacts and small Aboriginal sites are more likely to be identified within proximity to lower order water sources, and at greater distances from a water source. Within the study area there is a non-perennial second order natural water course, and there is also Kemps Creek, a perennial fourth order creekline, located approximately 247 metres west of the study area. The presence of a higher order creekline, along with a lower order creekline located within close proximity to the study area indicates that water resources, and by extension food resources, were readily accessible from the study area (Jo McDonald Cultural Heritage Management 2000, p.19).

Previous archaeological assessments within the local region have also identified that artefact sites and PAD sites are the most commonly occurring site types within the region, and are likely to occur across a variety of landforms which have not been subject to high levels of disturbance (White & McDonald 2010, Jo McDonald Cultural Heritage Management 2000). This is supported by an analysis of registered Aboriginal site types

within a 3 by 3 kilometre radius of the study area, which determined that 78.98% of sites within the local region were artefacts sites, and 18.84% of them were PAD sites. Modified trees represented 1.44% and grinding grooves represented 0.72%.

The purpose of the test excavations was to identify whether subsurface archaeological deposits occur within the study area. A total of 41 test pits were excavated across six PADs, and were spaced at 20 and 40 metre intervals (PAD 3 and 4 at 20 metres; and PAD 1, 2, and 5 at 40 metres). Test pits all ended on clay, ranging from depths of 70 millimetres to 500 millimetres, with an average depth of 210 millimetres. The soil consistency was noted to be in line with Blacktown and Luddenham soils. Overall, subsurface deposits did not appear to have undergone significant levels of disturbance.

All of the artefacts were found in test pits on a gentle slope landform within the top 100 millimetres of the soil profile. There was no confirmed evidence of size sorting within the assemblage. Artefact types included two proximal flakes and one angular fragment. All three artefacts were made from silcrete, which is typically the common raw material type found in surrounding assemblages.

The low density artefact scatter across a gentle slope is consistent with other excavations in the area at similar distances to water sources. While this analysis is limited due to the small sample size and can only make a limited contribution to the artefact trends and analysis in the area, it does conform to the previous studies and trends in the area. The low density of artefacts recovered from the site suggests that the area was not likely to have been used for short or long term occupation but was instead used for transitory occupation or resource gathering. This was confirmed by the RAPs during test excavations, who stated that while the whole area is important this would have not been a permanent habitation site and Aboriginal people are not likely to camp there due to the distance to Kemps Creek, and that it is not surprising to find a low amount of artefacts.

The potential for further information to be provided by AHIMS 45-5-5634/Mamre Road PAD 1 about Aboriginal occupation and land use as a result of further investigation is therefore considered low, as the sites are an isolated instance representative of intermittent activities.

6.5 Aboriginal site identified by the assessment

The test excavation program resulted in the identification of one subsurface archaeological deposit AHIMS 45-5-5634/Mamre Road PAD 1. A description of this site is provided below.

6.5.1 AHIMS 45-5-5634/Mamre Road PAD 1

AHIMS 45-5-5634/Mamre Road PAD 1 is located approximately 540 metres east of Mamre Road within Lot 3 DP 250002 (Table 9 and Figure 11).

Table 9 Grid reference for AHIMS 45-5-5634/Mamre Road PAD 1 (GDA94/MGA56) (approximate centre point of site)

Easting(mE)	Northing(mN)
296283	6251079

Site environment

Mamre Road PAD 1 is located on a gentle slope landform in the eastern portion of the study area. Mamre Road PAD 1 was subject to testing as part of this program which contained three Aboriginal stone artefacts from test pit 1, test pit 1.1 and test pit 2 within PAD 2, transect 1. The Mamre Road PAD 1 site extent covers a

1 metre buffer and has a length of 40 metres. Soils within this site were shallow at 250 millimetres in depth. Disturbances observed within the area relate to land clearing.

Site description

A silcrete proximal flake (ID no. 1) was located in PAD 2, transect 1, test pit 1, in spit 1 (0-100 millimetres). It measures 19.68 millimetres long, 16.62 millimetres wide, and 4.65 millimetres thick. A silcrete angular fragment (ID no. 2) was located in PAD 2, transect 1, test pit 1.1, in spit 1 (0-100 millimetres). It belongs to a size class of 10-15 millimetres. A silcrete proximal flake (ID no. 3) was located in PAD 2, transect 1, test pit 2, in spit 1 (0-100 millimetres). It measures 33.22 millimetres long, 16.91 millimetres wide, and 7.9 millimetres thick.



Photo 30 East facing view of AHIMS 45-5-5634/Mamre Road PAD 1



Photo 31 Silcrete proximal flake dorsal surface

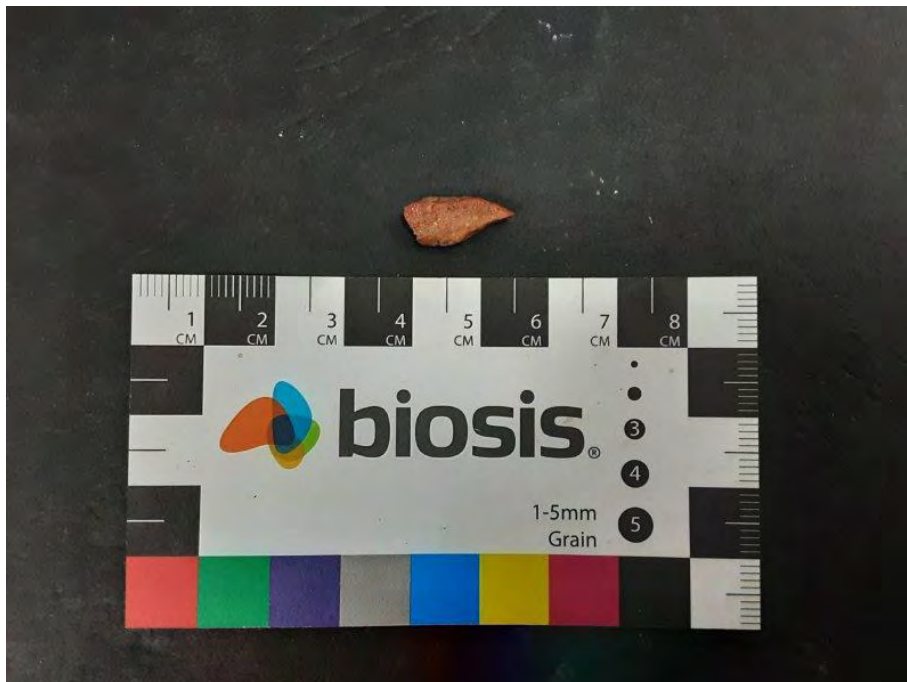


Photo 32 Silcrete angular fragment

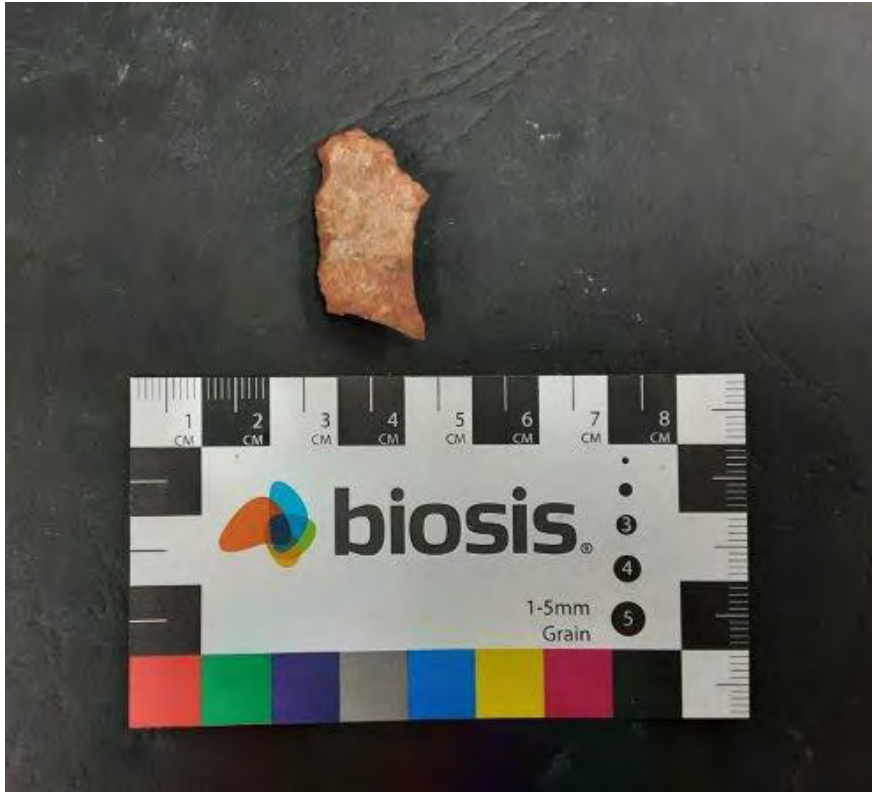
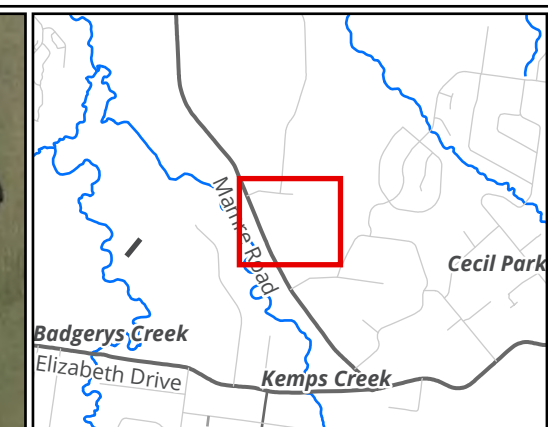


Photo 33 Silcrete proximal flake dorsal surface



Legend

- Study area
- Lot
- AHIMS 45-5-5634 / Mamre Road PAD 1

Figure 11 Aboriginal sites in the study area

0 25 50 75 100 125

Metres

Scale: 1:4,000@ A3

Coordinate System:

GDA 1994 MGA Zone 56



Matter: 37009, Date: 01 November 2023,
 Drawn by: JET, Checked by: AV, Last edited by: hliswoyo
 Location: P:\39500s\39590\Mapping\
 37009_MamreRd_Updates_for_39590, Layout: 37009_ACHA_F11_AboriginalSites

7 Scientific values and significance assessment

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

7.1 Introduction to the assessment process

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

- **Historical significance** (evolution and association) refers to historic values and encompasses the history of aesthetics, science and society, and therefore to a large extent underlies all of the terms set out in this section. A place may have historic value because it has influenced, or has been influenced by, an historic figure, event, phase or activity. It may also have historic value as the site of an important event. For any given place the significance will be greater where evidence of the association or event survives in situ, or where the settings are substantially intact, than where it has been changed or evidence does not survive. However, some events or associations may be so important that the place retains significance regardless of subsequent treatment.
- **Aesthetic significance** (Scenic/architectural qualities, creative accomplishment) refers to the sensory, scenic, architectural and creative aspects of the place. It is often closely linked with social values and may include consideration of form, scale, colour, texture, and material of the fabric or landscape, and the smell and sounds associated with the place and its use.
- **Social significance** (contemporary community esteem) refers to the spiritual, traditional, historical or contemporary associations and attachment that the place or area has for the present-day community. Places of social significance have associations with contemporary community identity. These places can have associations with tragic or warmly remembered experiences, periods or events. Communities can experience a sense of loss should a place of social significance be damaged or destroyed. These aspects of heritage significance can only be determined through consultative processes with local communities.
- **Scientific significance** (Archaeological, industrial, educational, research potential and scientific significance values) refers to the importance of a landscape, area, place or object because of its archaeological and/or other technical aspects. Assessment of scientific value is often based on the likely research potential of the area, place or object and will consider the importance of the data involved, its rarity, quality or representativeness, and the degree to which it may contribute further substantial information.

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

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

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

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

7.2 Archaeological (scientific significance) values

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

Research potential

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

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

Table 10 Site contents ratings used for archaeological sites

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

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

Table 11 Site condition ratings used for archaeological sites

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

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

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

Representativeness

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

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

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

Table 12 Site representativeness ratings used for archaeological sites

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

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

Table 13 Scientific significance ratings used for archaeological sites

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

Each site 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 16.

7.2.1 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 14 below.

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

Site name	Site content	Site condition	Representativeness	Scientific significance
AHIMS 45-5-5634/Mamre Road PAD 1	1	1	1	3 - Low

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

Site name	Statement of significance
AHIMS 45-5-5634/Mamre Road PAD 1	AHIMS 45-5-5634/Mamre Road PAD 1 is a low density sub-surface archaeological deposit on a gentle slope landform containing three silcrete artefacts. The site covers an area of approximately 40 by 1 metres. The site has been disturbed by land clearing and the soil profiles were generally intact but shallow. The soil profile varied from moderately compacted dark brown clayey loam and loamy clay to reddish brown, strong brown, and dark brown clay. This low density scatter is considered a common site type in the region with limited potential to contribute further information about Aboriginal occupation and land use within the local region. The archaeological significance of this site has been assessed as low.

8 Impact assessment

The proposed future development will consist of a warehouse and logistics hub. The potential impacts of these works on Aboriginal heritage is presented below.

8.1 Predicted physical impacts

The proposal is for a warehouse and distribution centre with ancillary office space with a total GFA of approximately 38,500 m² (Figure 3). Specifically, the proposal seeks approval for:

- Site preparation works, including demolition, clearing of all vegetation, bulk earthworks and retaining walls, construction of new internal roads and stormwater and drainage works.
- Subdivision of the site.
- Construction of an industrial warehouse buildings with ancillary office space comprising a total GFA of approximately 38,500m², including:
 - Loading docks and hardstand area, on-lot car parking and internal accessways.
 - Associated landscaping and signage.
 - Hours of operation of 24 hours, 7 days a week.

These works all have the potential to heavily impact ground surfaces through excavation as a result of the bulk earthworks and fill activities. The Aboriginal site within the study area will be impacted by these works.. A summary of impacts is provided below in Table 16.

Table 16 Summary of potential archaeological impact

AHIMS site no.	Site name	Significance	Type of harm	Degree of harm	Consequence of harm
AHIMS 45-5-5634	Mamre Road PAD 1	Low	Direct	Total	Total loss of value

8.2 Ecologically Sustainable Development

One of the primary aims of the NP&W Act is the 'conservation of objects places and features ... of cultural value within the landscape, including ... places, objects and features of significance to Aboriginal people ...' ((s.2A(1)(b)(i)). The *Operational Policy: Protecting Aboriginal Cultural Heritage (Version 2)* (State of NSW and Office of Environment and Heritage NSW 2011) provides guidance to proponents in term of ESD.

ESD has been defined in Part 3, 6. (2) Objective of the Authority of the *Protection of the Environment Administration Act 1991* (NSW). This outlines that the ESD requires the integration of economic and environmental considerations (including cultural heritage) in the decision-making process. In regard to Aboriginal cultural heritage, ESD can be achieved by applying the principle of intergenerational equity and the precautionary principle.

Intergenerational equity

The principle of intergenerational equity states that the present generation should make every effort to ensure the health, diversity and productivity of the environment – which includes cultural heritage – for the benefit of future generations.

In terms of Aboriginal cultural heritage, intergenerational equity can be considered in terms of the 'cumulative impacts' of any proposal to Aboriginal objects and places. For example, if few Aboriginal objects and places remain in a region (because of harm authorised under previous AHIPs), fewer opportunities remain for future generations of Aboriginal people to enjoy the cultural benefits of those Aboriginal objects and places.

Information about the significance of Aboriginal cultural heritage values associated with the Aboriginal objects and places proposed to be harmed will be relevant to the consideration of intergenerational equity and an understanding of the cumulative impacts of a proposal.

Where there is uncertainty, the precautionary principle should also be followed (see below).

The precautionary principle

The precautionary principle states that the lack of full scientific certainty about the threat of harm should not be used as a reason for not taking measures to prevent harm from occurring.

In applying the precautionary principle, decisions should be guided by:

- *a careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment (which includes cultural heritage)*
- *an assessment of the risk-weighted consequences of various options. The precautionary principle is relevant to OEH consideration of potential harm to Aboriginal cultural heritage where:*
- *the proposal involves a risk of serious or irreversible harm to Aboriginal objects or places or to the value of those objects or places, and*
- *there is a lot of uncertainty about the significance of Aboriginal cultural heritage values of the Aboriginal objects or places proposed to be harmed.*

Where this is the case, a precautionary approach should be taken and all cost-effective measures implemented to prevent or reduce harm to the Aboriginal objects/place.

8.2.1 Collection of archaeological information

As part of this assessment test excavations and community consultation have been undertaken to determine the archaeological and cultural significance of the study area. Test excavations identified one Aboriginal site and the information obtained from specialist analysis of these sites has been incorporated into this report to characterize and present information on Aboriginal use of the area.

Analysis of the site and data collected throughout the test excavations undertaken in the study area identified a low density artefact site. The site was identified on a gentle slope and consisted of silcrete raw material. This site is similar to those identified by previous assessments on similar landforms at similar distances to water sources. Analysis has provided limited additional information about site patterning in the area. Due to the site representing a low density sporadic deposit which is common in the area, the information obtained from this analysis is of low scientific value as it contributes little information that is not already known from previous assessments but is in fair condition. Further salvage and analysis of the deposits in the study area is not likely to provide any further information relating to Aboriginal land and technology use that is not already known about the area and no further assessment is recommended at this stage as a result. The information

obtained from this assessment contributes to our understanding of Aboriginal occupation and allows future generations to access and build on this knowledge in accordance with principles of intergenerational equity and ESD.

8.3 Assessment of impacts to the study area

The study area contains one AHIMS site (AHIMS 45-5-5634/Mamre Road PAD 1, and the and the proposed works will impact on Aboriginal heritage values (Figure 12).

As per Section 4.41 of the EP&A Act projects classified as SSDs do not require an AHIP under the NPW Act. Instead, all works must be conducted in accordance with the Conditions of Consent for the SSD issued by the Secretary, DPE. Consequently, it is recommended an ACHMP be developed in order to appropriately manage Aboriginal cultural heritage identified within the study area. An ACHMP sets out specific guidelines and protocols for the management of Aboriginal heritage across the life of the project, inclusive of unanticipated finds protocols, the requirement for heritage inductions to be undertaken by the site personnel prior to works, and long term care and control of Aboriginal archaeological materials. The ACHMP must be prepared by a suitably qualified archaeologist in consultation with the RAPs for the project.

The establishment of a long term care agreement in consultation with RAPs should be developed in order to ensure the artefacts identified as part of this assessment are adequately cared for. Several management options are possible depending on the wishes of RAPs. Artefacts recovered from the excavations can be given back to the Aboriginal community through a care and control agreement where they can then be used to teach subsequent generations about Aboriginal culture or can be reburied in a culturally appropriate place. A potential reburial location within the study area has been provided in Figure 12. This approach considers the principles of ESD and intergenerational equity and more importantly ensures that recovered artefacts are managed according to the wishes of RAPs.

As per the consultation guidelines it is recommended that the proponent provides a copy of this report to the RAPs 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. The RAPs should be consulted in regards to the resting place of the artefacts.

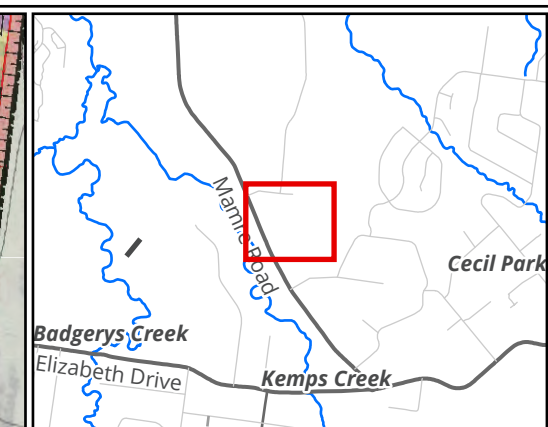
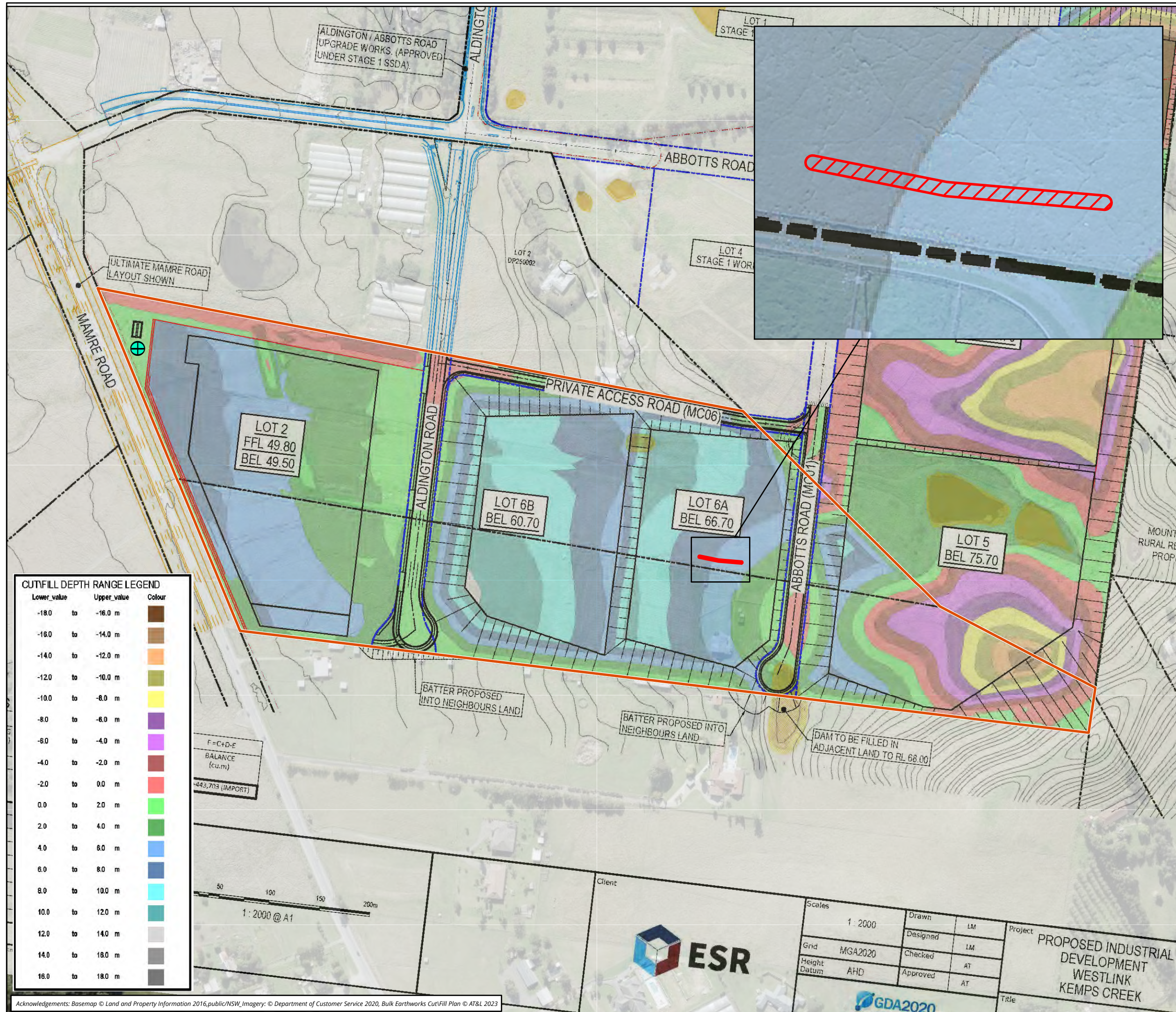
A summary of the impacts of the proposed works to the study area is presented in Table 17, Table 18 and in Figure 12.

Table 17 Summary of sub-surface impacts of proposed works (SSD-46983729)

Proposed works	Impacts to potential archaeological deposits (Yes/No)
<ul style="list-style-type: none"> Site preparation works, including demolition, clearing of all vegetation, bulk earthworks and retaining walls, construction of new internal roads and stormwater and drainage works. Subdivision of the site. Construction of an industrial warehouse buildings with ancillary office space comprising a total GFA of approximately 38,500m², including: <ul style="list-style-type: none"> Loading docks and hardstand area, on-lot car parking and internal accessways. Associated landscaping and signage. Hours of operation of 24 hours, 7 days a week. 	Yes – AHIMS 45-5-5634 (Mamre Road PAD 1)

Table 18 Summary of potential archaeological impacts to the study area

AHIMS site	Significance	Type of harm	Degree of harm	Consequence of harm
AHIMS 45-5-5634/Mamre Road PAD 1	Low	Direct	Total	An ACHMP should be developed for the study area. This should include a heritage induction for all site workers and contractors should be undertaken in order to prevent any unintentional harm to Aboriginal sites located within the study area and its surrounds; an unexpected finds protocol; and a long term care and control agreement for AHIMS 45-5-5634/Mamre Road PAD 1.



Legend

- Study area
- AHIMS 45-5-5634 / Mamre Road PAD 1
- ⊕ Proposed Reburial Site

Figure 12 Impact Assessment

0 20 40 60 80 100

Metres

Scale: 1:3,500@ A3
Coordinate System:
GDA 1994 MGA Zone 56



Matter: 39590, Date: 01 November 2023,
Prepared for: AV, Prepared by: HL, Last edited by: hliswoyo
Location: P:\39500s\39590\Mapping\39590_Mamre-rd_Kemps-Creek_ACHA-and-HIS-updates, Layout: 39590_AR_F12_ImpactAssessment_West

9 Conclusions and Recommendations

9.1 Conclusions

As part of the management and mitigation measures for the proposed works, an ACHA including archaeological survey, test excavations, and consultation with the Aboriginal community was undertaken. This was done to determine the presence and nature of any potential Aboriginal sites so that appropriate management could be undertaken. The archaeological survey identified five PADs, which were tested as part of the test excavation program. One Aboriginal site (AHIMS 45-5-5634/Mamre Road PAD 1) was identified, and consisted of three silcrete artefacts. This site is consistent with regional models and past studies, and will be destroyed by the proposed development. This assessment has positively contributed to our knowledge of Aboriginal land use in the area and will be available for future generations to build on in line with inter-generational equity and precautionary principles. To mitigate harm, the recommendations below have been developed.

9.2 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: Development of an Aboriginal Cultural Heritage Management Plan

As per Section 4.41 of the EP&A Act an AHIP under the NPW Act is not required for SSD projects authorised by a development consent. All works must be conducted in accordance with the SSD consent conditions.

It is recommended an ACHMP be developed in order to appropriately manage Aboriginal cultural heritage identified within the study area. This will identify how to properly manage Aboriginal heritage for the project and would include unanticipated finds protocols and a heritage induction to be undertaken by the site personnel prior to works. The ACHMP should also detail the long term care and control of AHIMS 45-5-5634/Mamre Road PAD 1.

The ACHMP must be prepared by a suitably qualified archaeologist in consultation with the RAPs for the project.

Recommendation 2: Long term care and control agreement

The establishment of a long term care agreement via the ACHMP in consultation with RAPs should be developed in order to ensure the artefacts identified as part of this assessment are adequately cared for. Several management options are possible depending on the wishes of RAPs. Artefacts recovered from the excavations can be given back to the Aboriginal community through a care and control agreement where

they can then be used to teach subsequent generations about Aboriginal culture or can be reburied in a culturally appropriate place.

This approach considers the principles of ESD and intergenerational equity and more importantly ensures that recovered artefacts are managed according to the wishes of RAPs.

Recommendation 3: Continued consultation with the RAPs

As per the consultation guidelines it is recommended that the proponent provides a copy of this report to the RAPs 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. The RAPs should be consulted in regards to the resting place of the artefacts.

Recommendation 4: Native landscaping

Consultation with Kamilaroi Yankuntjatjara Working Group has also recommended that native landscaping be implemented for the project. ESR Australia are to consult with the landscape architect for the project.

Recommendation 5: Discovery of unanticipated Aboriginal objects

All Aboriginal objects and Places are protected under the NSW NPW Act. It is an offence to disturb an Aboriginal site without a consent permit issued by Heritage NSW or SSD approval issued by DPE. 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 Heritage NSW and RAPs.

Recommendation 6: Discovery of unanticipated historical relics

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

Recommendation 7: Discovery of human remains

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

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

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Appendices

Appendix 1 AHIMS results

THE FOLLOWING APPENDIX IS NOT TO BE MADE PUBLIC

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : 39590 AV

Client Service ID : 803412

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
45-5-5678	Yiribana AS 1	GDA	56	294196	6253460	Open site	Valid	Artefact : -		
	Contact	Recorders		Austral Archaeology, Miss. Taylor (austral arch) Foster				Permits		
45-5-5186	Mamre Road Artefact Scatter 1901 (MAM AS1901)	GDA	56	295114	6253373	Open site	Valid	Artefact : -, Potential Archaeological Deposit (PAD) : -		
	Contact	Recorders		Artefact - Cultural Heritage Management - Pyrmont, Artefact - Cultural Heritage Ma				Permits		
45-5-5568	ALD-RD-PAD-01	GDA	56	295809	6253440	Open site	Valid	Potential Archaeological Deposit (PAD) : -		104841, 104842
	Contact	Recorders		Biosis Pty Ltd - Wollongong, Mrs. Samantha Keats				Permits		
45-5-5467	ARKC Area 1	GDA	56	296685	6252817	Open site	Valid	Potential Archaeological Deposit (PAD) : -		
	Contact	Recorders		Biosis Pty Ltd - Wollongong, Mrs. Samantha Keats				Permits		
45-5-5259	Elizabeth Drive AFT 1	GDA	56	293377	6249426	Open site	Valid	Artefact : -		
	Contact	Recorders		Kelleher Nightingale Consulting Pty Ltd, Miss. Kristen Taylor				Permits		
45-5-2553	CGD4	AGD	56	293300	6252500	Open site	Valid	Artefact : -, Modified Tree (Carved or Scarred) : -	Open Camp Site, Scarred Tree	98435
	Contact	Recorders		Dominic Steele Archaeological Consulting				Permits		
45-5-2550	CGD1	AGD	56	293350	6252800	Open site	Valid	Artefact : -	Open Camp Site	98435
	Contact	Recorders		Dominic Steele Archaeological Consulting				Permits		
45-5-5679	KC PAD 2	GDA	56	293691	6252166	Open site	Valid	Potential Archaeological Deposit (PAD) : -		
	Contact	Recorders		Austral Archaeology, Miss. Peta Rice				Permits		
45-5-4749	M12 A4	GDA	56	293785	6251051	Open site	Valid	Artefact : -		
	Contact	Recorders		Navin Officer Heritage Consultants Pty Ltd, Mrs. Nicola Hayes				Permits		
45-5-0215	South Creek	AGD	56	293800	6249900	Open site	Valid	Grinding Groove : -	Axe Grinding Groove	362
	Contact	Recorders		Ms. Laila Haglund				Permits		
45-5-5234	Elizabeth Precinct PAD 03	GDA	56	293924	6249724	Open site	Valid	Potential Archaeological Deposit (PAD) : -		
	Contact	Recorders		Artefact - Cultural Heritage Management - Pyrmont, Ms. Jennifer Norfolk				Permits		
45-5-2307	P-CP9	AGD	56	298110	6248750	Open site	Valid	Artefact : -	Open Camp Site	
	Contact	Recorders		Helen Brayshaw				Permits		
45-5-5502	Aldington Rd Kemps Ck IF-1	GDA	56	296357	6251913	Open site	Valid	Artefact : -		
	Contact	Recorders		Urbis Pty Ltd - Angel Place L8 123 Pitt Street, Mr. Owen Barrett				Permits		
45-5-5503	Abbot's Rd Kemps Creek IF1	GDA	56	296422	6251265	Open site	Destroyed	Artefact : -		

Report generated by AHIMS Web Service on 25/07/2023 for Samantha Keats for the following area at Datum : GDA, Zone : 56, Eastings : 293317.496 - 298530.689, Northings : 6248420.02 - 6254025.94 with a Buffer of 0 meters.. Number of Aboriginal sites and Aboriginal objects found is 93

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

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : 39590 AV

Client Service ID : 803412

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
	<u>Contact</u>	<u>Recorders</u>	Artefact - Cultural Heritage Management - Pyrmont,Urbis Pty Ltd - Angel Place L8 1					<u>Permits</u>		
45-5-5567	BakersLn PAD5	GDA	56	295258	6253931	Open site	Valid	Artefact : -		
	<u>Contact</u>	<u>Recorders</u>	Biosis Pty Ltd - Wollongong,Mrs.Samantha Keats					<u>Permits</u>		
45-5-3036	EP-I 3	AGD	56	295240	6253710	Open site	Valid	Artefact : -		
	<u>Contact</u>	<u>Recorders</u>	Navin Officer Heritage Consultants Pty Ltd					<u>Permits</u>	2188	
45-5-5303	Kemps North West (KNW) PAD	GDA	56	295455	6250265	Open site	Valid	Artefact : 1, Potential Archaeological Deposit (PAD) : 1		
	<u>Contact</u>	<u>Recorders</u>	Mr.Andrew Costello,Jacobs Group (Australia) Pty Ltd - North Sydney					<u>Permits</u>		
45-5-5501	784 Mamre Rd AFT1	GDA	56	295424	6253360	Open site	Valid	Artefact : -		
	<u>Contact</u>	<u>Recorders</u>	Urbis Pty Ltd - Angel Place L8 123 Pitt Street,Urbis Pty Ltd - Angel Place L8 123 Pitt					<u>Permits</u>		
45-5-5486	MR902TE_AS1	GDA	56	295460	6252681	Open site	Valid	Artefact : -		
	<u>Contact</u>	<u>Recorders</u>	Austral Archaeology,Mr.Ricardo Servin					<u>Permits</u>		
45-5-3106	Kemps Creek (KC PAD 1)	AGD	56	296000	6248875	Open site	Valid	Potential Archaeological Deposit (PAD) : 1, Artefact : 1		97456,98064
	<u>Contact</u> T Russell	<u>Recorders</u>	Jo McDonald Cultural Heritage Management see GML					<u>Permits</u>		
45-5-5315	MRP-OS2	GDA	56	296737	6253925	Open site	Valid	Artefact : -		
	<u>Contact</u>	<u>Recorders</u>	EMM Consulting - St Leonards - Individual users,Ms.Taylor Reid					<u>Permits</u>		
45-5-3033	EPTA11	AGD	56	293340	6253690	Open site	Valid	Artefact : -		
	<u>Contact</u>	<u>Recorders</u>	Navin Officer Heritage Consultants Pty Ltd					<u>Permits</u>	2188	
45-5-5676	Yiribana PAD 2	GDA	56	293621	6253570	Open site	Valid	Potential Archaeological Deposit (PAD) : -		
	<u>Contact</u>	<u>Recorders</u>	Austral Archaeology,Miss.Taylor (austral arch) Foster					<u>Permits</u>		
45-5-3032	EPTA10	AGD	56	293580	6253610	Open site	Valid	Artefact : -		
	<u>Contact</u>	<u>Recorders</u>	Navin Officer Heritage Consultants Pty Ltd					<u>Permits</u>	2188	
45-5-4008	Isolated Object 2009-5	GDA	56	297443	6248524	Open site	Valid	Artefact : -		
	<u>Contact</u>	<u>Recorders</u>	Extent Heritage Pty Ltd - Pyrmont - Individual users,Doctor.Alan Williams					<u>Permits</u>		
45-5-0496	Fleurs1 Fleurs Radio Telescope	AGD	56	293750	6250730	Open site	Valid	Artefact : -	Open Camp Site	961,1018,9843 5
	<u>Contact</u>	<u>Recorders</u>	University of Sydney					<u>Permits</u>		
45-5-5316	MRP-OS1	GDA	56	294413	6252254	Open site	Valid	Artefact : -		
	<u>Contact</u>	<u>Recorders</u>	EMM Consulting - St Leonards - Individual users,Ms.Taylor Reid					<u>Permits</u>		
45-5-5565	BakersLn PAD3	GDA	56	295361	6253886	Open site	Valid	Artefact : -		
	<u>Contact</u>	<u>Recorders</u>	Biosis Pty Ltd - Wollongong,Mrs.Samantha Keats					<u>Permits</u>		
45-5-5663	30-40 Martin Road Artefact Scatter 01	GDA	56	293326	6249023	Open site	Valid	Artefact : -		
	<u>Contact</u>	<u>Recorders</u>	Artefact - Cultural Heritage Management - Pyrmont,Mr.Michael Lever					<u>Permits</u>		

Report generated by AHIMS Web Service on 25/07/2023 for Samantha Keats for the following area at Datum :GDA, Zone : 56, Eastings : 293317.496 - 298530.689, Northings : 6248420.02 - 6254025.94 with a Buffer of 0 meters.. Number of Aboriginal sites and Aboriginal objects found is 93

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SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
45-5-4937	M12-AS-01	GDA	56	297650	6248694	Open site	Valid	Artefact : -		
	Contact	Recorders		Mr.Neville Baker,Sydney Water - Parramatta				Permits		
45-5-5301	Kemps Creek East (KCE) PAD	GDA	56	296543	6249177	Open site	Valid	Artefact : 1, Potential Archaeological Deposit (PAD) : 1		
	Contact	Recorders		Mr.Andrew Costello,Jacobs Group (Australia) Pty Ltd - North Sydney				Permits		
45-5-5235	Elizabeth Precinct PAD 02	GDA	56	293927	6249529	Open site	Not a Site	Potential Archaeological Deposit (PAD) : -		
	Contact	Recorders		Artefact - Cultural Heritage Management - Pyrmont,Artefact - Cultural Heritage Ma				Permits		
45-5-5306	South Creek East (SCE)	GDA	56	293940	6251020	Open site	Valid	Artefact : 1, Potential Archaeological Deposit (PAD) : 1		
	Contact	Recorders		Mr.Andrew Costello,Jacobs Group (Australia) Pty Ltd - North Sydney,Mr.Matthew K				Permits		
45-5-5344	MSP-09	GDA	56	294469	6253984	Open site	Valid	Artefact : -		
	Contact	Recorders		Biosis Pty Ltd - Wollongong,Mrs.Samantha Keats				Permits		
45-5-3029	EPTA4	AGD	56	294850	6253540	Open site	Valid	Artefact : -		
	Contact	Recorders		Navin Officer Heritage Consultants Pty Ltd				Permits	2188	
45-5-5268	Kemps Creek IF-02	GDA	56	295030	6253859	Open site	Valid	Artefact : -		
	Contact	Recorders		Urbis Pty Ltd - Angel Place L8 123 Pitt Street,Miss.Meggan Walker				Permits		
45-5-3035	EP-I 2	AGD	56	295190	6253500	Open site	Valid	Artefact : -		
	Contact	Recorders		Navin Officer Heritage Consultants Pty Ltd				Permits	2188	
45-5-5469	ARKC Area 2	GDA	56	296768	6253309	Open site	Valid	Potential Archaeological Deposit (PAD) : -		
	Contact	Recorders		Biosis Pty Ltd - Wollongong,Mrs.Samantha Keats				Permits		
45-5-5713	Ropes Creek Artefact Scatter 3	GDA	56	296764	6253645	Open site	Valid	Artefact : -		
	Contact	Recorders		EMM Consulting - St Leonards - Individual users,Miss.Amber Morgan				Permits		
45-5-5189	MSP-03	GDA	56	293501	6253805	Open site	Partially Destroyed	Artefact : -		
	Contact	Recorders		Biosis Pty Ltd - Wollongong,Biosis Pty Ltd - Wollongong,Mrs.Samantha Keats,Mrs.S				Permits		
45-5-4007	Artefact Scatter 2008-4	GDA	56	297641	6248524	Open site	Valid	Artefact : -		
	Contact	Recorders		Extent Heritage Pty Ltd - Pyrmont - Individual users,Doctor.Alan Williams				Permits		
45-5-5331	Elizabeth Precinct Isolated Find 04 (EP IF 04)	GDA	56	293336	6249535	Open site	Valid	Artefact : -		
	Contact	Recorders		Artefact - Cultural Heritage Management - Pyrmont,Ms.Alyce Haast				Permits		
41-5-0014	M12-AS-04	GDA	56	294361	6250957	Open site	Destroyed	Artefact : 1		
	Contact	Recorders		Jacobs Group (Australia) Pty Ltd - Newcastle,Miss.Chelsea Jones,Mr.Matthew Kelle				Permits		
45-5-5188	MSP-02	GDA	56	293594	6253823	Open site	Destroyed	Artefact : -		
	Contact	Recorders		Biosis Pty Ltd - Wollongong,Biosis Pty Ltd - Wollongong,Mrs.Samantha Keats,Mrs.S				Permits		

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
45-5-5634	Mamre Road PAD 1	GDA	56	296283	6251079	Open site	Valid	Potential Archaeological Deposit (PAD) : -		
	Contact	Recorders	Biosis Pty Ltd - Wollongong,Mrs.Samantha Keats							
45-5-5569	BakersLn PAD2	GDA	56	295194	6253772	Open site	Valid	Artefact : -		
	Contact	Recorders	Biosis Pty Ltd - Wollongong,Mrs.Samantha Keats							
45-5-4102	Kemps Creek IF1	GDA	56	295565	6253701	Open site	Valid	Artefact : 1		104747
	Contact	Recorders	Dominic Steele Archaeological Consulting							
45-5-5302	Kemps Creek West (KCW) PAD	GDA	56	296110	6249360	Open site	Valid	Artefact : 1, Potential Archaeological Deposit (PAD) : 1		
	Contact	Recorders	Mr.Andrew Costello,Jacobs Group (Australia) Pty Ltd - North Sydney							
45-5-5608	Aldington Road 02	GDA	56	296072	6253285	Open site	Valid	Artefact : -		
	Contact	Recorders	Austral Archaeology,Miss.Stephanie (austral arch) Moore							
45-5-5308	South Creek West T2 (SCW T2)	GDA	56	293360	6251085	Open site	Valid	Artefact : 1, Potential Archaeological Deposit (PAD) : 1		
	Contact	Recorders	Mr.Andrew Costello,Jacobs Group (Australia) Pty Ltd - North Sydney							
45-5-5233	Elizabeth Precinct Artefact Scatter 01 (EPAS 01)	GDA	56	293412	6249873	Open site	Valid	Artefact : -		
	Contact	Recorders	Artefact - Cultural Heritage Management - Pyrmont,Ms.Jennifer Norfolk							
45-5-2711	CDG1	AGD	56	293300	6252800	Open site	Valid	Artefact : -		1345,1539,473 7
	Contact	Recorders	Dominic Steele Archaeological Consulting							
45-5-4374	CP AS1	GDA	56	298104	6249004	Open site	Valid	Artefact : 1		
	Contact	Recorders	Mr.Josh Madden							
45-5-5677	Yiribana PAD 3	GDA	56	293819	6253423	Open site	Valid	Potential Archaeological Deposit (PAD) : -		
	Contact	Recorders	Austral Archaeology,Miss.Taylor (austral arch) Foster							
45-5-4529	Oakdale South AS4	GDA	56	297190	6253944	Open site	Valid	Artefact : -		
	Contact	Recorders	Artefact - Cultural Heritage Management - Pyrmont,Mr.Alex Timms							
45-5-5104	PAD 2 (Not a site)	GDA	56	294516	6249243	Open site	Not a Site	Potential Archaeological Deposit (PAD) : -		
	Contact	Recorders	Navin Officer Heritage Consultants Pty Ltd,Miss.Jasmine Fenyvesi,Mr.Matthew Kell							
45-5-5345	MSP-10	GDA	56	294548	6253896	Open site	Valid	Artefact : -		
	Contact	Recorders	Biosis Pty Ltd - Wollongong,Mrs.Samantha Keats							
45-5-5710	Ropes Creek Artefact Scatter 1	GDA	56	296772	6253718	Open site	Valid	Artefact : -		
	Contact	Recorders	EMM Consulting - St Leonards - Individual users,Miss.Amber Morgan							

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : 39590 AV

Client Service ID : 803412

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
45-5-5711	Ropes Creek Artefact Scatter 2	GDA	56	296774	6253626	Open site	Valid	Artefact : -		
	Contact	Recorders						Permits		
45-5-5659	Elizabeth Precinct Isolated Find 06 (EP IF 06)	GDA	56	293803	6249967	Open site	Valid	Artefact : -		
	Contact	Recorders						Permits		
45-5-5680	KC PAD 1	GDA	56	293770	6252350	Open site	Valid	Potential Archaeological Deposit (PAD) : -		
	Contact	Recorders						Permits		
45-5-0604	Cecil Park 1	AGD	56	297350	6251470	Open site	Valid	Artefact : -	Open Camp Site	1283,98435
	Contact	Recorders						Permits	694	
45-5-4767	M12 A5	GDA	56	296537	6249457	Open site	Valid	Artefact : -		
	Contact	Recorders						Permits		
45-5-2057	PGH1;Monier PGH;	GDA	56	298268	6254015	Open site	Destroyed	Artefact : -	Isolated Find	98435,103366
	Contact	Recorders						Permits		
45-5-5692	Aldington Road IF01	GDA	56	296330	6253139	Open site	Valid	Artefact : -		
	Contact	Recorders						Permits		
45-5-3031	EPTA6	AGD	56	295210	6253410	Open site	Valid	Artefact : -		
	Contact	Recorders						Permits	2188	
45-5-3034	EP-I 1	AGD	56	295260	6253400	Open site	Valid	Artefact : -		
	Contact	Recorders						Permits	2188	
45-5-4006	Artefact Scatter PAD 2007-4	GDA	56	295792	6248524	Open site	Valid	Artefact : -		
	Contact	Recorders						Permits		
45-5-3999	PAD 2001-6	GDA	56	295825	6248852	Open site	Valid	Potential Archaeological Deposit (PAD) : -		
	Contact	Recorders						Permits		
45-5-5578	Aldington Road Kemps Creek PAD 1	GDA	56	296008	6252610	Open site	Valid	Artefact : -		
	Contact	Recorders						Permits		
45-5-0214	Kemps Creek;	AGD	56	296100	6248300	Open site	Valid	Artefact : -	Open Camp Site	
	Contact	Recorders						Permits		
45-5-5504	Abbot's Rd Kemps Creek IF2	GDA	56	296149	6251410	Open site	Destroyed	Artefact : -		
	Contact	Recorders						Permits		
45-5-5232	Elizabeth Precinct Isolated Find 01 (EPIF 01)	GDA	56	293416	6249892	Open site	Valid	Artefact : -		
	Contact	Recorders						Permits		
45-5-2991	TCE 1	AGD	56	293300	6252700	Open site	Valid	Artefact : -		99352
	Contact T Russell	Recorders						Permits	2056	
45-6-1778	Lec 11;	AGD	56	293300	6252820	Open site	Valid	Artefact : -	Open Camp Site	1345,98435

Report generated by AHIMS Web Service on 25/07/2023 for Samantha Keats for the following area at Datum :GDA, Zone : 56, Eastings : 293317.496 - 298530.689, Northings : 6248420.02 - 6254025.94 with a Buffer of 0 meters.. Number of Aboriginal sites and Aboriginal objects found is 93

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AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : 39590 AV

Client Service ID : 803412

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status **	SiteFeatures	SiteTypes	Reports
	Contact	Recorders						Permits		
45-5-2568	CGD5	AGD	56	293300	6253500	Open site	Valid	Artefact : -	Open Camp Site	98435
	Contact	Recorders						Permits		
45-5-2310	KC/ED2;	AGD	56	297520	6248760	Open site	Valid	Artefact : -	Open Camp Site	
	Contact	Recorders						Permits		
45-5-5478	Mamre Road Kemps Creek AFT 1	GDA	56	296966	6249219	Open site	Valid	Artefact : -		
	Contact	Recorders						Permits		
45-5-5632	805MAMRE-AS01	GDA	56	294607	6253281	Open site	Valid	Artefact : -		
	Contact	Recorders						Permits		
45-5-5269	Kemps Creek IF-01	GDA	56	294976	6253943	Open site	Valid	Artefact : -		
	Contact	Recorders						Permits		
45-5-3030	EPTA5	AGD	56	295170	6253570	Open site	Valid	Artefact : -		
	Contact	Recorders						Permits	2188	
45-5-5610	Aldington Road 04	GDA	56	295845	6253075	Open site	Valid	Artefact : -		
	Contact	Recorders						Permits		
45-5-5609	Aldington Road 03	GDA	56	296045	6253055	Open site	Valid	Artefact : -		
	Contact	Recorders						Permits		
45-5-5505	Abbot's Rd Kemps Creek IF3	GDA	56	296168	6251367	Open site	Destroyed	Artefact : -		
	Contact	Recorders						Permits		
45-5-5230	Elizabeth Precinct Isolated Find 03 (EPIF 03)	GDA	56	293375	6249980	Open site	Valid	Artefact : -		
	Contact	Recorders						Permits		
45-5-5307	South Creek West T1 (SCW T1)	GDA	56	293360	6251085	Open site	Valid	Artefact : 1, Potential Archaeological Deposit (PAD) : 1		
	Contact	Recorders						Permits		
45-5-5231	Elizabeth Precinct Isolated Find 02 (EPIF 02)	GDA	56	293466	6250004	Open site	Valid	Artefact : -		
	Contact	Recorders						Permits		
45-6-1779	Lec 12;	AGD	56	293300	6252850	Open site	Valid	Artefact : -	Open Camp Site	1345,98435,99352
	Contact	Recorders						Permits	2056	
45-5-5468	ARKC Area 3	GDA	56	296932	6253304	Open site	Valid	Potential Archaeological Deposit (PAD) : -		
	Contact	Recorders						Permits		
45-5-0605	Cecil Park 2	AGD	56	297600	6251780	Open site	Valid	Artefact : -	Open Camp Site	1283,98435
	Contact	Recorders						Permits		

Report generated by AHIMS Web Service on 25/07/2023 for Samantha Keats for the following area at Datum :GDA, Zone : 56, Eastings : 293317.496 - 298530.689, Northings : 6248420.02 - 6254025.94 with a Buffer of 0 meters.. Number of Aboriginal sites and Aboriginal objects found is 93

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AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : 39590 AV

Client Service ID : 803412

<u>SiteID</u>	<u>SiteName</u>	<u>Datum</u>	<u>Zone</u>	<u>Easting</u>	<u>Northing</u>	<u>Context</u>	<u>Site Status **</u>	<u>SiteFeatures</u>	<u>SiteTypes</u>	<u>Reports</u>
45-5-5623	50 Martin Rd PAD	GDA	56	293328	6248999	Open site	Valid	Potential Archaeological Deposit (PAD) : -		
	<u>Contact</u>	<u>Recorders</u>	Artefact - Cultural Heritage Management - Pyrmont,Artefact - Cultural Heritage Ma							
45-5-5190	MSP-04	GDA	56	293580	6253610	Open site	Valid	Artefact : -		
	<u>Contact</u>	<u>Recorders</u>	Biosis Pty Ltd - Wollongong,Mrs.Samantha Keats							
45-5-5607	Aldington Road 01	GDA	56	296335	6253304	Open site	Valid	Artefact : -		
	<u>Contact</u>	<u>Recorders</u>	Austral Archaeology,Miss.Stephanie (austral arch) Moore							

** Site Status

Valid - The site has been recorded and accepted onto the system as valid

Destroyed - The site has been completely impacted or harmed usually as consequence of permit activity but sometimes also after natural events. There is nothing left of the site on the ground but proponents should proceed with caution.

Partially Destroyed - The site has been only partially impacted or harmed usually as consequence of permit activity but sometimes also after natural events. There might be parts or sections of the original site still present on the ground

Not a site - The site has been originally entered and accepted onto AHIMS as a valid site but after further investigations it was decided it is NOT an aboriginal site. Impact of this type of site does not require permit but Heritage NSW should be notified

Report generated by AHIMS Web Service on 25/07/2023 for Samantha Keats for the following area at Datum :GDA, Zone : 56, Eastings : 293317.496 - 298530.689, Northings : 6248420.02 - 6254025.94 with a Buffer of 0 meters.. Number of Aboriginal sites and Aboriginal objects found is 93

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AHIMS site ID: 45-5-5634

Date recorded: 08-08-2022

Site Location Information

Site name: Mamre Road PAD 1

Easting: 296283

Northing: 6251079

Coordinates must be in GDA94 (MGA)

Horizontal Accuracy (m):

5

Zone: 56

Non-Differential GPS

Recorder Information

(The person responsible for the completion and submission of this form)

Title	Surname	First name
Mrs.	Keats	Samantha

Organisation: Biosis Pty Ltd

Address: 30 Wentworth Street, Port Kembla NSW 2505

Phone: 0242011061

E-mail: ahims@biosis.com.au

Site Context Information

Land Form
Pattern: Undulating Plain

Land Use: Pastoral/Grazing

Land Form
Unit: Slope

Vegetation: Cleared

Distance to
Water (m): 540

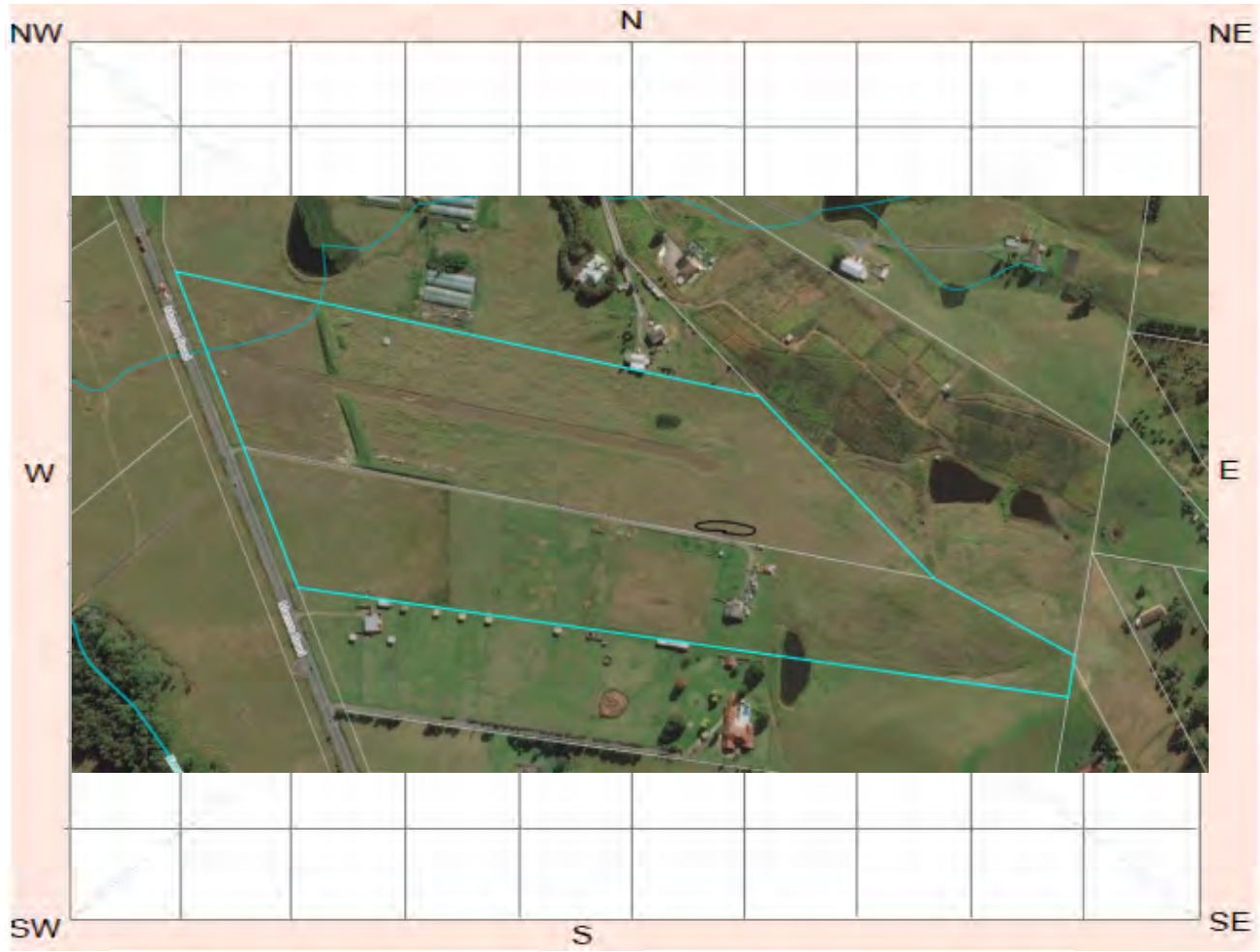
Primary
Report: Biosis (2022). 1030-1048 and 1050-1064 Mamre Rd Kemps
Creek: ACHA

How to get
to the site:

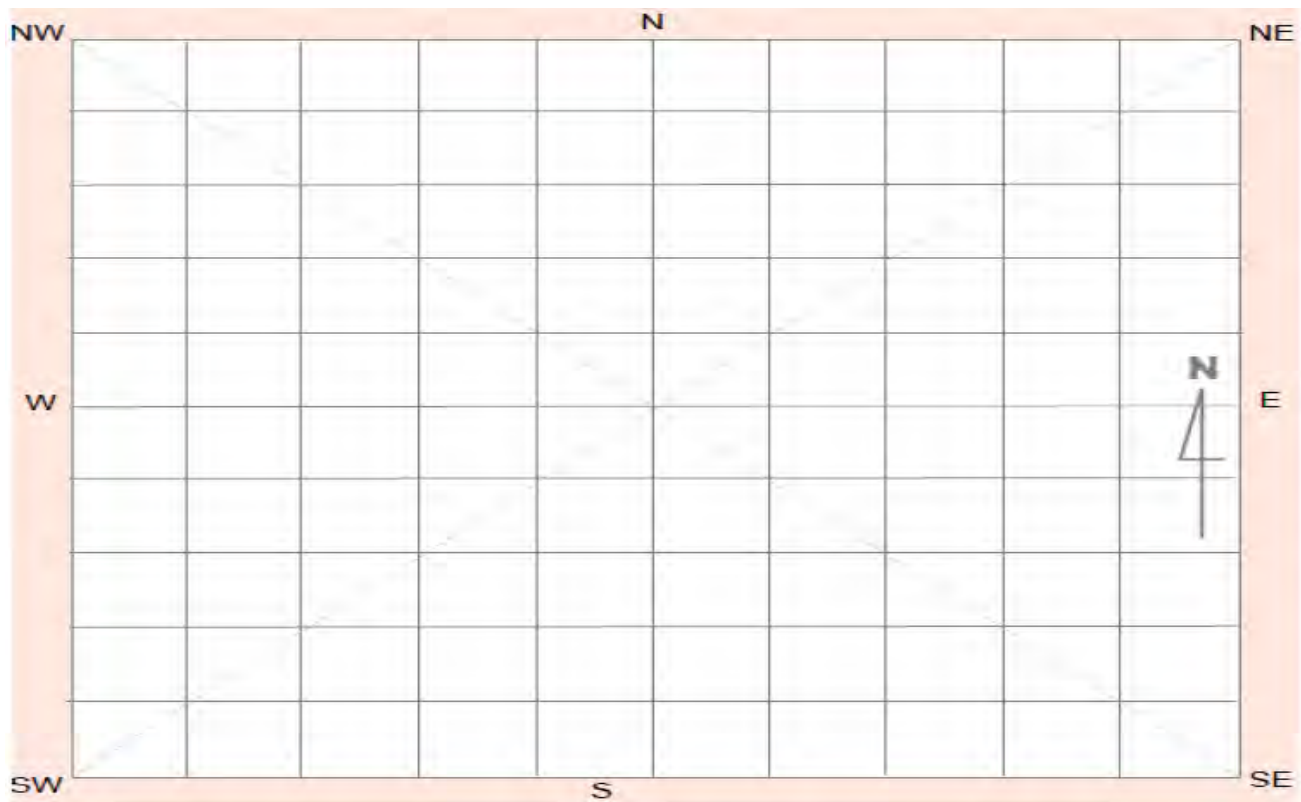
540 metres east of Mamre Road within Lot 3 DP 250002

Other site
information:

Site location map



Site plan



Site contents information

open/closed site:

Open

Site condition:

Good

Features:

		Number of features	Length of feature(s) extent (m)	Width of feature (s) extent (m)	Scarred Trees			
					Scar Depth (cm)	Regrowth (cm)	Scar shape	Tree Species
1.	<div>Potential Archaeological Deposit</div>	<div></div>	<div>40</div>	<div>1</div>	<div></div>	<div></div>	<div></div>	<div></div>

Feature condition:

Description:

This site is located on a gentle slope landform in the eastern portion of the study area. Mamre Road PAD 1 was subject to testing which identified 3 artefacts from 3 test pits. Soils within this site were shallow at 250mm in depth. Disturbances observed within the area relate to land clearing.

Features:

		Number of features	Length of feature(s) extent (m)	Width of feature (s) extent (m)	Scarred Trees			
					Scar Depth (cm)	Regrowth (cm)	Scar shape	Tree Species
2.	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>

Feature condition:

Description:

Features:

		Number of features	Length of feature(s) extent (m)	Width of feature (s) extent (m)	Scarred Trees			
					Scar Depth (cm)	Regrowth (cm)	Scar shape	Tree Species
3.	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>	<div></div>

Feature condition:

Description:

Features:

4.

Feature condition:

Description:

Scarred Trees

Scar Depth (cm)	Regrowth (cm)	Scar shape	Tree Species
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

Features:

5.

Feature condition:

Description:

Scarred Trees

Scar Depth (cm)	Regrowth (cm)	Scar shape	Tree Species
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

Site photographs



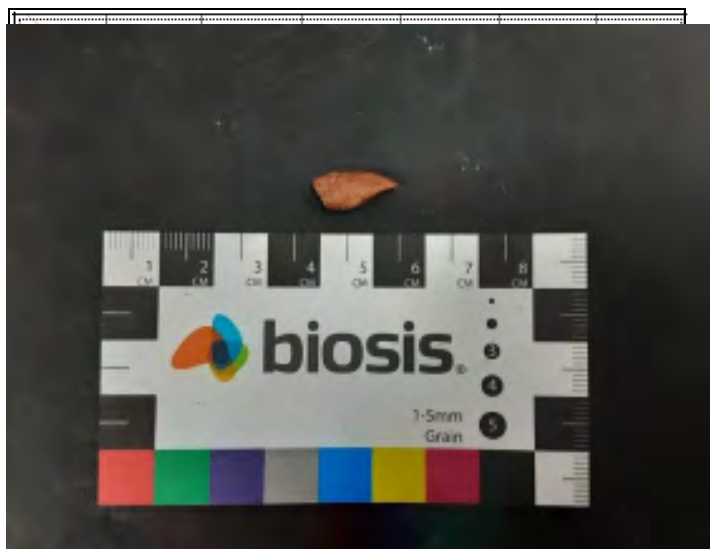
Description:

West facing view of Mamre Road PAD 1

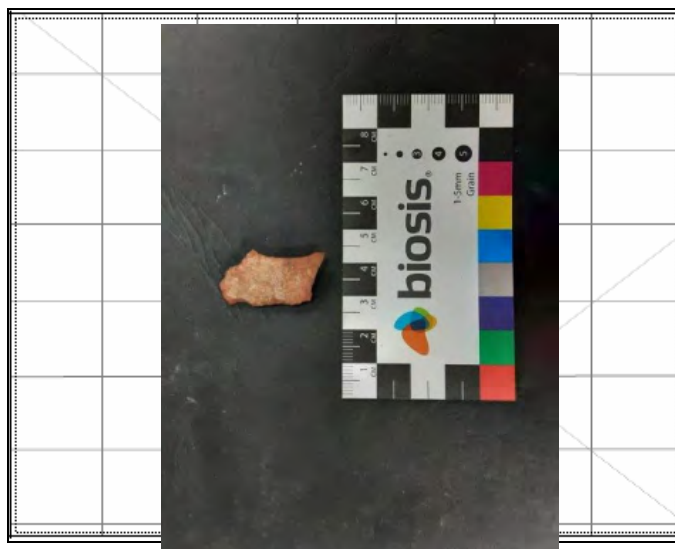


Description:

Silcrete proximal flake dorsal surface



Description:



Description:

Site restrictions

Do you want to
Restrict this site?:

Restriction type:

Why is this site restricted?:

Further information contact

Title Surname First name

Organisation:

Address:

Phone: E-mail:

Site interpretation and community statement

Appendix 2 Test excavation results and test pit drawings

Transect	Test Pit Number	Context Number	StartDepth_mm	EndDepth_mm	Colour (Munsell Code)	Compaction	Texture	Disturbance	Inclusions	PH	Horizon clarity	Notes
PAD 1												
1	TP1	1	0	190	7.5YR 3/2 Dark Brown	Moderate	Clayey Loam	Grass roots		6.5	Clear	
		2	120	250	7.5YR 4/3 Brown	Moderate	Clay	Grass roots		5	Clear	Ends on clay at 250mm
	TP2	1	0	250	7.5YR 3/2 Dark brown	Moderate	Clayey Loam	Grass roots		6.5	Clear	
		2	250	360	7.5YR 4/3 Brown	Moderate	Clay			5	Clear	Ends on clay at 360mm
	TP3	1	0	160	7.5YR 3/2 Dark brown	Moderate	Clayey Loam	Grass roots	Baked clay 10mm 2%	6.5	Clear	
		2	130	240	7.5YR 4/4 Reddish brown	Moderate	Clay			5		Ends on clay at 240mm
2	TP1	1	0	220	7.5YR 3/2 Dark brown	Moderate	Clayey Loam	Grass roots		6.5	Gradual	
		2	220	390	7.5 Yr 4/2 Brown	Moderate	Clay	Grass roots	Baked clay small nodules 2%,	5	Gradual	Ends on clay at 390mm
PAD 2												
		1	0	170	7.5YR 3/2 Dark brown	Moderate	Loamy Clay	Grass roots	2-5mm gravel 10%	6.5	Clear	

Transect	Test Pit Number	Context Number	StartDepth_mm	EndDepth_mm	Colour (Munsell Code)	Compaction	Texture	Disturbance	Inclusions	PH	Horizon clarity	Notes
1	TP1	2	170	200	7.5YR 4/4 Reddish brown	Moderate	Clay			6.5	Clear	Clay from context 2 into base, clay more prominent in wall of northern portion
	TP1.1	1	0	180	7.5YR 3/2 Dark brown	Moderate	Clayey Loam	Grass roots		6.5	Gradual	
		2	180	230	7.5 YR 4/6 Strong Brown	Moderate	Clay			6.5	Gradual	Ends on clay at 230mm
	TP2	1	0	200	7.5YR 3/2 Dark brown	Moderate	Loamy Clay	Grass roots	2-5mm gravel 10%	6.5	Gradual	
		2	200	250	7.5YR 3/2 Dark brown	Moderate	Clay			6.5	Gradual	Ends on clay at 250mm
	TP3	1	0	150	7.5YR 3/2 Dark brown	Moderate	Loamy Clay	Grass roots	2-5mm gravel, 10%	6.5	Gradual	
		2	150	180	7.5YR 4/4 Reddish brown	Moderate	Clay			6.5	Gradual	Ends on clay at 180mm
	TP4	1	0	180	7.5YR 3/2 Dark brown	Moderate	Loamy Clay	Grass roots	2-5mm gravel 5%	6.5	Gradual	
		2	180	200	7.5YR 3/2 Dark brown	Moderate	Clay			6.5	Gradual	Ends on clay at 200mm
	TP5	1	0	170	7.5YR 3/2 Dark brown	Moderate	Loamy Clay	Grass roots		6.5	Gradual	

Transect	Test Pit Number	Context Number	StartDepth_mm	EndDepth_mm	Colour (Munsell Code)	Compaction	Texture	Disturbance	Inclusions	PH	Horizon clarity	Notes
	TP5	2	180	200	7.5YR 3/2 Dark brown	Moderate	Clay				6 Clear	Mixed clay, clayey loam, ends on clay at 200mm
PAD 3												
1	TP1	1	0	100	7.5YR 3/2 Dark brown	Moderate	Loamy Clay	Grass roots			5 Clear	
		2	100	180	7.5 YR 3/3 Dark brown	Moderate	Loamy Clay	Grass roots			5 Clear	Ends on clay at 180mm
	TP2	1	0	100	7.5YR 3/2 Dark brown	Moderate	Loamy Clay	Grass roots			6.5 Gradual	
		2	100	220	7.5YR 2.5/2 Very dark brown	Moderate	Loamy Clay	Grass roots			5 Diffuse	
	TP3	1	0	130	7.5YR 3/2 Dark brown	Moderate	Loamy Clay	Grass roots			5 Gradual	Pockets of orange clay (7.5 yd 4/6) mottled throughout, clay at base
		2	130	220	7.5YR 3/3 Dark brown	Moderate	Loamy Clay	Grass roots			5 Gradual	Ends at 220mm
		1	0	100	7.5YR 3/2 Dark brown	Moderate	Loamy Clay	Grass roots			5 Clear	

Transect	Test Pit Number	Context Number	StartDepth_mm	EndDepth_mm	Colour (Munsell Code)	Compaction	Texture	Disturbance	Inclusions	PH	Horizon clarity	Notes
2	TP1	2	100	240	7.5YR 3/2 Dark brown	Moderate		Grass roots			5 Clear	Clay at base, ending at 240mm
	TP2	1	0	70	7.5YR 3/2 Dark brown	Moderate	Loamy Clay	Grass roots			5 Gradual	
		2	70	130	7.5YR 4/3 Brown	Moderate	Loamy Clay		Clay mottling		6.5 Gradual	Clay mottling in base, test pit ends on clay at 130mm
	TP3	1	0	220	7.5YR 3/3 Dark brown	Moderate	Loamy Clay	Grass roots			6.5 Diffuse	
		2	220	280	7.5YR 3/2 Dark brown	Moderate	Loamy Clay	Grass roots			6.5 Gradual	Clay at base, ending at 280mm
PAD 4												
1	TP1	1	0	160	7.5YR 3/2 Dark brown	Moderate	Loamy Clay	Grass roots	5% gravel, 2-5mm		6.5 Gradual	
		2	160	190	7.5YR 3/2 Dark brown	Moderate	Clay				6.5 Gradual	Ends on clay at 190mm
	TP2	1	0	180	7.5YR 3/2 Dark brown	Moderate	Loamy Clay	Grass roots	Dried orange clay 2-10mm, 2%		6.5 Gradual	

Transect	Test Pit Number	Context Number	StartDepth_mm	EndDepth_mm	Colour (Munsell Code)	Compaction	Texture	Disturbance	Inclusions	PH	Horizon clarity	Notes
	TP3	2	180	200	7.5YR 3/2 Dark brown	Moderate	Clay			6.5	Gradual	Ends on clay at 200mm
		1	0	180	7.5YR 3/2 Dark brown	Moderate	Loamy Clay	Grass roots		6.5	Gradual	
		2	180	200	7.5YR 4/4 Reddish brown	Moderate	Clay			6.5	Gradual	Ends on clay at 200mm
2	TP1	1	0	150	7.5YR 3/2 Dark brown	Moderate	Loamy Clay	Grass roots		6.5	Gradual	
		2	150	170	7.5YR 3/2 Dark brown	Moderate	Clay			6.5	Gradual	Ends on clay at 170mm, increase in moisture with depth
	TP2	1	0	180	7.5YR 3/2 Dark brown	Moderate	Loamy Clay	Grass roots		6.5	Gradual	
		2	180	200	7.5YR 3/2 Dark brown	Moderate	Clay			6.5	Gradual	Ends on clay at 200mm, increase in moisture with depth
		1	0	180	7.5YR 3/2 Dark brown	Moderate	Loamy Clay	Grass roots		6.5	Gradual	

Transect	Test Pit Number	Context Number	StartDepth_mm	EndDepth_mm	Colour (Munsell Code)	Compaction	Texture	Disturbance	Inclusions	PH	Horizon clarity	Notes
	TP3	2	180	190	7.5YR 4/4 Reddish brown	Moderate	Clay			6.5	Gradual	Test pit ends on clay at 190mm, large rocks in base
	TP4	1	0	190	7.5YR 3/2 Dark brown	Moderate	Loamy Clay	Grass roots		6.5	Clear	
		2	180	250	7.5YR 4/4 Reddish brown	Moderate	Clay	Rocks		6.5	Clear	Ends on clay at 250mm

PAD 5

1	TP1	1	0	130	7.5YR 2.5/2 Very dark brown	Moderate	Clayey Loam	Grass roots	Grass roots	5	Gradual	
		2	140	280	7.5YR 3/4 Dark brown	Moderate	Clayey Loam		Clay mottling through to clear clay	5	Gradual	Ends on clay at 280mm
	TP2	1	0	170	7.5YR 3/2 Dark brown	Moderate	Loamy Clay	Grass roots	2-5mm gravel 10%	5	Gradual	
		2	170	200	7.5YR 4/4 Reddish brown	Moderate	Clay			5	Gradual	Ends on clay at 200mm, sandstone in base and in walls

Transect	Test Pit Number	Context Number	StartDepth_mm	EndDepth_mm	Colour (Munsell Code)	Compaction	Texture	Disturbance	Inclusions	PH	Horizon clarity	Notes
	TP3	1	0	220	7.5YR 3/2 Dark brown	Moderate	Loamy Clay	Grass roots	Sandstone 100mm 5%	5	Clear	
		2	220	240	7.5YR 3/2 Dark brown	Moderate	Clay			5	Clear	Ends on clay at 100mm
	TP4	1	0	100	7.5YR 3/3 Dark brown	Moderate	Clay		Grass roots	5	Clear	Ends on clay at 100mm
2	TP1	1	0	70	7.5YR 3/4 Dark brown	Moderate	Clayey Loam		Grass roots	5	Gradual	
		2	70	200	7.5YR 4/3 Brown	Moderate	Clayey Loam		Small sandstone rubble mixed through into clay base	5	Gradual	Ends on clay at 200mm
	TP2	1	0	170	7.5YR 3/2 Dark brown	Moderate	Loamy Clay	Grass roots	2-5mm gravel 10%	5	Gradual	
		2	170	200	7.5YR 4/4 Reddish brown	Moderate	Clay			5	Gradual	Ends on clay at 200mm
	TP3	1	0	140	7.5YR 3/2 Dark brown	Moderate	Loamy Clay	Grass roots	2-5mm gravel 10%	5	Gradual	
		2	140	160	7.5YR 3/2 Dark brown	Moderate	Clay			5	Gradual	Ends on clay at 160mm
		1	0	130	7.5YR 3/2 Dark brown	Moderate	Loamy Clay	Grass roots	2-5mm gravel 10%	5	Gradual	

Transect	Test Pit Number	Context Number	StartDepth_mm	EndDepth_mm	Colour (Munsell Code)	Compaction	Texture	Disturbance	Inclusions	PH	Horizon clarity	Notes
	TP4	2	130	180	7.5YR 3/2 Dark brown	Moderate	Clay				5 Gradual	Ends on clay at 180mm, 500mm
	TP5	1	0	330	7.5YR 3/2 Dark brown	Moderate	Loamy Clay	Grass roots	2-5mm gravel		5 Gradual	
		2	330	500	7.5YR 3/2 Dark brown	Moderate	Clay	Old tree root			5 Gradual	Ends on clay at 360mm, with50mm in base of test pit from old tree root
	3	TP1	1	0	150	5YR 3/3 Dark reddish brown	Moderate	Loamy Clay	Grass roots	Some dried orange clay, 10mm 5%		5 Gradual
2			150	300	5YR 3/3 Dark reddish brown	Moderate	Clay	Sandstone rocks			5 Gradual	Ends on clay at 300mm
TP2		1	0	200	7.5YR 3/2 Dark brown	Moderate	Loamy Clay	Grass roots	Dried orange clay in wall		5 Gradual	

Transect	Test Pit Number	Context Number	StartDepth_mm	EndDepth_mm	Colour (Munsell Code)	Compaction	Texture	Disturbance	Inclusions	PH	Horizon clarity	Notes
		2	200	300	7.5YR 3/2 Dark brown	Moderate	Clay				5 Gradual	Ends on clay at 300mm
	TP3	1	0	200	7.5YR 3/2 Dark brown	Moderate	Loamy Clay	Grass roots	2-5mm gravel 10%		5 Gradual	
		2	200	230	7.5YR 3/2 Dark brown	Moderate	Clay				5 Gradual	Ends on clay at 230mm
PAD 6												
1	TP1	1	0	130	7.5YR 3/2 Dark brown	Moderate	Clayey Loam	Grass roots			5 Gradual	
		2	130	200	7.5YR 4/4 Reddish brown	Moderate	Clay				5 Gradual	Ends on clay at 200mm

2/8/2022

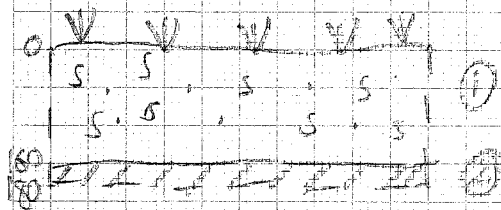
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37009 1030-1048 and 1050-1064 MAMPE RD

SCALE 1:10

PAD 4

T1 TP1 ↑N



KEY

V GRASS

hatched CLAY

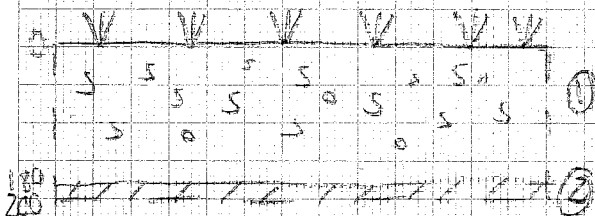
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... GRAVEL

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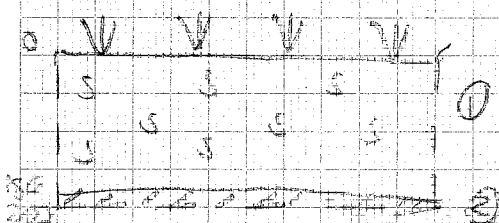
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T1 TP2 ↓N



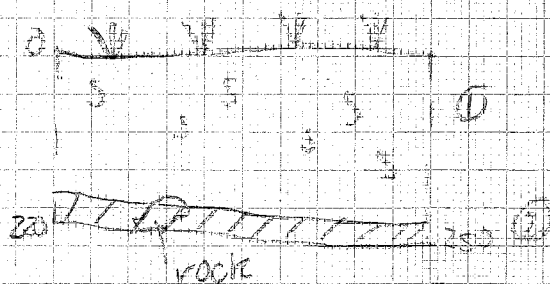
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T1 TP3 ↓N



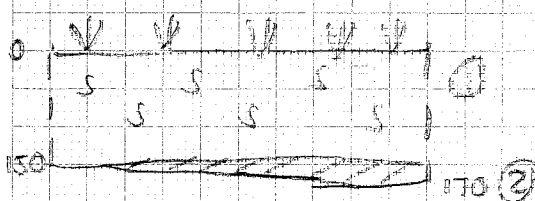
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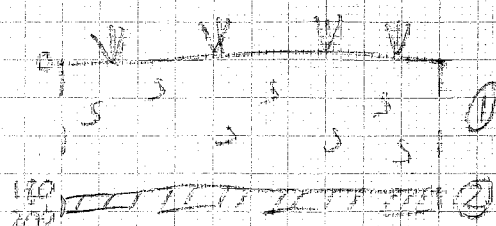
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T2 TP1 ↑N



PAD 4

T2 TP2 ↑N

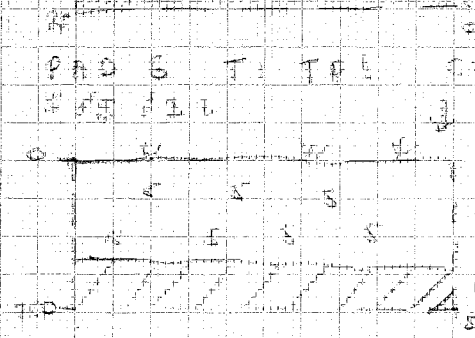
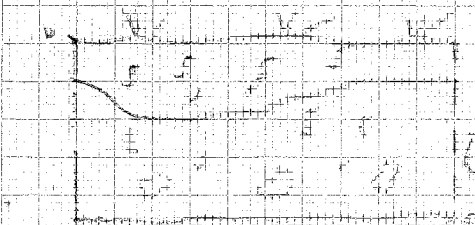
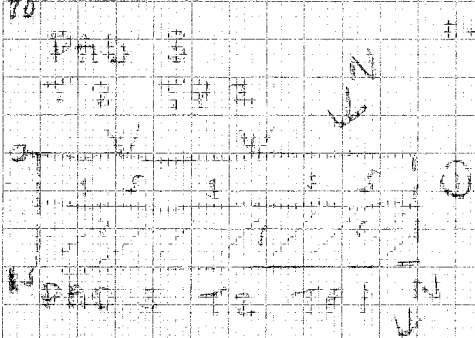
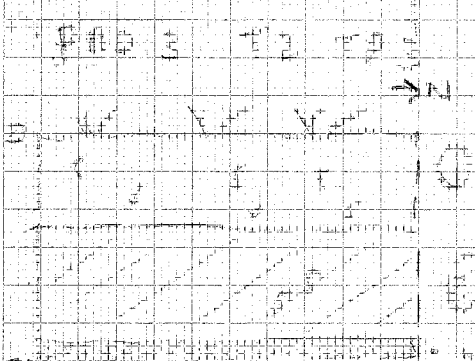
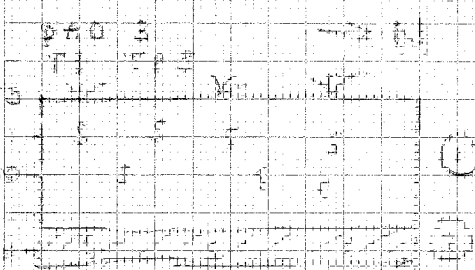
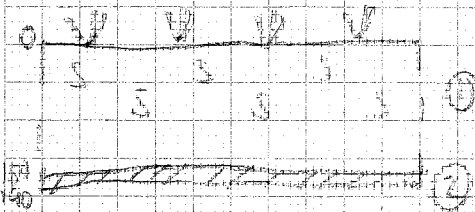


37004 MAMRE CONTINUED

2/8/2012
3/5/2012

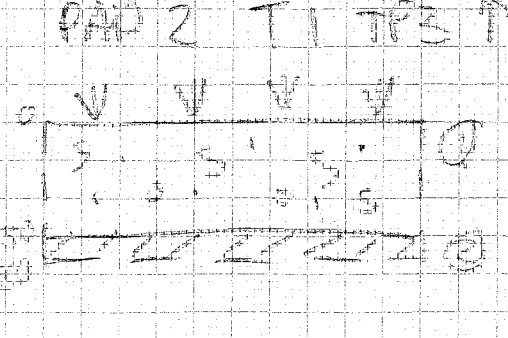
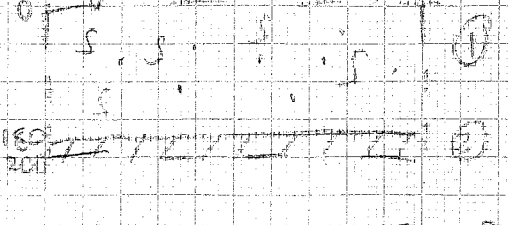
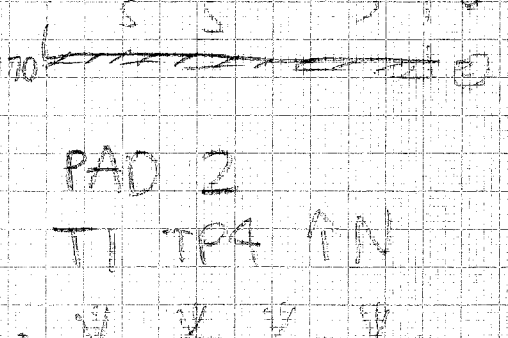
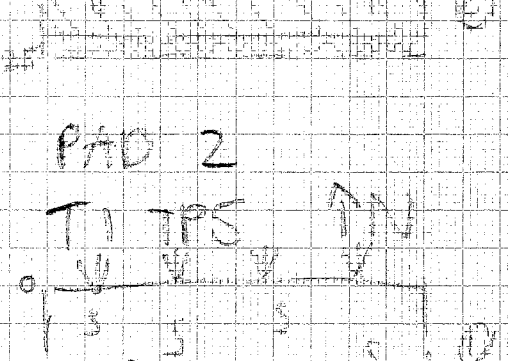
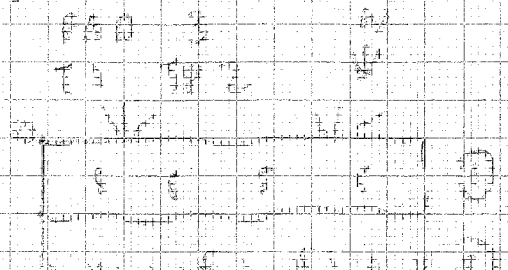
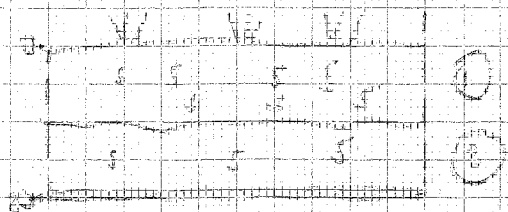
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T2 TP3 ↑N



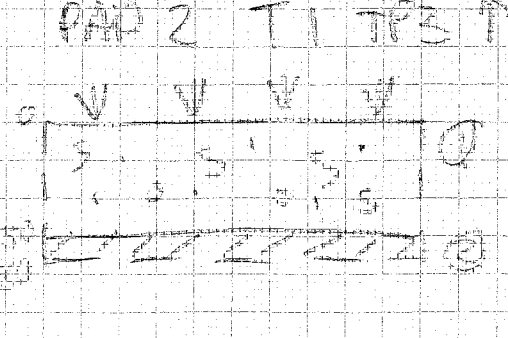
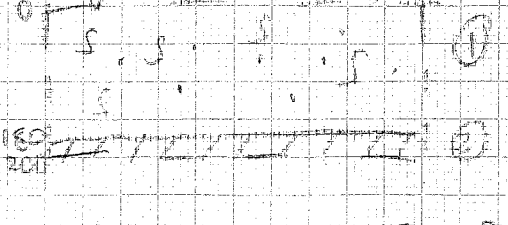
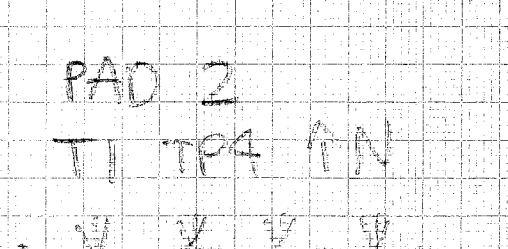
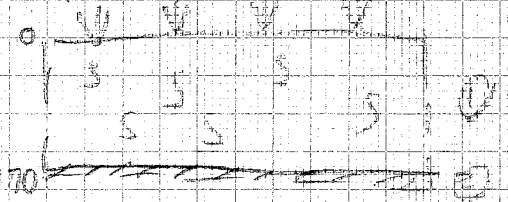
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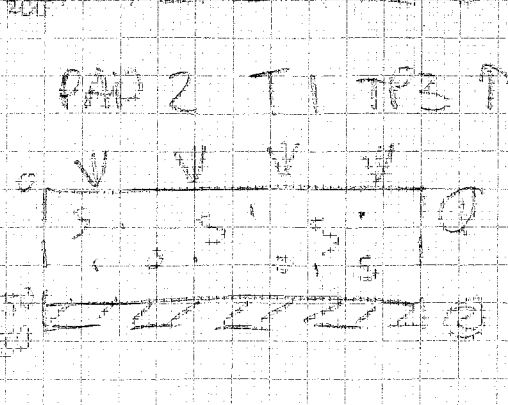
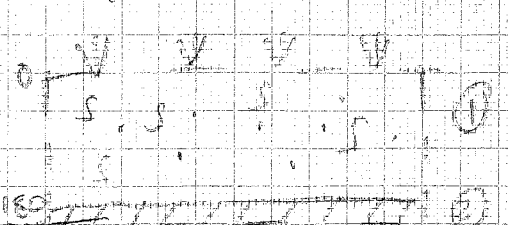
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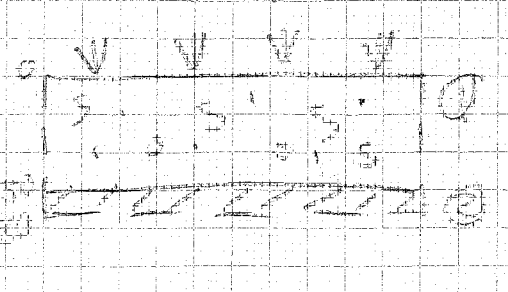


PAD 2

T1 TP4 ↑N



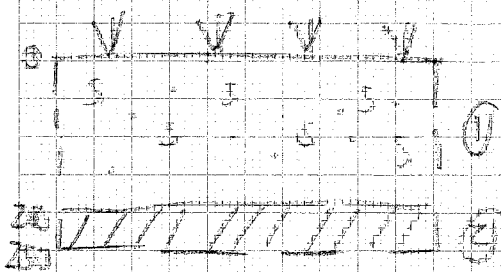
PAD 2 T1 TP3 ↑N



37009 MAMRE RD CONTINUED 3/8/22

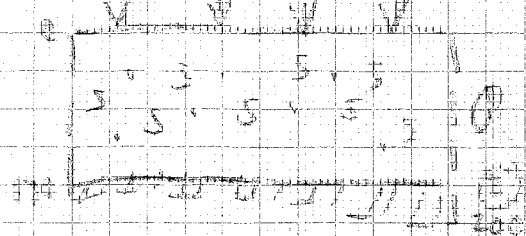
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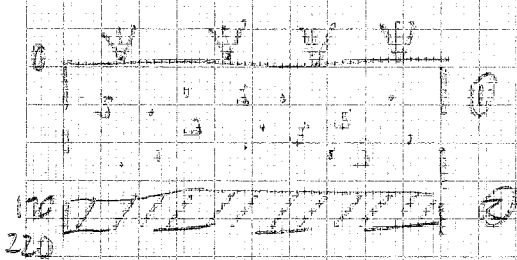
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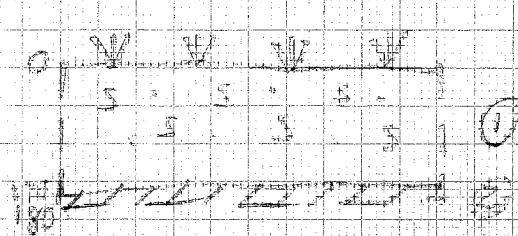
PAD 2

T1 TP1 \leftarrow N



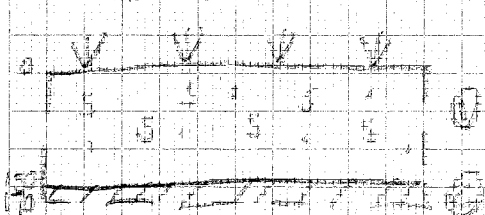
PAD 2

T2 TP2 \leftarrow N



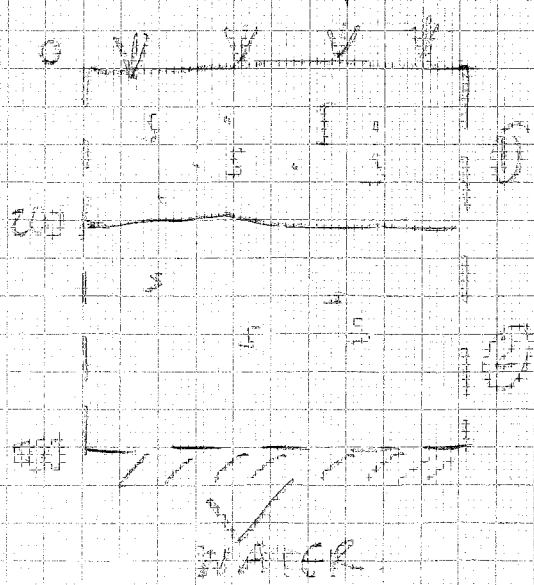
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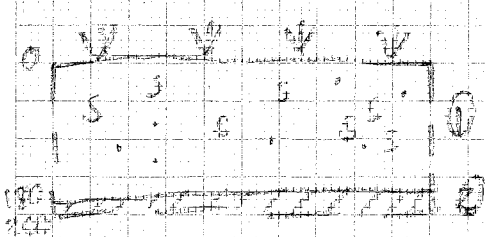
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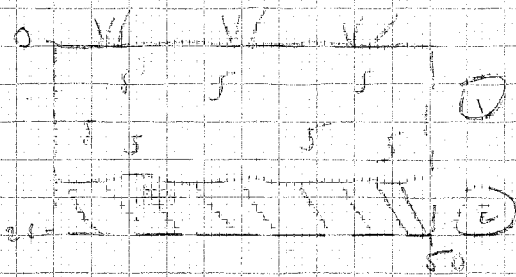
PAD 2

T2 TP5 \rightarrow N

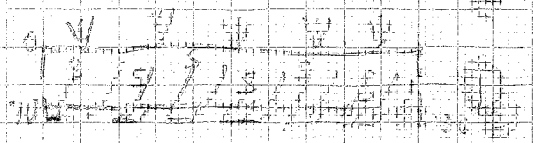


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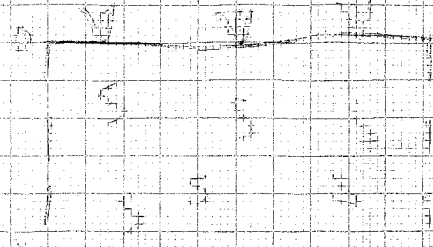
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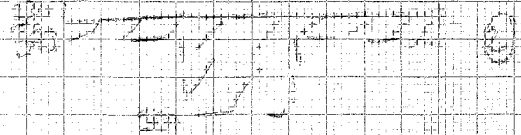
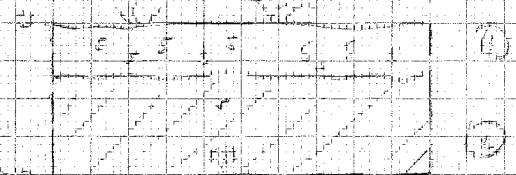
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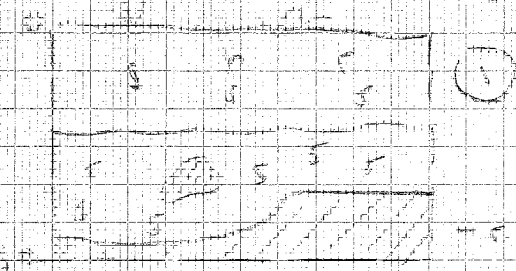
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PAD 5 T1 T14



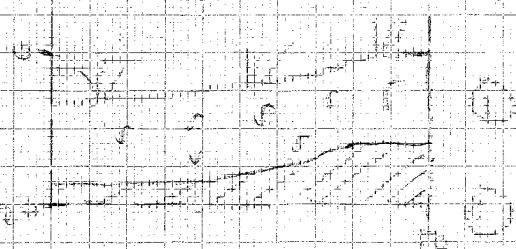
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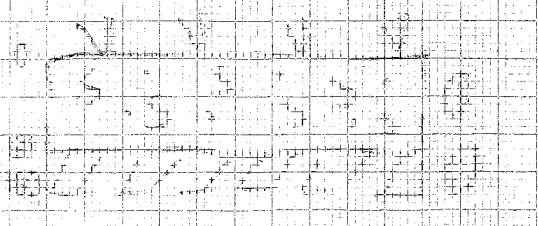
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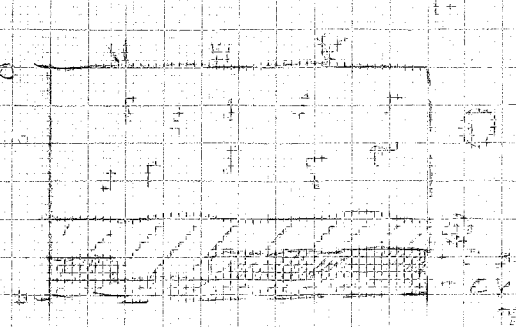
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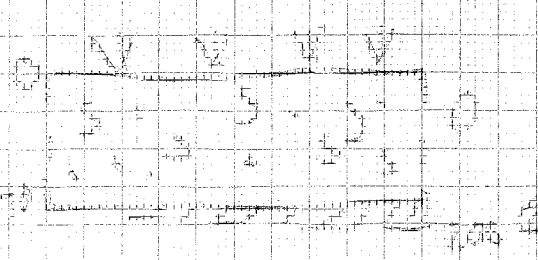
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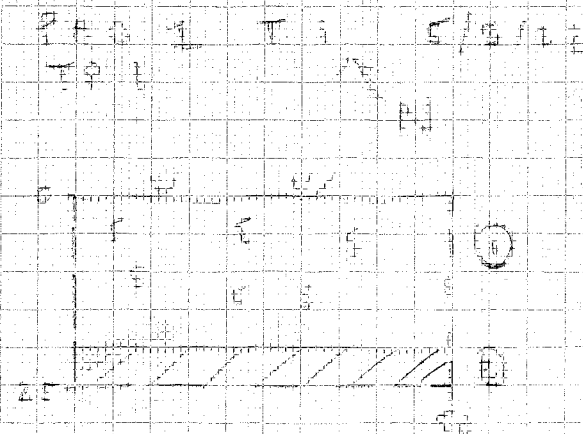
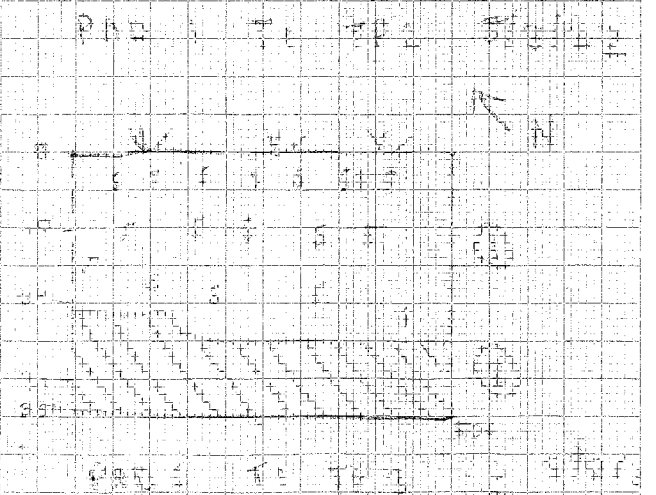
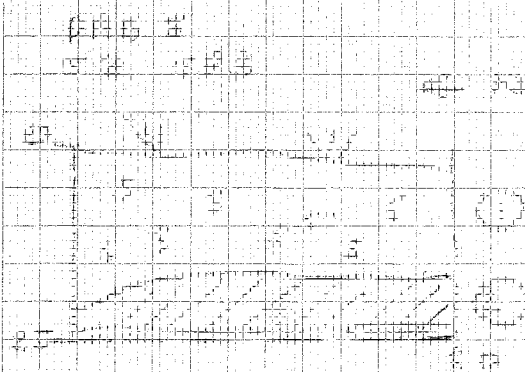
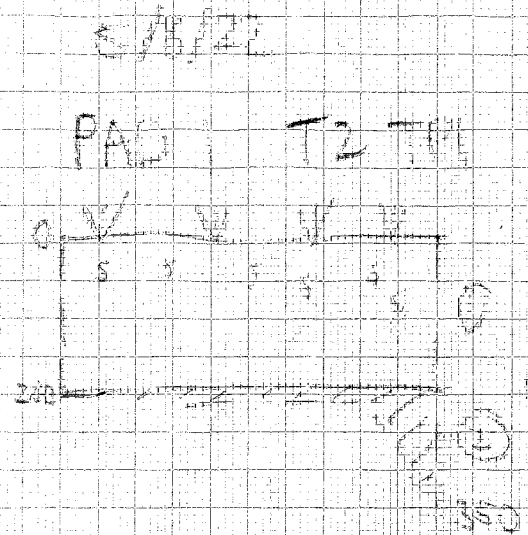
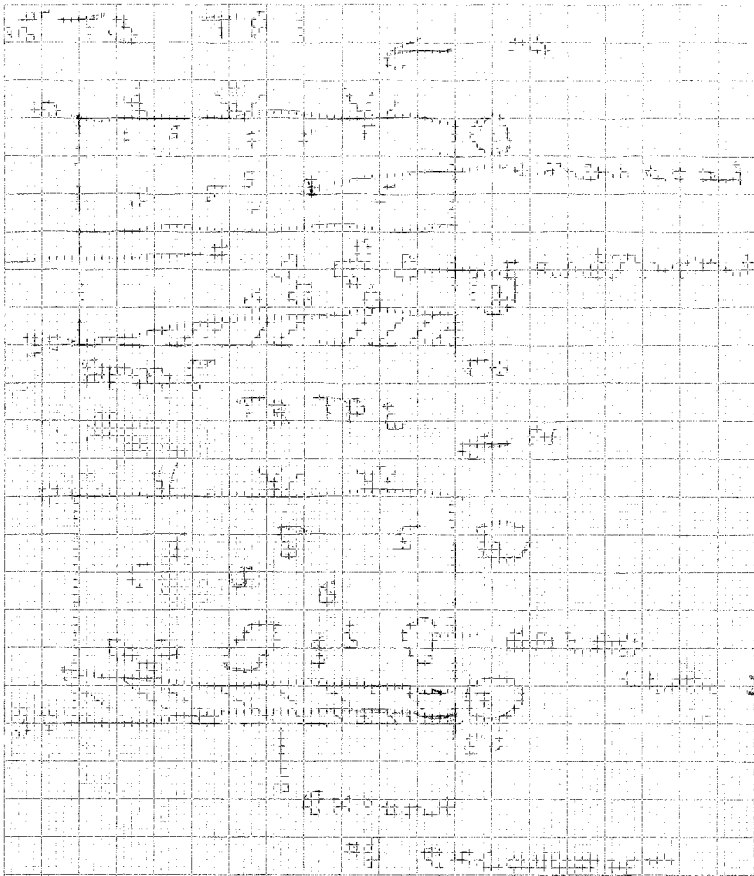


PAD 5 T2 T15



EXPLANATION

3/12/22 10:00 AM 10:00 AM



3/12/22

Appendix 3 Artefact data

ID No.	PAD	Pit N.	Spit N.	Type	Raw material	Cortex (%)	Platform type	Platform width (mm)	Platform depth (mm)	Length (mm)	Width (mm)	Thickness (mm)	Size class	Comments
1	2	T1TP1	1 (0-100mm	Flake - Proximal	Silcrete	20%	Flaked	6.35	2.4	19.68	16.62	4.65		Euralia scar
2	2	T1TP1.1	1 (0-100mm	Angular Fragment	Silcrete	5%							10-15mm	
3	2	T1TP2	1 (0-100mm	Flake - Proximal	Silcrete		Flaked	6.37	2.51	33.22	16.91	7.9		