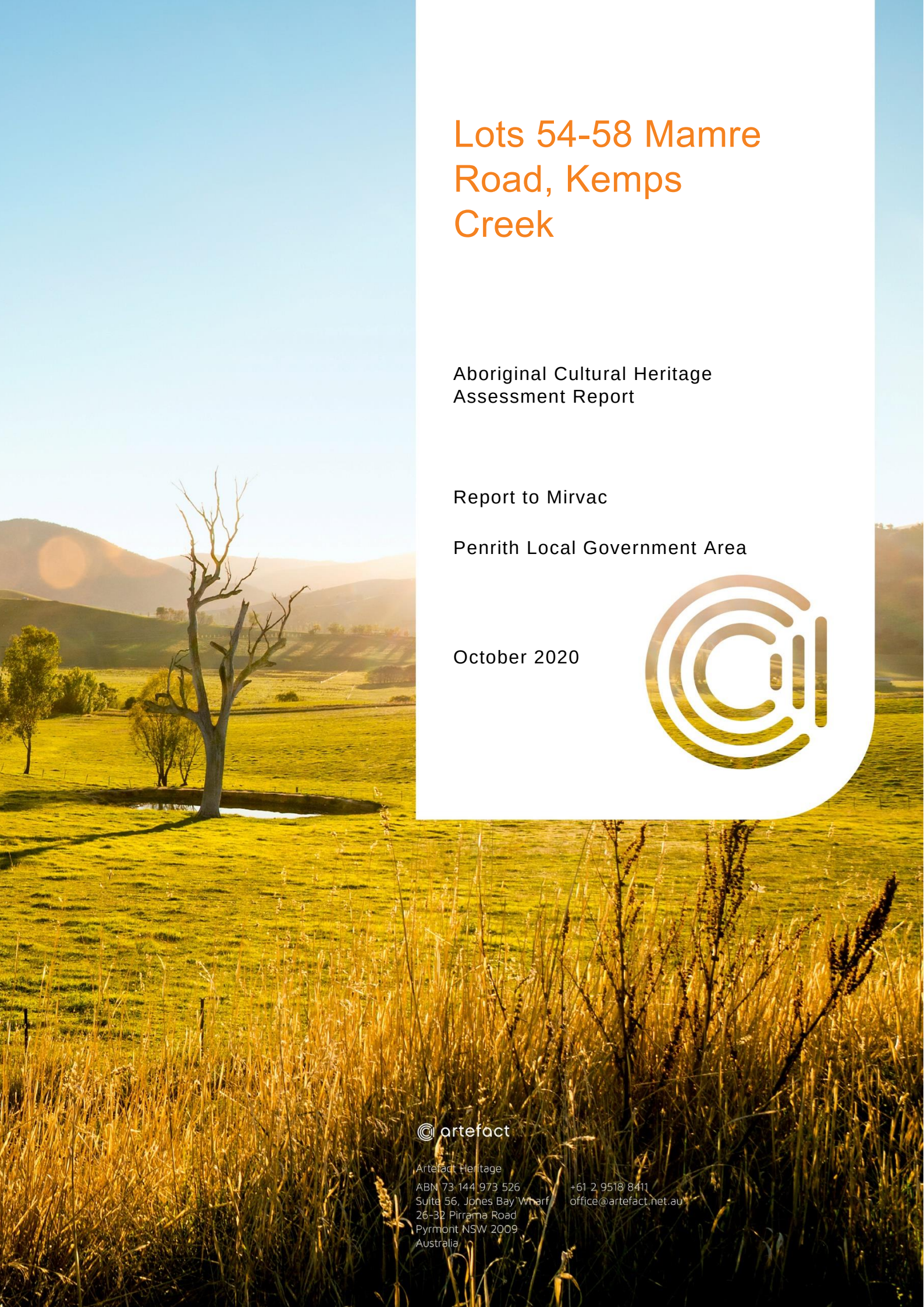
Lots 54-58 Mamre Road, Kemps Creek

Aboriginal Cultural Heritage Assessment Report

Report to Mirvac

Penrith Local Government Area

October 2020



artefact

Artefact Heritage
ABN 73 144 973 526
Suite 56, Jones Bay Wharf
26-32 Pirrama Road
Pyrmont NSW 2009
Australia

+61 2 9518 8411
office@artefact.net.au

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EXECUTIVE SUMMARY

In January 2019, Mirvac (the proponent) commissioned Artefact Heritage Services Pty Ltd (Artefact Heritage) to prepare a combined Aboriginal and non-Aboriginal heritage assessment (Artefact Heritage 2019a) for a development proposal at Lots 54-58 DP 259135, Mamre Road Kemps Creek (the study area). The assessment identified one previously unregistered Aboriginal site, Mamre Road Artefact Scatter 1901 [MAM AS 1901] (AHIMS ID 45-5-5186), and an area of archaeological potential. The assessment recommended that further investigations occur to assess the nature and extent of the area of Aboriginal archaeological potential and impacts to MAM AS 1901 (AHIMS ID 45-5-5186) and the identified area of archaeological potential.

Archaeological survey of the study area was completed over two days (2 – 3 October 2019) and resulted in the identification of additional Aboriginal objects associated with MAM AS 1901 (AHIMS ID 45-5-5186) and an area of Potential Archaeological Deposit (PAD), which incorporated and revised the area of archaeological potential identified in the initial assessment (Artefact Heritage 2019b). The newly identified site features included five artefact concentrations, ranging in size from 15 artefacts in concentration 1 to three artefacts in concentration 5, and six isolated artefacts. The Archaeological Survey Report (ASR) recommended that archaeological test excavation should be conducted within MAM AS 1901 (AHIMS ID 45-5-5186) to investigate the nature and extent of potential subsurface archaeological deposits and inform an assessment of archaeological significance.

On 30 April 2020, the project was declared a State Significant Development (SSD) and will be assessed under Part 4 Division 4.1 of the *Environmental Planning & Assessment Act* (1979) (EP&A Act). The Planning Secretary's Environmental Assessment Requirements (SEARs) application no. SSD-10448 were issued for the project. The SEARs specific to Aboriginal heritage include:

- Identifying and describing the Aboriginal cultural heritage values exist across the development and document in an Aboriginal Cultural Heritage Assessment Report (ACHAR)
- Consultation with Aboriginal people must be undertaken and documented in the ACHAR
- A description of the impacts on Aboriginal cultural heritage values.

In accordance with the recommendations provided in the ASR a test excavation program was carried out from the 15 June to 24 June 2020. A total of 47 Aboriginal archaeological test pits were excavated as part of the test excavation program. The test excavation program recovered 25 additional Aboriginal objects and identified one area of subsurface artefact concentration, A3. The findings of the test excavation program were documented in an Archaeological Test Excavation Report (ATER) (Artefact Heritage 2020a).

This ACHAR will inform the Environmental Impact Statement (EIS) that is being prepared by the proponent for the project.

Overview of findings

- One Aboriginal site, MAM AS 1901 (AHIMS ID 45-5-5186), is located within the study area
- MAM AS 1901 (AHIMS ID 45-5-5186) includes a low-density, subsurface artefact assemblage and an artefact concentration, in additional to the previously recorded surface features
- MAM AS 1901 (AHIMS ID 45-5-5186) is assessed as being of moderate archaeological significance

- The proposed works will impact MAM AS 1901 (AHIMS ID 45-5-5186) and result in total loss of value

Recommendations

- The artefact concentration at A3 should be subject to a salvage excavation program to record the full extent of the intact artefact concentration after project determination
- The RAPs should be provided an opportunity to conduct a collection of Aboriginal objects across the extent of the surface sites that will be impacted by the proposed works after project determination
- Following completion of archaeological investigation, analysis and reporting, the assemblage retrieved from the test excavation program, salvage excavation program, and surface collection should be reburied on site, in a location that will not be subject to future impact
- A methodology for the reburial of Aboriginal objects should be developed in consultation with the RAPs
- Any project redesign resulting in substantial changes to the extent of surface or subsurface impacts may require additional assessment. However, it is noted that the proposed works already includes landform modification and disturbance to the whole site and study area.

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ABBREVIATIONS

ACHAR	Aboriginal Cultural Heritage Assessment Report
AHIMS	Aboriginal Heritage Information Management System
AHIP	Aboriginal Heritage Impact Permit
ALR Act	*Aboriginal Land Rights Act 1983*
Artefact Heritage	Artefact Heritage Services Pty Ltd
ASR	Archaeological Survey Report
ATER	Archaeological Test Excavation Report
ATSIHP Act	*Aboriginal and Torres Strait Islander Heritage Protection Act 1984*
BP	Before Present (that is 1950)
CHL	Commonwealth Heritage List
Code of Practice	Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales
Consultation Requirements	Aboriginal cultural heritage consultation requirements for proponents 2010
DCP	Development Control Plan
DECCW	Department of Environment Climate Change and Water (now Heritage NSW, DPC)
DPIE – Heritage	Department of Planning, Industry and Environment – Heritage (now Heritage NSW, DPC)
EP&A Act	*Environmental Planning and Assessment Act 1979*
EPBC Act	*Environment Protection and Diversity Conservation Act 1999*
gm	grams
GPS	Global Positioning System
Guide	Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW (OEH 2011)
ha	hectares
Heritage NSW, DPC	Heritage NSW, Department of Premier and Cabinet
JMcD CHM	Jo McDonald Cultural Heritage Management
km	Kilometre
LALC	Local Aboriginal Land Council
LEP	Local Environmental Plan

LGA	Local Government Area
m	metres
mm	millimetres
NHL	National Heritage List
NPW Act	*National Parks and Wildlife Act 1974*
NTSCorp	Native Title Service Provider for Aboriginal Traditional Owners in New South Wales and the Australian Capital Territory
OEH	Office of Environment and Heritage (now Heritage NSW, DPC)
PAD	Potential Archaeological Deposit
RAP	Registered Aboriginal Party
RNE	Register of the National Estate
TA	Test area

1.0 INTRODUCTION

1.1 Project background

In January 2019, Mirvac (the proponent) commissioned Artefact Heritage Services Pty Ltd (Artefact Heritage) to prepare a combined Aboriginal and non-Aboriginal heritage assessment (Artefact Heritage 2019a) for a development proposal at Lots 54-58 DP 259135, Mamre Road Kemps Creek (the study area). The assessment identified one previously unregistered Aboriginal site, Mamre Road Artefact Scatter 1901 [MAM AS 1901] (AHIMS ID 45-5-5186), and an area of archaeological potential. The assessment recommended that further investigations occur to assess the nature and extent of the area of Aboriginal archaeological potential and impacts to MAM AS 1901 (AHIMS ID 45-5-5186) and the identified area of archaeological potential.

Archaeological survey of the study area was completed over two days (2 – 3 October 2019) and resulted in the identification of additional Aboriginal objects associated with MAM AS 1901 (AHIMS ID 45-5-5186) and an area of Potential Archaeological Deposit (PAD), which incorporated and revised the area of archaeological potential identified in the initial assessment (Artefact Heritage 2019b). The newly identified site features included five artefact concentrations, ranging in size from 15 artefacts in concentration 1 to three artefacts in concentration 5, and six isolated artefacts. The Archaeological Survey Report (ASR) recommended that archaeological test excavation should be conducted within MAM AS 1901 (AHIMS ID 45-5-5186) to investigate the nature and extent of potential subsurface archaeological deposits and inform an assessment of archaeological significance.

On 30 April 2020, the project was declared a State Significant Development (SSD) and will be assessed under Part 4 Division 4.1 of the *Environmental Planning & Assessment Act* (1979) (EP&A Act). The Planning Secretary's Environmental Assessment Requirements (SEARs) application no. SSD-10448 were issued for the project. The SEARs specific to Aboriginal heritage include:

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In accordance with the recommendations provided in the ASR a test excavation program was carried out from the 15 June to 24 June 2020. A total of 47 Aboriginal archaeological test pits were excavated as part of the test excavation program. The test excavation program recovered 25 additional Aboriginal objects and identified one area of subsurface artefact concentration, A3. The findings of the test excavation program were documented in an Archaeological Test Excavation Report (ATER) (Artefact Heritage 2020a).

This ACHAR will inform the Environmental Impact Statement (EIS) that is being prepared by the proponent for the project.

1.2 Study area

The study area covers approximately 56.3 hectares (ha) and is comprised of Lots 54 – 58 DP 259135 (Figure 1). The study area is bounded by Mamre Road to the west and is within the Parish of Melville and County of Cumberland. The study area falls within the Penrith Local Government Area (LGA) and the boundaries of Deerubbin Local Aboriginal Land Council (Deerubbin LALC).

1.3 Proposed works

The proposed works involve the construction of industrial buildings, internal road network layout, building locations, gross floor area, car parking, concept landscaping, building heights, setbacks and built form parameters (Figure 2). Stage 1 works will involve:

- The demolition and removal of existing rural structures and remediation works
- Clearing of existing vegetation across the study area
- Dewatering and decommissioning of dams across the study area
- Realignment of existing creek and establishment of an E2 Environmental Conservation zone
- Bulk earthworks and dewatering
- Importation and placement of spoil material
- Establishment of retaining walls
- Catchment level stormwater infrastructure, trunk services connections, utility infrastructure, roads and access infrastructure
- Construction of warehouse and distribution centre
- Boundary stormwater management, fencing and landscaping
- Staged subdivision.

1.4 Secretary's Environmental Assessment Requirements

The SEARs relevant to Aboriginal cultural heritage and where they are addressed in this in this report are summarised in Table 1.

Table 1: Secretary's Environmental Assessment Requirements

Secretary's Environmental Assessment Requirements	Section
Identifying and describing the Aboriginal cultural heritage values that exist across the development and document in an Aboriginal Cultural Heritage Assessment Report (ACHAR)	Section 6.0 Archaeological survey: provides details on Aboriginal objects identified during the survey of the study area. Section 7.0 Aboriginal test excavation: provides details on Aboriginal objects identified during the test excavation. Section 8.0 Aboriginal cultural heritage assessment: Overview of Aboriginal cultural heritage values identified during background research completion for this assessment. Section 9.0 Significance assessment: description of historic, cultural, scientific and aesthetic Aboriginal cultural heritage values identified for the study area.
Consultation with Aboriginal people must be undertaken and documented in the ACHAR and	Section 3.0 Consultation: provides a description of consultation with Aboriginal stakeholders completed in accordance with the Consultation Requirements. Appendix 2 Consultation log: A detailed overview of consultation with Aboriginal stakeholders completed in accordance with the Consultation Requirements. Appendix 3 Consultation records: full records of comprehensive Aboriginal stakeholder consultation completed in accordance with the Consultation Requirements.

Secretary's Environmental Assessment Requirements	Section
A description of the impacts on Aboriginal cultural heritage values	Section 10.0 Impact assessment: provides a description of the of the proposed impacts on identified Aboriginal objects and cultural heritage values

1.5 Study objectives

The objectives of this ACHAR are to:

- Assess the Aboriginal cultural heritage values of the study area, including archaeological and community cultural values, and the significance of identified values, as required by the SEARs
- Identify Aboriginal cultural heritage values that may be impacted by the proposed works, including consideration of cumulative impacts, and measures to avoid significant impacts required by the SEARs
- Ensure appropriate Aboriginal community consultation in the assessment process, as required by the SEARs
- Identify any recommended further investigations, mitigation and management measures required, in compliance the SEARs.

This ACHAR has been undertaken in accordance with the following requirements and guidelines:

- SEARs (SSD-10448) issued 30 April 2020
- Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW (OEH 2011)
- Aboriginal cultural heritage consultation requirements for proponents 2010 (DECCW 2010b)
- The Burra Charter 2013 (Australia ICOMOS 2013).

1.6 Limitations

This ACHAR is based on the findings of ASR (Artefact Heritage 2019b), the Archaeological Test Excavation Report (ATER) (Artefact Heritage 2020a) and the results of Aboriginal stakeholder consultation completed by Artefact Heritage (Section 3.0, Appendix 2 and 3).

1.7 Authors and contributors

This ACHAR was authored by Ryan Taddeucci (Senior Heritage Consultant, Artefact Heritage) with management input and review by Josh Symons (Principal, Artefact Heritage).

1.8 Report structure

The purpose of this report is to document the results of an investigation of Aboriginal heritage at the study area. As such, the structure of this report includes:

- Section 1 – Introduction
- Section 2 – Legislative Context: outlines relevant legislation for this assessment

- Section 3 – Consultation: provides information on the Aboriginal consultation process and results
- Section 4 – Environmental Background: provides an overview of the environmental conditions to provide context for the predictive model
- Section 5 – Archaeological Context: presents the results of the background research and database searches used to develop a predictive model
- Section 6 – Archaeological Survey: presents the methodology and results of previous Aboriginal archaeological surveys completed within the study area
- Section 7 – Archaeological Test excavation: present a description of the aims and proposed methods of the test excavation program
- Section 8 – Aboriginal Cultural Heritage Assessment: outlines the methodology for conducting an Aboriginal cultural heritage assessment and heritage values identified through background research and stakeholder consultation.
- Section 9 – Significance Assessment: an assessment of the cultural, historic, scientific and aesthetic significance of the study area.
- Section 10 – Impact Assessment: discussion of how the proposed works will impact the identified Aboriginal site and how to mitigate against the loss of heritage value
- Section 11 – Management and Mitigation Measures: Outlines the proposed method of mitigating against loss of cultural value.
- Section 12 – Salvage methodology: presents the methodology prosed for salvage excavation including proposed research questions
- Section 13 – Recommendations: summary of recommendations for further investigations and mitigation against loss of heritage values.
- Section 13 – References.

Figure 1: Extent of MAM AS 1901 (AHIM ID 45-5-5186)

Redacted for public display

Figure 2: Aspect Industrial Estate Master Plan (Provided by Mirvac on 15 October 2020)

2.0 LEGISLATIVE CONTEXT

2.1 State heritage legislation

2.1.1 National Parks and Wildlife Act 1974

The *National Parks and Wildlife Act 1974* (NPW Act), administered by Heritage NSW, DPC provides statutory protection for all Aboriginal 'objects' (consisting of any material evidence of the Aboriginal occupation of NSW), and for 'Aboriginal Places' (areas of cultural significance to the Aboriginal community).

The protection provided to Aboriginal objects applies irrespective of the level of their significance or issues of land tenure. However, areas are only gazetted as Aboriginal places if the Minister is satisfied that sufficient evidence exists to demonstrate that the location was and/or is of special significance to Aboriginal culture.

There are no gazetted Aboriginal places in the study area. All Aboriginal objects, whether recorded or not are protected under the NPW Act.

Section 86 of the NPW Act identifies that it is an offence to harm or desecrate an Aboriginal object and/or an Aboriginal place. Section 86 outlines penalty units applicable where it is identified that a person or corporation is in breach of Section 86.

The NPW Act defines harm to an object or place as any act or omission that:

(a) destroys, defaces or damages the object or place, or

(b) in relation to an object moves the object from the land on which it had been situated, or

(c) is specified by the regulations, or

(d) causes or permits the object or place to be harmed in a manner referred to in paragraph (a), (b) or (c)

A section 90 permit is the only Aboriginal Heritage Impact Permit (AHIP) available under the *National Parks and Wildlife Act 1974* and is granted by Heritage NSW, DPC. Various factors are considered by Heritage NSW, DPC in the AHIP application process, such as site significance, Aboriginal consultation requirements, Ecological Sustainable Development (ESD) principles, project justification and consideration of alternatives. The penalties and fines for damaging or defacing an Aboriginal object were increased in 2010.

As this project is being assessed under Part 4 Division 4.1 of the EP&A Act permits issued under the NPW Act are not required for impacts approved by Heritage NSW, DPC under the SSD. Impacts to Aboriginal objects will be authorised by the Conditions of Approval for the project issued by Heritage NSW, DPC under the EP&A Act.

2.1.2 Environmental Planning and Assessment Act 1979

The EP&A Act establishes the framework for cultural heritage values to be formally assessed in the land use planning, development assessment and environmental impact assessment processes. The EP&A Act consists of three main parts of direct relevance to Aboriginal cultural heritage; Part 3 which governs the preparation of planning instruments, Part 4 which relates to development assessment processes for local government (consent) authorities, and Part 5 which relates to activity approvals by governing (determining) authorities.

Part 3, Division 3.4 deals with the development of Local Environmental Plans (LEPs). Planning decisions within Local Government Areas (LGAs) are guided by LEPs. Each LGA is required to develop and maintain an LEP that includes Aboriginal and historical heritage items which are protected under the EP&A Act and the *Heritage Act 1977*. The study area is located within the boundaries of the Penrith LGA and is covered by the Penrith LEP. No Aboriginal heritage items listed on either LEP are located within the study area.

The proposal will be assessed under Part 4, Division 4.1 of the EP&A Act, which establishes an assessment and approval regime for SSD. Part 4, Division 4.1 applies to development that is declared to be SSD by a State Environmental Planning Policy (SEPP). Section 4.41 (previously section 89J(c)) of the EP&A Act specifies that approvals or permits under section 90 of the NPW Act 1974 are not required for approved SSD.

2.1.3 Aboriginal Lands Right Act 1983

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

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

The study area is within the boundary of the Deerubbin LALC.

2.2 Commonwealth legislation

2.2.1 Environment Protection and Biodiversity Conservation Act 1999

The *Environment and Heritage Legislation Amendment Act (No.1) 2003* amends the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) to include 'national heritage' as a matter of National Environmental Significance and protects listed places to the fullest extent under the Constitution. It also establishes the National Heritage List (NHL) and the Commonwealth Heritage List (CHL).

The *Australian Heritage Council Act 2003* (AHC Act) establishes a new heritage advisory body - the Australian Heritage Council (AHC), to the Minister for the Environment and Heritage and retains the Register of the National Estate (RNE).

The *Australian Heritage Council (Consequential and Transitional Provisions) Act* 2003 repeals the *Australian Heritage Commission Act* 1975, amends various Acts as a consequence of this repeal and allows the transition to the current heritage system.

Together the above three Acts provide protection for Australia's natural, Indigenous and non-Indigenous heritage. The new features include:

- A new NHL of places of national heritage significance
- A new CHL of heritage places owned or managed by the Commonwealth
- The creation of the AHC, an independent expert body to advise the Minster on the listing and protection of heritage places

- Continued management of the Register of the National Estate (RNE).

A summary of register searches is outlined below:

- No items listed on the NHL are located within the study area
- No items listed on the CHL are located within the study area
- No items listed on the RNE are located within the study area.

2.2.2 Aboriginal and Torres Strait Islander Heritage Protection Act 1984

The Commonwealth *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* (ATSIHP Act), deals with Aboriginal cultural property (intangible heritage) in a wider sense. Such intangible heritage includes any places, objects and folklore that 'are of particular significance to Aboriginals in accordance with Aboriginal tradition'. These values are not currently protected under the NPW Act.

There is no cut-off date and the ATSIHP Act may apply to contemporary Aboriginal cultural property as well as ancient sites. The ATSIHP Act takes precedence over state cultural heritage legislation where there is conflict. The Commonwealth Minister who is responsible for administering the ATSIHP Act can make declarations to protect these areas and objects from specific threats of injury or desecration. The responsible Minister may make a declaration under Section 10 of the Commonwealth Act in situations where state or territory laws do not provide adequate protection of intangible heritage.

Where an Aboriginal individual or organisation is concerned that intangible values within the proposal are not being adequately protected, they can apply to the Minister for a declaration over a place.

No intangible places were identified during this assessment.

2.2.3 Native Title Act 1994

The main purpose of the *Native Title Act 1993* is to recognise and protect native title. Native title is the rights and interests in land and waters that Aboriginal and Torres Strait Islanders have under their traditional laws and customs.

The following list is indicative of the type of land, which might be subject to native title:

- Vacant Crown land and any other public or Crown lands including oceans and inland waterways, beaches and foreshores, State forests, national parks and public reserves
- Pastoral leases
- Land held by government agencies
- Land held in trust for Aboriginal communities.

Under the amended *Native Title Act 1993*, Native Title is extinguished by the following:

- Private freehold land, valid grants of private freehold land or waters
- Residential, commercial or exclusive possession leases
- Mining dissection leases
- Community purpose leases (e.g. religious, sporting or charitable purposes)
- Scheduled interests that give exclusive possession

- Public works (e.g. schools, public amenities, hospitals etc.).

Section 24KA of the *Native Title Act 1993*, requires that native title claimants are notified of any 'future act' which may result in a change in land use for Crown lands affected by claims. 'Future act' is defined in section 233 of the Act as a proposed activity or development on land and/or waters that may affect native title, by extinguishing (removing) it or creating interests that are inconsistent with the existence or exercise of native title. If after one month there was no response, then the proponent will be deemed to have fulfilled their obligations under the Act.

A search of the National Native Title Tribunal database was completed on 1 October 2019. There are no Native Title claims currently registered in the study area.

3.0 CONSULTATION

Aboriginal community consultation is being undertaken in accordance with the Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010 (DECCW 2010b).

3.1 Registration of Aboriginal parties

In accordance with Step 4.1.2 of the Consultation Requirements, letters/emails were send on 1 October 2019 to the following organisations to request the names of Aboriginal people who may hold cultural knowledge relevant to determining the significance of Aboriginal objects and/or places within Kemps Creek:

- Greater Sydney Office of Environment and Heritage
- Deerubbin Local Aboriginal Land Council
- The Registrar, Aboriginal Land Rights Act 1983
- National Native Title Tribunal
- NTSCORP
- Penrith City Council
- Greater Sydney Local Land Services.

In accordance with Step 4.1.3 of the consultation requirements, an advertisement was placed in the Koori Mail on 9 October 2019. The advertisement invited all Aboriginal persons and organisations who hold cultural knowledge relevant to determining the significance of Aboriginal objects and places in the study area to register their interest by 23 October 2019.

In accordance with Step 4.1.3 of the consultation requirements, letters/emails were sent on 11 October 2019 to all Aboriginal persons or organisations identified through responses from agencies contacted as part of Step 4.1.2. The letters provided details about the location and nature of the proposal, an invitation to register as an Aboriginal stakeholder, and notice that their details would be provided to Heritage NSW, DPC and the Deerubbin LALC.

Those Aboriginal stakeholders listed in Table 2 registered an interest in the project.

Table 2: List of registered stakeholders

Group	Name
Murra bidgee Mullangari	Ryan Johnson
Darug Custodian Aboriginal Corporation	Justine Coplin
Widescope Indigenous Group	Steven Hickey
Amanda Hickey Cultural Services	Amanda Hickey

Group	Name
[redacted]	
Wailwan Aboriginal Group	Philip Boney
Didge Ngunawal Clan	Lilly Carroll and Paul Boyd
Ngambaa cultural Connections	Karina Slater
A1 Indigenous Services	Carolyn Hickey
Muragadi	Jesse Carroll Johnson
Barking Owl Aboriginal Corporation	Jody Kulakowski
Kawul Cultural Services	Vicky Slater
Wurrumay Consultancy	Kerrie Slater
Butucarbin Aboriginal Corporation	Jennifer Beale

Deerubbin LALC did not register their interest in the project but was included in stakeholder consultation as the study area is within their boundaries.

In accordance with Step 4.1.6 of the consultation requirements, a list of registered Aboriginal stakeholders and a copy of the published Step 4.1.3 advertisement were forwarded to both the Parramatta Heritage NSW, DPC Regional Operations Group and the Deerubbin LALC on 12 November 2019. [redacted]

3.2 Test excavation methodology

A copy of the draft test excavation methodology [TEM] (Artefact Heritage 2020b) was distributed to RAPs on 1 May 2020 with a 28-day period for review and comment. By the end of the review period six groups had provided comment, see Table 3 for a summary of the RAP comments. The methodology was finalised following the receipt of comments and the end of the 28-day consultation period.

Table 3: Summary of RAP comments on test excavation methodology

Organisation	Comments
Muragadi	Supported the proposed test excavation methodology and agrees with the recommendations
Didge Ngunawal Clan	Supported the proposed test excavation methodology
A1 Indigenous Services	Supported the proposed test excavation methodology. Requested that Kawalkan youth employees be considered for fieldwork
Wailwan Aboriginal Group	Supported the proposed test excavation methodology
Widescope Indigenous Group	Supported the proposed test excavation methodology
Darug Custodian Aboriginal Corporation	Supported the proposed test excavation methodology and agreed with the recommendations

3.3 Review of draft ACHAR

The draft version of this ACHAR was provided to the RAPs for a 28-day review on 5 August 2020, requesting comments by 2 September 2020. By the end of the review period four groups had provided comment, see Table 4 for a summary of the RAP comments.

Steve Randall (Site Officer, Deerubbin LALC) was telephoned on 1 September 2020 to confirm if he had received the draft ACHAR and if he had any comments. Mr. Randall stated that Deerubbin LALC supports the findings and recommendations of the ACHAR (Steve Randall 2020, pers.comm, 1 September).

Table 4: Summary of RAP comments on draft ACHAR

Organisation	Comments
Amanda Hickey Cultural Services	Supported the draft ACHAR and agrees with the recommendations
Butucarbin Aboriginal Corporation	Supported the draft ACHAR and agrees with the recommendations
Didge Ngunawal Clan	Supported the draft ACHAR and agrees with the recommendations
Muragadi	Supported the draft ACHAR and agrees with the recommendations

4.0 ENVIRONMENTAL BACKGROUND

4.1 Geology and soils

The underlying geology of the study area is divided into two types of deposit. Bringelly Shale is the dominant geological unit within the study area. Bringelly Shale forms part of the Wianamatta Group, consisting of shale, carbonaceous claystone, claystone, laminate, fine to medium grained lithic sandstone, rare coal, and tuff (Clark and Jones 1991). The northwest portion of the study area comprises of quaternary fluvial deposits associated with Kemps Creek. The quaternary fluvial deposits are described as fine-grained sand, silt and clay (Clark and Jones 1991).

Overlying soils are likely to consist of residual soils developed in situ across the raised portions of the study area associated with the underlying Bringelly Shale. Soil landscapes are predominantly residual Blacktown soils and the erosional Luddenham soils, incised by the fluvial South Creek soils found along most major water courses. The residual soils, called the Blacktown soil landscape, generally consist of shallow duplex soils over a clay base (Office of Environment and Heritage [Heritage NSW, DPC] 2014).

Overlying fluvial soils were associated with the alluvium across the low-lying terrain bordering Ropes Creek. The fluvial soils, called the South Creek soil landscape, would be subject to frequent flood events, possibly resulting in a deep, homogenous deposit susceptible to mixing (Heritage NSW, DPC 2014). The Luddenham soils are shallow (<1,000 millimetres [mm]) dark podzolic soils or massive earthy clays on crests, moderately deep (700-1,500 mm) red podzolic soils on upper slopes, and moderately deep (<1,500 mm) yellow podzolic soils and prairie soils on lower slopes and drainage lines. The Luddenham soil landscape is generally associated with undulating to rolling low hills on Wianamatta Group shales, often associated with Minchinbury (eSPADE 2016).

A significant feature of the regional geological landscape includes a significant source of silcrete at Plumpton Ridge, approximately 12.8 kilometres northeast of the study area. Silcrete, a raw material used by Aboriginal people across Sydney Basin, was extracted from underlying Tertiary period geology called the St Marys formation. The silcrete raw material source at Plumpton Ridge was an important and extensively used quarry where extraction and tool manufacture activities took place (JMcD CHM 2006).

4.2 Natural resources

The study area would once have been covered by open Cumberland Plain Woodland, which is typical of the Wianamatta Group shale geology. Tree species would have included Forest Red Gum (*Eucalyptus tereticornis*), and Grey Box (*E. moluccana*) (Benson and Howell 1990).

It is likely that the Darug people practiced a mobile subsistence land-use strategy due to seasonal availability of resources, which necessitated movement or trade (Attenbrow 2010: 78). Aboriginal people hunted kangaroo and wallaby and snared possums for food and skins. In marine or estuarine environments Aboriginal people caught fish and collected shellfish. There are many accounts by Europeans of Aboriginal people in canoes on rivers and the ocean, fishing and cooking the fish on small fires within the vessels (e.g. Collins 1798).

Plants were an important source of nutrition, common edible species being Macrozamia, a cycad palm with poisonous seeds that were detoxified and ground into a paste and Xanthorrhoea, or grass tree. The grass tree nectar was a high-energy food, the resin strong hafting glue, and the flower spikes used for spear barbs.

From observations by early European colonists, only about twenty species of plant are identified as being used for food or manufacture by Aboriginal people of the Sydney region (Attenbrow 2010: 41). It is likely this is only a fraction of what was actually used.

4.3 Landforms and hydrology

The study area is located across ridge crest, slope and undulating landform contexts. Kemps Creek is located 940 m west of the study area. An unnamed, first order tributary of Kemps Creek runs east-west through the northern portion of the study area (Lot 58).

4.4 Historical land use

4.4.1 Original land grants: 1805-1826

The first land grants within the study area were granted to Richard Fitzgerald and Nicholas Bayly. Fitzgerald received 300 acres in 1805, and Bayly received 550 acres in 1810. These grants extended across the east and west sides of Mamre Road, bordered on the west by South Creek. Historic evidence suggests that from 1810, Bayly had been utilising Fitzgerald's land.

During this time intensive construction was undertaken at Bayly Park however it is unlikely that construction of significant structures occurred within the study area. The study area likely underwent land clearance and stumping and would have been utilised for grazing. It is likely that orchard and garden areas associated with Bayly Park were located on the western side of Mamre Road. A fence along the boundary between Richard Fitzgerald and Nicholas Bayly's land grants was likely constructed as well as paddock fences within Bayly Park and Restitution Farm.

4.4.2 Fleurs: 1826 – 1883

During Richard Jones ownership of Bayly Park, the estate was renamed Fleurs. Several structures are listed in a real estate advertisement for the property during this phase, however there is no evidence to suggest what structures were constructed by Bayly or by Jones. It is likely that most of the structures and outbuildings were located on the western side of Mamre Road, out of the study area. Possible structures that may have been built during this phase on the eastern side of Mamre Road within the study area may have included loose boxes for horses, calf pens, pigsties, milking yards or stock yards. The vineyard established by Jones may have been partially located on the eastern side of Mamre Road and within the study area, however it is more likely that it would have been located nearby the main house, particularly due to the alluvial soils associated with Kemps Creek.

During this phase it is most likely that the study area continued to be utilised for grazing and pastoral purposes, perhaps with minor cultivation of the land for vineyards. Additional fencing structures may have been constructed, likely using timber post and rail fencing.

4.4.3 Subdivision: 1883 - c.1930s

In 1883 the Fleurs estate was subdivided into 20-acre lots and Mamre Road was established, resulting in the division of Bayly Park. Several new boundary fences would have been established as a result of the subdivision, in addition to the erection of boundary fences along Mamre Road. As a result of the construction of Mamre Road any structures in the area would have been demolished. Further land clearance may have occurred in addition to the planting of new formal garden spaces. While Fleurs estate was subdivided, aerial imagery shows that no residential properties were constructed in this phase in the study area and that market gardening had not occurred. Minor

earthworks and irrigation may have also occurred in this phase. It is likely that grazing would have continued within parts of the study area.

4.4.4 Rural farming and residential use: 1930s – present

In 1930 Fleurs was again subdivided into 10 Lots and sold. During this phase, the study area was utilised for grazing until the 1980s, when market gardening was introduced. In 1958 Mamre Road was widened, which would have resulted in the demolition of fences and structures on the western boundary of the study area. The first residential property was constructed in Lot 55 between 1970 and 1982. Between 1982 and 1991, the remaining residential and agricultural structures within the study area were constructed. From 1982, the study area became used for market gardening and grazing in localised areas. During this phase, larger bulk earthworks would have begun, particularly in Lot 54, to create flat or raised land for the construction of large agricultural outbuildings. Earthworks would have been utilised to raise the levels of dams within the study area at this time, and it is possible that smaller creeks would have been blocked off and converted into dams during this phase.

4.4.5 Summary

The study area was utilised for pastoral activities for the majority of its history and was subject to extensive clearance of native vegetation to facilitate this purpose. Historical records indicate that the study area was not subject to extensive landform modification or disturbance through widespread construction of built structures. It was only in the later part of the 20th century that market gardening and dam construction across portions of the study area (1930s-present). Therefore, disturbance from historical land use is likely to be limited.

5.0 ARCHAEOLOGICAL CONTEXT

5.1 Aboriginal material culture

The archaeological understanding of the early Aboriginal settlement of the Sydney Basin and surrounds is constantly expanding and developing. The oldest evidence of human occupation in the vicinity of the study area comes from Cranebrook Terrace, located 16.4 km northwest of the study area (Attenbrow 2010: 18-20). Cranebrook Terrace has been dated to 41,700 years Before Present (BP) (ANU-4016).

Dates from the three closest sites to the study area are:

- Power Street Bridge 2, located 11.6 km northeast of the study area, has been dated to 5,957 years BP (NZA-3112)
- Regentville RS1, located 13.9 km northwest of the study area, has been dated to 12,100 years BP (W-1986 [TL])
- Plumpton Ridge, located 13.6 km northeast of the study area, has been dated to 2,250 years BP (Beta 195216).

The existing archaeological record is limited to certain materials and objects that were able to withstand degradation and decay. As a result, the most common type of Aboriginal objects remaining in the archaeological record are stone artefacts. Archaeological analyses of these artefacts in their contexts have provided the basis for the interpretation of change in material culture over time. Technologies used for making tools changed, along with preference of raw material. Different types of tools appeared at certain times, for example ground stone hatchets are first observed in the archaeological record around 4,000yBP in the Sydney region (Attenbrow 2010: 102). It is argued that these changes in material culture were an indication of changes in social organisation and behaviour.

The Eastern Regional Sequence was first developed by McCarthy in 1948 to explain the typological differences he was seeing in stone tool technology in different stratigraphic levels during excavations such as Lapstone Creek near the foot of the Blue Mountains (McCarthy *et al*. 1948). The sequence had three phases that corresponded to different technologies and tool types (the Capertian, Bondaian and Eloueran). The categories have been refined through the interpretation of further excavation data and radiocarbon dates (Hiscock and Attenbrow 2005; McDonald 2006). It is now thought that prior to 8,500 yBP tool technology remained fairly static with a preference for silicified tuff, quartz and some unheated silcrete. Bipolar flaking was rare with unifacial flaking predominant. No backed artefacts have been found of this antiquity.

After 8,500 years BP silcrete was more dominant as a raw material, and bifacial flaking became the most common technique for tool manufacture. From about 4,000 to 1,000 years BP backed artefacts appear more frequently. Tool manufacture techniques become more varied and bipolar flaking increases (JMcD CHM 2006). It has been argued that from 1,400 to 1,000 years before contact there is evidence of a decline in tool manufacture. This reduction may be the result of decreased tool making, an increase in the use of organic materials, changes in the way tools were made, or changes in what types of tools were preferred (Attenbrow 2010: 102). The reduction in evidence coincides with the reduction in frequency of backed blades as a percentage of the assemblage.

After European colonisation Aboriginal people of the Cumberland Plain often continued to manufacture tools, sometimes with new materials such as bottle glass or ceramics. There are several sites in Western Sydney were flaked glass has been recorded, for example at Prospect (Ngara Consulting 2003) and Oran Park (JMcD CHM 2007).

5.2 Aboriginal histories of the locality

The study area is located near the boundaries of two Aboriginal language groups, Dharawal and Gundungurra (Tindale 1974). The Dharawal are placed in the area from the south side of Botany Bay and Port Hacking to north of the Shoalhaven River and inland to Campbelltown, Camden and Bargo. They are thought to have ranged further north into the Liverpool region, the boundaries defined today can only be used as indicative (Attenbrow 2010). The Gundungurra are described as occupying the southern rim of the Cumberland Plain, west of the Georges River, including a boundary area with the Dharawal in the Camden and Bargo locality.

As traditional territorial boundaries were fluid it is uncertain which group(s) occupied the study area (Peterson 1976). The current state of knowledge about the fluidity of tribal boundaries is based partly on studies of contemporary Aboriginal communities in northern and central Australia who were less affected by European colonisation, and partly on observations of Aboriginal groups to the west and south-west of Sydney who had been severely affected by the disconnection from their lands cause by European colonisation (Thomson 1985).

There are also ethno-historical observations made by early explorers and settlers in the region, who first came into contact with the Aboriginal people of these areas in the 18th and 19th century. Wilson, during a 1798 expedition through the region, observed that people were wearing large skin cloaks. When James Backhouse travelled to the region in 1836, he noted that skin cloaks were still worn, but some European clothes and blankets were also used, and that ceremonies such as tooth avulsion were also practised (Koettig 1981).

In the early 1800s, relationships between the Aboriginal people of the area and the European settlers were in general amicable. Karskens (2010) notes several examples of close relationships between landowners and local Aboriginal people (Karskens 2010). Relations between Aboriginal people and colonists did not remain amicable. A sustained drought during 1814 and 1815, and continued disenfranchisement of Aboriginal people from the land lead to tensions between farmers and Aboriginal people who remained to the southwest of Sydney. Aboriginal people were accused of stealing corn and potatoes and spearing cattle. A number of farmers were killed on their properties. In a dispatch Governor Macquarie wrote that:

> *The Native Blacks of this country…have lately broken out in open hostility against the British Settlers residing on the banks of the River Nepean near the Cow Pastures (Macquarie 1816 in Gapps 2018).*

Aboriginal people were targeted, and it was ordered that Aboriginal men be strung from trees when they were killed as an example (Turbet 2011: 234).

In 1816, the tensions culminated in the Appin massacre when Aboriginal people where pursued by a detachment led by Captain James Wallis. Fourteen Aboriginal people of the Dharawal nation were shot or driven over a cliff to their deaths by the soldiers. The bodies of two of the Aboriginal men were strung up at the site (Turbet 2011).

Overall, the devastation of the Aboriginal culture did not come about through war with the British, but instead through disease and forced removal from traditional lands. It is thought that during the 1789 smallpox epidemic over half of the Aboriginal people of the Sydney region died. This loss of life meant that some of the Aboriginal groups who lived away from the coastal settlement of Sydney may have disappeared entirely before Europeans could observe them or record their clan names (Karskens 2010: 452).

Into the nineteen and twentieth century's descendants of the Gundungurra and Dharawal groups continued to live across the southern margin of the Cumberland Plain along with Aboriginal people from other areas of NSW.

5.3 Registered Aboriginal sites

The locations and details of Aboriginal sites are considered culturally sensitive information. It is recommended that this information, including the AHIMS data and GIS imagery, is removed from this report if it is to enter the public domain.

An extensive search of the Aboriginal Heritage Information Management System (AHIMS) was conducted on 14 May 2020 (Client ID 426334).

An area of approximately 3.8 kilometres (east-west) by 4.6 kilometres (north-south) was included in the search. The AHIMS search provides archaeological context for the area and identifies whether any previously recorded Aboriginal sites are located within or near the study area. The parameters of the search were as follows:

GDA 1994 MGA 56	293236 – 297080 mE 6250447 – 6255081 mN
Buffer	0 m
Number of sites	56
AHIMS Search ID	426334

The nature and location of the registered sites is a reflection of the past Aboriginal occupation from which they derive, but is also influenced by historical land-use, and the nature and extent of previous archaeological investigations. Although Aboriginal occupation covered the whole of the landscape, the availability of fresh water, and associated resources, was a significant factor in repeated and long-term occupation of specific areas within the landscape. Certain site types, such as culturally modified trees, are particularly vulnerable to destruction through historical occupation, while others, such as stone artefacts, are more resilient.

A total of 52 sites were identified by the extensive AHIMS search. AHIMS lists 20 standard site features that can be used to describe a site registered with AHIMS, and more than one feature can be used for each site. The frequency of recorded site types is summarised in Table 5. For the 56 sites within the search area, four site features were recorded. The majority of recorded sites are Artefacts (n=51) followed by Artefact, Potential Archaeological Deposits (PADs) (n=3). The distribution of recorded sites within the AHIMS search area is shown in Figure 7.

Table 5: Frequency of site features from AHIMS data.

Site Feature	Frequency	Percentage (%)
Artefact	45	86.54
Artefact, Modified Tree (Carved or Scarred)	1	1.92
Artefact, Potential Archaeological Deposit (PAD)	6	11.54
Total	**52**	100.00

The nature and location of the registered sites reflects the past Aboriginal occupation from which they derive, but is also influenced by historical land-use, and the nature and extent of previous

archaeological investigations. Although Aboriginal occupation covered the whole of the landscape, the availability of fresh water, and associated resources, was a significant factor in repeated and long-term occupation of specific areas within the landscape. Certain site types, such as culturally modified trees, are particularly vulnerable to destruction through historical occupation, while others, such as stone artefacts, are more resilient.

A large number of AHIMS registered sites are located to the west and east of the study area, following the alignment of Kemps Creeks in the west and Ropes Creek in the east. A large number of AHIMS sites in the centre of the study area have been identified between two unnamed tributaries of Ropes Creek and Kemps Creek (Figure 7). It is therefore likely that Aboriginal objects will be identified within close proximity to waterways. Based on the existing AHIMS data, it is predicted that the most likely site type to be featured within the study area is surface artefact sites, associated with waterways.

One AHIMS site, MAM AS 1901 (AHIMS ID 45-5-5186), is located within the study area, in the eastern portion of Lot 58 DP 259135. MAM AS 1901 (AHIMS ID 45-5-5186) and consisted of a ground edge axe (Figure 4), nine silcrete flakes (Figure 6), one mudstone flake, one quartzite flake and one chert flake. The artefacts were located in an eroding slope landform that is slightly raised above the adjacent drainage line on the edge of a formed dam (Figure 3). The visible site extent is approximately 60 m in length and 40 m wide. The site has experienced disturbance from previous pastural and grazing practises. Vegetation around MAM AS 1901 (AHIMS ID 45-5-5186) had been cleared and there is no old tree growth. Ground visibility was high due to erosion, exposures within the site shows silty loams with well-rounded ironstone/shale gravels (Figure 5).

Figure 3: Location of MAM AS1901 (AHIMS ID 45-5-5186) in the landscape (J Norfolk, 21 January 2019).

Figure 4: Ground edge axe found at MAM AS 1901 (AHIMS ID 45-5-5186) – ground edge on right (J Norfolk, 21 January 2019).

Figure 5: Surface visibility and soils at location of MAM AS1901 (AHIMS ID 45-5-5186) (J Norfolk, 21 January 2019).

Figure 6: Silcrete flake within MAM AS1901 (AHIMS ID 45-5-5186) (J Norfolk, 21 January 2019).

Figure 7: Results of extensive AHIMS search

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Figure 8: AHIMS sites within the study area

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5.4 Previous archaeological work in the local area

Previous archaeological investigations (Artefact Heritage 2019b and summaries in Table 6) have identified areas in close proximity to Ropes Creek and its tributaries as areas of high archaeological sensitivity (Biosis 2010; Navin Officer 2007). Artefact densities drop further out from these waterlines in what are termed transitional areas to background scatter levels. There is a noted increase in artefact densities on elevated slopes and crests around first and second order streams that run off major water courses. GML (2013 and 2015) also identified clay oven features within the property to the north of the current study area. However, Artefact Heritage (2018a) noted that artefacts densities drop on elevations higher than 90 m above sea level.

Table 6: Summary of key studies

Author and date	Title
JMcD CHM 2004	Archaeological Investigations at the Austral Site (AHIMS ID 45-5-2986) 'The Vineyard', Wallgrove Road, Horsley Park
JMcD CHM 2006	Archaeological Subsurface Investigations at SEPP59 EC/1 (AHIMS ID 45-5-3201) and EC3/2 (AHIMS ID 45-5-3202), Wonderland Surplus, Old Wallgrove Road, Eastern Creek
Godden Mackay Logan 2007	Oakdale Concept Plan, Aboriginal Heritage Assessment and Impact Assessment
Navin Officer 2007	Erskine Park Employment Area, Ropes Creek, Western Sydney, NSW, Archaeological Subsurface Testing Program
Biosis 2010	Erskine Park Link Road Aboriginal Archaeological Excavation undertaken as part of AHIP1113179: Excavation Report for Roads & Traffic Authority
Artefact Heritage 2014	Energy from Waste Facility, Eastern Creek, Aboriginal Heritage Test Excavation
Navin Officer 2016	M12 Motorway Strategic Route Options Analysis
Artefact Heritage 2018a	Oakdale South Industrial Estate Archaeological Salvage Report
Artefact Heritage 2018b	Oakdale Industrial Estate, Oakdale West Archaeological Test Excavation Report
Artefact Heritage 2018c	CSR Advanced Manufacturing Hub MOD3
Artefact Heritage 2019a	Elizabeth Drive Enterprise Precinct Heritage Baseline Advice
Artefact Heritage 2019b	Mamre Road Precinct Aboriginal and Non-Aboriginal Heritage Constraints Assessment

5.5 Predictive model

Archaeological investigation across the Cumberland Plain has been comprehensive over the past 30 years, including survey, excavation and desktop analysis studies. This varied and intensive investigation has led to the development and continual refinement of a predictive model for Aboriginal occupation within the region.

The Cumberland Plain has been extensively studied due to the growth demand of the ever-increasing Sydney population. Regional studies have been done on the large Growth Centres of the North West and South West of the Cumberland Plain, west of Sydney Basin. White and McDonald (2010) have contributed to the debate over site prediction by discussing the nature of Aboriginal site distribution, interpreted through lithic analysis of excavated sites in the Rouse Hill Development Area (White and McDonald 2010). The Rouse Hill Development Area is located about 15 km north of the current study area, the watercourses in the development area (Caddies Creek and Second Ponds Creek) derive from the same source as South Creek, the Hawkesbury River, and are of a similar stream order. The Soil landscapes are also reflective of those in the current study are, South Creek Soil Landscape along the high order watercourses and associated remnant Blacktown Soil Landscape. The study gave rise to the commonly referred Stream Order Model which provides a sound basis for archaeological investigations in the Cumberland plain. The paper provides a spatial and distributive analysis of Aboriginal objects in relation to freshwater resources and along varying landform units. The findings of this study highlighted the relationship between proximity to freshwater and landscape with archaeological evidence of Aboriginal occupation. The study found that artefact densities were most likely to be greatest on terraces and lower slopes within 100 m of freshwater resources (White and McDonald 2010). The predictive model identified that ridgelines and crests located between drainage lines will contain archaeological evidence though usually representative of background scatter (White and McDonald 2010).

While White and McDonald's (2010) predictive model can be seen as an indicative model of the archaeology of the Cumberland Plain, a more recent study has been conducted by Godden Mackay and Logan (GML 2012) at the East Leppington Precinct approximately 11 km south of the current study area. The study utilised the Stream Order Model developed by White and McDonald (2010) in their investigations and three different and complementary models to explain their findings. The Stream Order Model is a regional based model and doesn't consider the small-scale intra-landform variations that can affect the predictions of this model.

Owen and Cowie (2017) describe three other models that can be used to more accurately describe archaeological probability within the landscape. Economic Resource Model, Activity Overprinting Model and Domiciliary Spacing Model. The Economic Resource Model focuses on the resource zones, confluences of creeks are considered high resource zones due to the richness in flora and fauna. The model suggests that the evidence of Aboriginal activities will decrease with distance from theses resource rich nodes. Activity Overprinting Model was used to explain the density of sites at increasing distances from the creek and Domiciliary Spacing Model was used to describe the features and spatial variation of a site.

In conjunction with these models, an understanding of the soil landscape and the nature and prevalence of cultural material within these contexts is important in the predictive model process. Deposits that contain cultural material are likely to exist within the Blacktown soil landscapes however, these are deposits are generally not stratified. Blacktown soils typically contain cultural material in A Horizon deposits, which generally extend approximately 300 mm below the ground surface.

Alluvial deposits associated with the South Creek Soil landscape have the potential to support stratified archaeological deposits. These stratified deposits are most likely to exist within raised embankments where environmental forces, such as flash flooding, are less likely to have impacted Aboriginal cultural material situated on the ground surface. The deposits may have a vertical distribution that parallels alluvial deposition over time. The NSW Soil and Land Information System produced a technical report outlining the results of a core sample taken within the south east portion of the current study area, along the alluvial flats of South Creek. The results show that the South Creek soils extends to a depth of three metres in this area, although the South Creek A horizon deposits are relatively shallow extending to 350 mm below the ground surface. Every predictive

model has its limitations and constraints and should be used as a guiding factor for future investigation and be used as a bridging tool to further current understanding of the cultural environment.

Based on the recorded AHIMS sites, previous studies and the environmental context, predictions can be made on the type of Aboriginal archaeological evidence potentially present within the current study area. Test excavation will likely identify a high density, subsurface artefact scatter, primarily comprised of silcrete. Artefacts are likely to be associated with waterways.

6.0 ARCHAEOLOGICAL SURVEY

6.1 Aims

The aims of the archaeological survey were to:

- Record the landform, general soil information, surface conditions and vegetation conditions encountered during the survey and how these impact on the visibility of objects
- Record any Aboriginal objects observed during the survey
- Define the boundaries of any Aboriginal sites and areas of PAD based on landmarks and historical maps
- Reinspect previously identified Aboriginal sites and areas of archaeological potential within the study area
- Identify areas of disturbance which may have impacted the presence of intact soils and archaeological features
- Consultation with Deerubbin LALC to discuss the proposal, undertake archaeological survey, and discuss the intangible cultural heritage values of the study area
- Collect information to ascertain whether further archaeological investigation is required.

6.2 Personnel and timing

The archaeological survey was completed over two days from 2 October 2019 to 3 October 2019. The survey was directed and supervised by Ryan Taddeucci (Senior Heritage Consultant, Artefact Heritage). Table 7 lists all participants in the survey and their dates of participation.

Table 7: Participants in the test excavation program

Name	Organisation	Role	Date
Ryan Taddeucci	Artefact Heritage	Senior Heritage Consultant	3 October 2019
Jennifer Norfolk	Artefact Heritage	Heritage Consultant	2 October 2019
Sarah Hawkins	Artefact Heritage	Heritage Consultant	2 October – 3 October 2019
Steve Randall	Deerubbin LALC	Site Officer	2 October – 3 October 2019

6.3 Methodology and coverage

Archaeological survey of the study area was conducted on foot, in accordance with the Code of Practice. The study area was divided into 10 Survey units (SUs), based on landform and access, these units were numbered SU1 – SU10. The overall strategy was to complete a full coverage survey, where possible. A handheld Global Positioning System (GPS) was used to track the path of the survey team and record the coordinates of survey transects, as well as the location of key features

(disturbances, areas of archaeological sensitivity/potential). The coordinate system projection used for all site recording was GDA94 MGA 56.

The survey was conducted with three people traversing the area spaced 30 m apart. All ground exposures were examined for Aboriginal objects (stone artefacts, imported shell, or other traces of Aboriginal occupation).

A photographic record was kept during the survey. Photographs were taken to record aspects of survey units including vegetation and disturbance. Scales were used for photographs where appropriate.

A summary of survey coverage, in accordance with the Code of Practice, is outlined in Table 8 and Table 9 below.

Table 8: Survey coverage summary

Survey unit	Landform	Survey unit area (sq. m)	Visibility (%)	Exposure (%)	Effective coverage Area (sq. m)	Effective coverage (%)
1	Slope	36,220	5	20	362.2	1
2	Crest	47,200	10	0	0	0
3	Slope	23,030	2	0	0	0
4	Slope	26,990	2	0	0	0
5	Slope	91,990	50	20	9,199	10
6	Crest	46,346	10	95	4,402.87	9.5
7	Slope	79,275	15	35	4,161.9375	5.25
8	Slope	101,490	10	95	9,641.55	9.5
9	Crest	38,795	20	5	387.95	1
10	Flat	62,419	25	95	14,824.5	23.75

Table 9: Landform survey coverage

Landform	Landform Area (sq. m)	Area effectively surveyed (sq. m)	% of landform effectively surveyed	Number of sites
Slope	358,995	23,364.69	6.5	1
Crest	132,341	4,790.82	3.6	1
Flat	62,419	14,824.5	23.75	0

6.4 Results

The survey resulted in the identification of 21 surface artefacts, in addition to the 13 surface artefacts identified during the previous site inspection (Figure 9). Steve Randall (Site officer, Deerubbin LALC), noted that the area was an intact landform and was likely to feature Aboriginal objects below the

surface. It was confirmed that Aboriginal objects are likely to be present below the ground surface, as artefacts eroding out of the ground surface likely to represent further subsurface potential.

The site contained five artefact concentrations ranging in size from 15 artefacts in concentration 1 to three artefacts in concentration 5. The site also included six isolated artefacts. The artefacts identified during the previous site inspection were not relocated and it is assumed that they have been reburied by colluvial processes, associated with the seasonal inundation of the study area. As a result, the entire extent of MAM PAD 1901 is considered to be an area of PAD.

Surface visibility across the site was low, due to dense grass cover and leaf litter. Only the areas of erosion surrounding the dams featured high ground surface visibility. Observations during the site survey did not identify any significant areas of surface disturbance. General surface disturbance across the area is likely to have been caused by vegetation removal, whilst isolated instances of surface disturbance include localised erosion associated with unformed vehicle tracks and some minor artificial drainage channels.

The site assemblage was comprised mostly of complete flakes (n=17, 41.94%). However, the site also featured three formal tools, a geometric microlith, a ground edged axe, and a tula. The assemblage featured significant artefact diversity which is indicative of site occupation of groups of people engaged in lower residential mobility (Binford, 2001). Debris, cores and longitudinal flake fragments are indicative of artefact manufacturing processes and the presence of these artefacts within the assemblage indicates that artefact manufacture is likely to have occurred on site. Ground-edge axes are associated with the removal of bark from trees to produce wooden objects.

The areas surrounding the artificial dams are considered to be of high archaeological potential as subface artefacts were observed to be eroding out of the ground surface. To the east of the dams, the landform slopes up towards a ridge line which is within 200 m of a water course. Under the Code of Practice this is considered to be an archaeologically sensitivity landform. Furthermore, previous assessments within the vicinity of the study area have identified that the ridge landforms within close proximity to waterways yield high density artefact deposits. It is likely that artefacts were deposited on the upper ridgeline and have been washed down the slope into the artificial dams. Therefore, the intact slopes leading up to the ridgeline are considered to be of moderate archaeological potential, due to the redepositing of material through colluvial processes.

The ASR (Artefact Heritage 2019b) recommended that Archaeological test excavation be completed within the PAD portion of MAM AS 1901 (AHIMS ID 45-5-5186) to investigate the nature and extent of potential subsurface archaeological deposits and inform an assessment of archaeological significance.

Figure 9: Revised extent of MAM AS 1901 (AHIM ID 45-5-5186)

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7.0 ARCHAEOLOGICAL TEST EXCAVATION

In accordance with the recommendations provided in the ASR, archaeological test excavations were conducted within MAM AS 1901 (AHIMS ID 45-5-5186) in June 2020. Test excavation was conducted in accordance with the Code of Practice. Under an SSD approval it is not a requirement that test excavation be completed in accordance with the Code of Practice. However, the test excavation methodology was guided by the Code of Practice to produce comparable results with archaeological test excavations completed within the wider region in accordance with the Code of Practice.

A detailed discussion of the results of the test excavation program is provided in the ATER which is appended to this report as Appendix 4.

7.1 Timing and personnel

The test excavation program was carried out over 8 days from the 15 June to 24 June 2020. Test excavation was supervised by Ryan Taddeucci (Senior Heritage Consultant, Artefact Heritage).

A full list of participants in the test excavation is available in the test excavation report.

7.2 Test excavation strategy and methodology

In accordance with the sample strategy outlined in the TEM (Artefact Heritage 2020b), two test areas (TA1 and TA2) were initially established in the western portions of Lot 58 and Lot 56. TA1 was comprised of four east-west oriented transects (A – C) while TA2 was comprised of five north-south oriented transects (E – I). The general approach was to place 500 mm x 500 mm test pits at 30 m intervals along each transect (Figure 10).

Since the completion of the ASR (Artefact Heritage 2019b) the dam located within the northern portion of the study area had increased in size, resulting in two test pits (C1 and D1) being inaccessible. An additional transect comprised of three test pits was placed to offset against the loss of sample area (Transect K). Transect K was placed between Transects A and B due to the high artefact counts within those areas, specifically within A3 and B4. Due to the presence of several barbed wire fences across the proposed location of TA2, the spacing of the transects was reduced from the 45 m proposed by the TEM to 40 m. An additional transect (Transect J) was also placed between TA1 and TA2 to offset against the loss of the sample area.

In total, 47 test pits were excavated (Figure 11). A total of two test pits, A3 and B4, were expanded to an open area comprised of nine 500 mm x 500 mm test pits to further investigate the distribution of artefacts within these high-density areas.

Each test pit was hand excavated in 100 mm spits, with the exception of the first excavation unit which was excavation in 50 mm spits. Excavations within all test pits ceased at the C horizon, which consisted of an archaeologically sterile layer of highly plastic clay at a depth of approximately 300 mm.

7.3 Results

The test excavation program recovered 25 artefacts from the 15.5 m^2 that was excavated across the site (Figure 12), resulting in an artefact density of 1.61 artefacts per m^2. The highest concentration of artefacts was retrieved from the open area excavation at A3, which yielded a total of 13 artefacts, 52% of the total site assemblage. As a result, A3 was considered to be an artefact concentration, with a density of 8.67 artefacts/m^2. It was concluded that fluvial processes were unlikely to have resulted in

the deposition of the artefact concentration at A3 and that the deposit was likely to be of high archaeological integrity. The artefacts recovered from the remainder of the site were considered to be representative of a background scatter.

The artefact concentration within A3 was found to be primarily comprised of fragmented artefacts that had likely been damaged as a result of the site being trampled by cattle or other pastoral and agricultural process. The artefact typology and raw materials present indicated that the assemblage was potentially associated with later stage artefact manufacturing and that the artefacts were predominantly sourced from a waterway, possibly from the nearby Kemps Creek. Although it was determined that artefact manufacturing occurred onsite, based on the presence of an additional an additional piece of debris and a core fragment identified within the B4 open area 50 m southeast of A3, it was concluded that A3 itself was not a reduction area. Overall, it was interpreted that A3 deposit was unlikely to be representative of long term or repeated site occupation and was more likely to represent temporary site occupation by a small, highly mobile group engaged in opportunistic resource acquisition.

The total artefact count for Mamre Road Artefact Scatter 1901 (AHIMS ID 45-5-5186) is 60 artefacts, with 35 surface artefacts identified during the previous site inspection and survey of the study area and 25 subsurface artefacts identified during the test excavation program. Overall, it was found that that MAM AS 1901 (AHIMS ID 45-5-5186) consists of a low-density artefact scatter that contains six isolated surface artefacts, four surface artefact concentrations, and one subsurface artefact concentration. It was concluded that that assemblage represented opportunistic artefact manufacture rather than the mass manufacture of artefacts associated with permanent occupation.

Figure 10: Location of test areas

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Figure 11: Location of test pits

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Figure 12: Results of test excavation

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8.0 ABORIGINAL CULTURAL HERITAGE ASSESSMENT

8.1 Methodology

The cultural assessment in this report includes information collected through desktop assessment and Aboriginal community consultation undertaken in accordance with the Consultation. This information was collected by Ryan Taddeucci (Senior Heritage Consultant, Artefact Heritage).

8.2 Cultural landscape

The World Heritage Convention of United Nations Educational, Scientific and Cultural Organisation (UNESCO) defines a cultural landscape as one which has 'powerful religious, artistic or cultural associations of the natural element rather than material cultural evidence, which may be insignificant or even absent' (UNESCO 1991). The relationship between Aboriginal Australians and the land is conceived in spiritual terms rather than primarily in material terms (Andrews et al 2006). Aboriginal cultural knowledge has been defined as:

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

Aboriginal cultural knowledge was traditionally bequeathed through oral traditions from generation to generation. Within all Aboriginal communities there was a time of dislocation and upheaval associated with the arrival of colonial settlers. This widespread disruption resulted in much of the detailed knowledge and understanding of many of the elements of the cultural landscape being lost from the Aboriginal community, nonetheless many Aboriginal people maintain a strong connection to the land of their ancestors and collectively possess a wealth of knowledge passed down through the generations.

8.3 Identified Aboriginal cultural heritage values

Table 10 provides a summary of the Aboriginal cultural heritage values associated with the study area.

Table 10: Cultural heritage values identified for the study and surroundings

Cultural heritage value	Description	Source
Archaeological evidence of Aboriginal occupation	Aboriginal people have expressed a strong view that sites and deposits associated with the archaeological record of Aboriginal occupation at Badgerys Creek were of high cultural value to Aboriginal people.	Navin Officer 2016
Badgerys Creek	The area is regarded as having characteristics which would have made it of significance in the traditional life of Aboriginal people of the pre-colonial past and, as such it should be retained in as natural state as possible The intangible cultural values of the landscape and its surviving biota were valued for their association with	Navin Officer 2016

Cultural heritage value	Description	Source
	traditional culture and lore, and the sense of the place and social identity derived from them.	
Ropes Creek	Creek lines are of importance to Aboriginal people past and present as camping places and burials.	Artefact Heritage 2016
Archaeological evidence of previous Aboriginal occupation	Areas with the potential to contain evidence of Aboriginal occupation can provide cultural links to their ancestors and are of great value and significance.	Artefact Heritage 2016
Current evidence of Aboriginal occupation	A higher than national average of Aboriginal people currently live in the Penrith LGA supporting the long-term importance of the area to Aboriginal people past and present	https://www.murumittigar.com.au/who-we-are/history/

9.0 SIGNIFICANCE ASSESSMENT

A significance assessment of the scientific, social, historic and aesthetic values of the study area is included below.

9.1 Significance assessment criteria

An assessment of the cultural heritage significance of an item or place is required in order to form the basis of its management. The Guide (OEH 2011: 10) provides guidelines, in accordance with the Burra Charter (Australia ICOMOS 2013) for significance assessment with assessments being required to consider the following criteria:

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

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

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

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

9.1.1 Historic value

Historic values refer to the association of the place with aspects of Aboriginal history. Historic values are not necessarily reflected in physical objects, but may be intangible and relate to memories, stories or experiences. The study area is not known to be associated with any people, events or activities of historical importance to the Aboriginal community. A total of 60 Aboriginal objects have been identified within MAM AS 1901 (AHIMS ID 45-5-5186) during the test excavation program and previous surveys of the study area. However, it was assessed that the assemblage represented temporary site occupation rather than significant long term or repeated site occupation. The assemblage does not suggest that MAM AS 1901 (AHIMS ID 45-5-5186) was the location of any significant event or activity in the pre-contact or post-contact past. Therefore, at this level of assessment, the study area is considered not to be of historic significance.

9.1.2 Aesthetic value

Aesthetic values refer to the sensory, scenic, architectural and creative aspects of the place. These values may be related to the landscape and are often closely associated with social/cultural values. As the subject site is located within an urbanised setting, which has undergone significant clearance, modification and development; all aesthetic significance is lost.

The study area is considered to be of moderate aesthetic based on proximity to aesthetically pleasing features such as trees and remnant, intact landforms.

9.1.3 Socio/cultural value

Social/cultural heritage significance should be addressed by the Aboriginal people who have a connection to, or interest in, the area. As part of the consultation process the registered Aboriginal stakeholder groups were asked to provide appropriate information on the cultural significance of the subject site.

9.1.4 Scientific value

MAM AS 1901 (AHIMS ID 45-5-5186) is a low-density artefact scatter which contains six isolated surface artefacts, four surface artefact concentrations, and one subsurface artefact concentration. Only the subsurface artefact concentration has been assessed as demonstrating archaeological integrity, while the remainder of the assemblage is located in a highly disturbed context. Overall, the site is considered to be of moderate research and educational significance due to the potential to study an intact artefact deposit.

Three formal tools were identified on the surface of MAM AS 1901 (AHIMS ID 45-5-5186) which are considered to be of high rarity and representative value within the regional context. However, the majority of the artefact assemblage is comprised of fragmented flaked artefacts which are not considered to be rare within the regional context or representative of Aboriginal site utilisation. Overall, MAM AS 1901 (AHIMS ID 45-5-5186) is considered to be of moderate rarity and representative value.

MAM AS 1901 (AHIMS ID 45-5-5186) is considered to be of moderate archaeological significance. A summary of the archaeological significance of sites identified during test excavation is presented in Table 11.

Table 11: Significance assessment

Site name (AHIMS ID)	Research potential	Representativeness	Rarity	Education potential	Overall significance assessment
MAM AS 1901 (AHIMS ID 45-5-5186)	Moderate	Moderate	Moderate	Moderate	Moderate

9.2 Statement of significance

No specific historic or socio/cultural values associated with MAM AS 1901 (AHIMS ID 45-5-5186) were identified. The study area is considered to be of moderate aesthetic significance due to the presence of traditional landscape features. The study area is also considered to be of moderate

scientific significance due to the presence of a subsurface artefact concentration that has been assessed as demonstrating archaeological integrity.

10.0 IMPACT ASSESSMENT

10.1 Proposed works

The proposed works involve the construction of industrial buildings, internal road network layout, building locations, gross floor area, car parking, concept landscaping, building heights, setbacks and built form parameters (Figure 13). Stage 1 works will involve:

- The demolition and removal of existing rural structures and remediation works
- Clearing of existing vegetation across the study area
- Dewatering and decommissioning of dams across the study area
- Realignment of existing creek and establishment of an E2 Environmental Conservation zone
- Bulk earthworks and dewatering
- Importation and placement of spoil material
- Establishment of retaining walls
- Catchment level stormwater infrastructure, trunk services connections, utility infrastructure, roads and access infrastructure
- Construction of warehouse and distribution centre
- Boundary stormwater management, fencing and landscaping
- Staged subdivision.

10.2 Aboriginal heritage impact

The test excavation program and previous archaeological investigations have provided evidence for the presence of surface and subsurface Aboriginal objects within the study area. Bulk earthworks across the study area, in addition to the other proposed works, would result in total removal or modification of the ground within the study area. This would result in the total removal of all identified Aboriginal objects and artefact concentrations within the study area. As a result, the impacts associated with the proposed works would result in a total loss of Aboriginal heritage value for MAM AS 1901 (AHIMS ID 45-5-5186).

A summary of the impacts to MAM AS 1901 (AHIMS ID 45-5-5186) is provided in Table 12. This assessment is based on the impact area, which includes the areas required for construction of the proposed industrial warehouse and distribution buildings.

Table 12: Impact assessment

Site name (AHIMS ID)	Type of harm	Degree of harm	Consequence of harm
MAM AS 1901 (AHIMS ID 45-5-5186)	Direct	Total	Total loss of value

10.3 Ecological Sustainable Development principles

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

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

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

10.3.1 The integration principle

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

10.3.2 The precautionary principle

If there are threats of serious or irreversible environmental damage, lack of full scientific confidence should not be used as a reason for postponing measures to prevent environmental degradation (the 'precautionary principle').

MAM AS 1901 (AHIMS ID 45-5-5186) was identified during the archaeological survey completed for the project. In order to ameliorate the uncertainty associated with the area of archaeological potential, a test excavation program has been conducted. The combination of predictive models and the results of the test excavation have been used to assess the probable nature of the archaeological record within the study area.

To ensure full scientific confidence and retrieve a sample of the identified archaeological resource prior to impacts, targeted salvage is recommended within the subsurface artefact concentration A3. This excavation would provide better scientific confidence and contribute to the archaeological record providing information regarding land use, task specialisation and resource gathering strategies of Aboriginal people over a potentially long timespan.

10.3.3 The principle of intergenerational equity

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

Further archaeological investigations through a salvage excavation of A3 has been recommended in order to mitigate against impacts to the subsurface artefact concentration within the study area.

10.4 Cumulative impacts

A cumulative impact is an impact on Aboriginal cultural heritage resulting from the incremental impact of the action/s of a development when added to other past, present and reasonably foreseeable future actions.

Kemps Creek and the surrounding region is subject to several large development projects which will result in a substantial cumulative impact to the Aboriginal cultural heritage of the region.

The Western Sydney International Airport site at Badgerys Creek extends over approximately 1700 hectares, with adjacent lands progressively scheduled for resumption and development over the next 50 years. At least 70 Aboriginal sites have been identified across the airport site with additional heritage investigation identifying additional Aboriginal objects as part of project mitigation measures (Navin Officer 2016). While effort has been made to preserve sites through environmental conservation areas and movement of topsoil it is expected that a large portion of these sites will be impacted or relocated as part of construction.

Options assessment of the proposed M12 route resulted in the identification of a number of surface and subsurface sites through a combination of survey and test excavation. A total of 19 Aboriginal sites are located within the construction footprint and will be subject to impact as part of the program including several sites to the north of the current study area (Jacobs 2019).

The development of the Oakdale South Estate in Horsley Park identified seven Aboriginal sites, with six of these located within the impact footprint of the development. Salvage excavations carried out in November and December 2016 within two of the identified sites, Oakdale South AS 3 (AHIMS ID 45-5-4528) and Oakdale South AS 4 (AHIMS ID 45-5-4529), retrieved 1,301 artefacts across 86 m^2 (Artefact Heritage 2018a).

The test excavation program confirmed the presence of one subsurface artefact concentration of moderate archaeological significance within MAM AS 1901 (AHIMS ID 45-5-5186), in addition to the six isolated surface artefacts and four surface artefact concentrations that had been previously identified. The proposed works would result in a total impact to the Aboriginal site. While resulting in a comparatively small cumulative impact when compared to the impacts of the above projects, the increase will never-the-less result in an increase to the cumulative destruction of Aboriginal cultural heritage in the region.

Figure 13: Impacts of the proposed works on MAM AS 1901 (AHIMS ID 45-5-5186)

Redacted for public display

11.0 MANAGEMENT AND MITIGATION MEASURES

The overall guiding principle for cultural heritage management is that where possible Aboriginal sites should be conserved.

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

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

- Low archaeological significance – conservation where possible. SSD Conditions of Approval would be required to impact the site before work can commence
- Moderate archaeological significance – conservation where possible. If conservation was not practicable, further archaeological investigation would be required such as salvage excavations or surface collection in accordance with the SSD Conditions of Approval.
- High archaeological significance – conservation as a priority. Where all other practical alternatives have been discounted mitigation measured such as comprehensive salvage excavations in accordance with the SSD Conditions of Approval would be required.

MAM AS 1901 (AHIMS ID 45-5-5186) has been assessed as demonstrating moderate archaeological significance. Therefore, further archaeological investigation would be required.

11.1 Surface collection

To prevent the unnecessary destruction and loss of archaeological material located on the ground surface, the RAPs should be given the opportunity to conduct a surface collection of Aboriginal objects across the mapped extent of MAM AS 1901 (AHIMS ID 45-5-5186).

11.2 Construction Environment Management Plan (CEMP) and unexpected finds procedure

A CEMP and accompanying unexpected finds procedure will provide a method to manage potential heritage constraints and unexpected finds during construction works. Aspects of site area protection that should be included in the CEMP include an unexpected finds procedure. If Aboriginal objects are identified during construction, work should stop immediately and Deerubbin LALC, Heritage NSW, DPC and an archaeologist contacted to identify and record the objects.

11.3 Discovery of human remains

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

- Do not further move or disturb these remains

- Immediately cease all works at the particular location
- Secure the area so as to avoid further harm to the remains
- Notify the NSW police
- Notify Heritage NSW, DPC on the Environment Line (131 555) as soon as practicable and provide any available details of the remains and their location
- Not to recommence any work at the particular location unless authorised in writing by Heritage NSW, DPC.

11.4 Changes to the proposed works

This ACHAR is based upon the most recent information made available to Artefact Heritage as of the date of preparation of this report. Any changes made to the proposal should be assessed by an archaeologist in consultation with the RAPs. Any changes that may impact on Aboriginal sites not assessed as part of the proposal may warrant further investigation and result in changes to the recommended management and mitigation measures.

11.5 Management of Aboriginal objects

It is proposed that Aboriginal objects recovered from the test excavation program will be reburied within the study area, outside the proposed impact area. Consultation with the RAPs regarding this approach will be conducted as part of the Aboriginal stakeholder review of the ACHAR. At the time this report was prepared the reburial site location had not been determined. The proponent would need to identify a location that will not be impacted by the proposed works for consideration by the RAPs. An Aboriginal Site Recording Form must be forwarded to the AHIMS Registrar with information on the location and depth of reburial.

11.6 Salvage excavation

MAM AS 1901 (AHIMS ID 45-5-5186) has been assessed as being of moderate archaeological significance. Therefore, it is recommended that further archaeological investigations occur within the study area. The artefact concentration should be subject to a salvage excavation program to record the full extent of the intact artefact concentration.

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

12.0 SALVAGE METHODOLOGY

12.1 Salvage excavation justification

MAM AS 1901 (AHIMS ID 45-5-5186) was assessed as demonstrating moderate archaeological significance. As a result, it is recommended that further archaeological excavations are completed to further investigate the nature and extent of the artefact concentration located at A3. Targeted salvage excavation will also provide the opportunity to contribute to the understanding of site formation processes within the context of the central Cumberland Plain.

12.2 Research questions

The research questions are designed to guide archaeological investigations and maximise the research value gained from the non-renewable resource of the archaeological record. Key research questions for the proposed excavation at MAM AS 1901 (AHIMS ID 45-5-5186) include:

Question 1: Is the artefact density and distribution identified within A3 representative of the entire artefact concentration?

Archaeological test excavation identified a concentration of artefacts (8.67 artefacts/m^2) within a 1.5 m x 1.5 m area at the open area A3. This area contained the majority (52%) of the retrieved assemblage. One of the aims of the archaeological salvage excavation will be to determine whether the test excavation results represent a broader high-density artefact distribution associated with A3.

Question 2: Is there evidence of single or overlapping knapping events?

One piece of debris was identified in A3, and an additional piece of debris and a core fragment were identified approximately 50 m southeast of A3 in the open area excavation B4. This indicates that artefact manufacturing may have occurred onsite. However, no knapping floor was identified. Therefore, one of the aims of the salvage program would be to further excavate the areas around A3 to identify a knapping event. This would include further investigation and possible artefact use and manufacturing activities during analysis of the test excavation assemblages.

This information may include data on depth of retrieved artefacts, differences in raw material, differing treatment of the raw material (i.e. heat treatment), and conjoin analysis. This information would be discussed in the context of previous predictive models for the distribution of archaeological material in the local and regional context.

Question 3: How was raw material utilised in the local context?

High quality raw materials are considered rare within the central Cumberland Plain. As a result, high quality raw materials are often found to be heavily reduced due to this scarcity and the large distances required to procure them. By analysing the amount of cortex, average size range and weight, the utilisation of different raw material types would be discussed in the context of raw material reduction and conservation away from source areas. This information would be used to discuss how the assemblage at MAM AS 1901 (AHIMS ID 45-5-5186) either conforms to or challenges assumptions about raw material use within the Cumberland Plain.

Question 4: How does the test excavation compare to the results of sub-surface investigation in the regional context?

Salvage excavation would provide the opportunity to compare artefact assemblages with sub-surface investigations from similar and contrasting landform contexts within the Cumberland Plain. It would

also provide an opportunity to test the Stream Order Model predictive model developed by White and MacDonald (2010) by discussing the distribution of Aboriginal objects in relation to freshwater resources and along varying land units. Comparative information would include intactness of deposit, degree of truncation, and nature and frequency of retrieved Aboriginal objects.

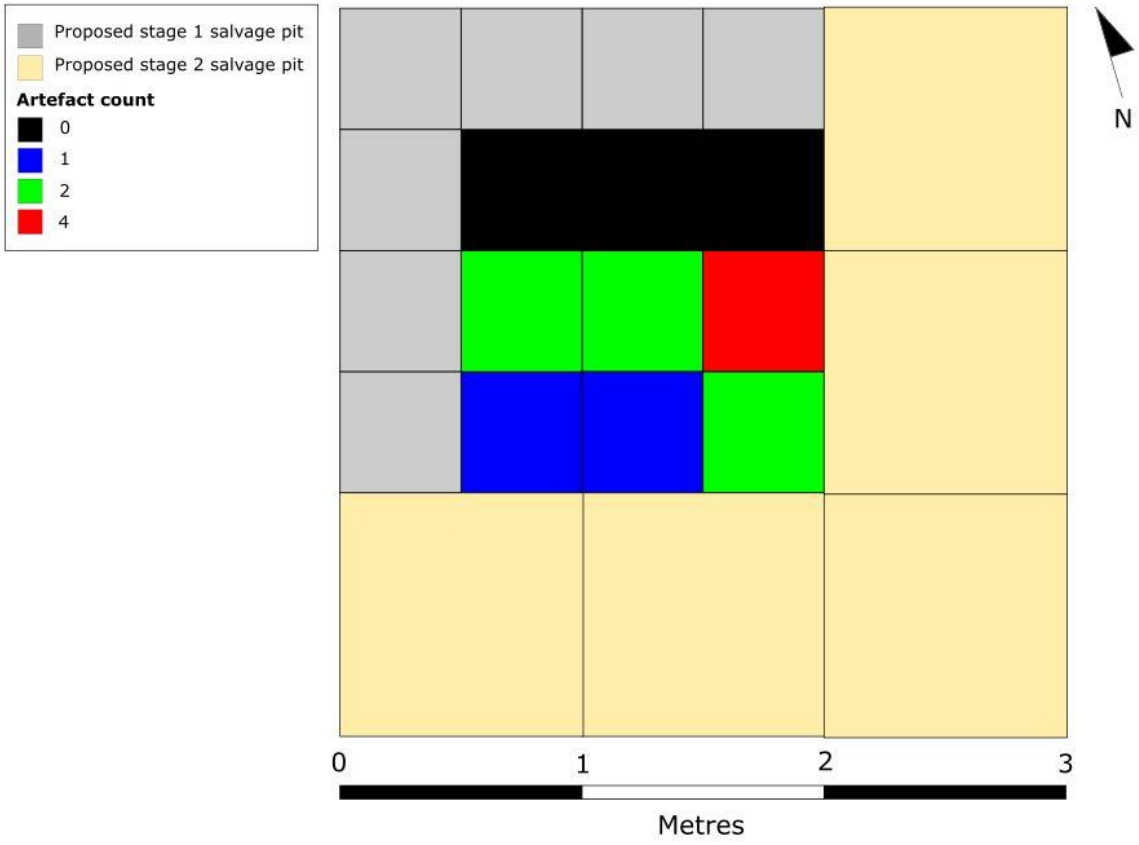
Question 5: What information can the retrieved assemblage provide on land-use patterns in the local context?

The comparative results of test excavation and the results of other sub-surface investigations in the area would be discussed in terms of Aboriginal land-use strategies of the local region. This would include a discussion of raw material conservation techniques, artefact types and size and weight characteristics of the assemblage.

12.3 Excavation approach and methodology

To further investigate the distribution of artefacts in the vicinity of excavation unit A3, a staged salvage excavation approach is recommended. This would include an initial stage (Stage I) of 0.5 m x 0.5 m salvage pits followed by a sondage of 1 m x 1 m salvage pits (Stage II). As the test excavations were completed in 0.5 m x 0.5 m excavation units to produce a 1.5 m x 1.5 m open area, it is proposed that seven 0.5 m x 0.5 m Stage I salvage pits are excavated to produce a 2 m x 2 m open area. The Stage I salvage pits would be placed along the northern and western edge of A3 as Stage II excavations will focus on areas anticipated to yield high artefact densities (Figure 14). Stage II salvage excavations will be completed along the eastern and southern edge of A3.

Figure 14: Proposed Stage I and Stage II pits



Depending on the results of Stage I and Stage II excavations, additional salvage excavations may be completed (Stage III). The placement of Stage III salvage pits would be determined by the supervising archaeologist with regard to the following 'triggers' identified during Stage I and Stage II excavations:

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

All excavated squares would be recorded in detail including photographs, level readings, plans, and context sheets. Stratigraphic sections detailing the stratigraphy and features within the excavated deposit would also be drawn. A detailed geomorphological analysis would be undertaken by a qualified geomorphologist where appropriate.

All squares would be excavated according to soil horizons where practicable or 100 mm arbitrary spits where defined units within the A horizon are absent. Excavating in spits provides vertical control, especially if a conjoin analysis is performed. If a stratigraphic deposit is identified, excavation may be conducted stratigraphically.

All material retrieved from the excavated pits would be hand sieved through a 3 mm mesh. Wet sieving would be preferred, especially in clay soils, and would be completed on site close to the excavation area. All recovered stone artefacts would be cleaned, dried, and bagged with a brief analysis conducted in the field. This analysis would include logging artefact type, raw material, and dimensions. These items would then be taken off site to be analysed in detail by relevant specialists.

12.4 Surface collection methodology

In order to mitigate the Aboriginal heritage impact of the proposed development, it is recommended that RAPs are offered the opportunity to walk over the extent of the MAM AS 1901 (AHIMS ID 45-5-5186) and collect any visible surface artefacts. Surface collection is proposed as it is likely that machinery entering the worksite to undertake the proposed works may damage surface artefacts located on the eastern edge of the study area. Surface collection will be undertaken using the following method:

- Artefact collection will be undertaken by a team comprising an archaeologist and RAP representatives.
- Artefact locations will be marked on the ground and recorded with a hand-held GPS prior to collection.
- Collected artefacts will be catalogued on site by the team, with recorded attributes as listed for the test excavation analysis.
- Artefacts will be labelled and bagged with location information, and then managed with the assemblage retrieved from salvage excavation.

Details of the location and nature of artefacts retrieved during surface collection will be included in the salvage excavation report.

12.5 Procedure for the discovery of human remains

Where suspected human remains are identified during salvage excavation or construction works, all work in that area will cease and the area cordoned off. Where it is unclear whether the remains are human, a specialist, such as a Physical Anthropologist, will be called to site to confirm. Where it is either clear that the remains or human, or it has been confirmed by a specialist, the NSW Police and NSW Heritage – DPC Environment Line (131 555) will then be notified.

Work will not recommence in the area where skeletal remains have been identified until such time as the relevant approval has been granted.

12.6 Reporting and Aboriginal objects

All Aboriginal objects retrieved during the course of salvage excavation would be washed and placed in re-sealable bags for further analysis and recording. Once salvage excavation has been completed, the artefact assemblage would be recorded and stored as stipulated in the NSW Heritage – DPC Code of Practice as best practice. This includes recording key attributes of material, artefact type, platform type, termination type and dimensions, as well as photographic and drawn records of representative artefacts.

All recorded information would be entered into a Microsoft Excel spreadsheet with detail linked to the provenance of each artefact. Once entered into the spreadsheet, the data can be readily supplied with the test excavation report to NSW Heritage – DPC and RAPs in either electronic or hard-copy form. An archaeologist experienced in stone artefact recording would conduct the attribute recording and analysis.

All artefacts would be given a unique number and stored in double re-sealable specimen bags. A permanent marker would be used to record the provenance and unique number of artefacts in each bag in writing on the outside of the bag and on an archival grade tag such as Dupont ™ Tyvek ® paper.

An Aboriginal Site Impact Recording Form (ASIRF) must be submitted to the Heritage – DPC Aboriginal Heritage Information Management System (AHIMS) Registrar detailing the procedure and results of the salvage program.

12.7 Temporary and long-term care and management of retrieved Aboriginal objects

The temporary repository of any retrieved artefacts will be in a locked cupboard on the premises of the archaeological consultant.

Any artefacts recovered during the salvage excavations and surface collection will be reburied on site, along with the artefacts recovered from the test excavation. The reburial location will be a designated place that will not be subject to further impacts. The location of the reburied site will be recorded with a differential GPS and an update made to the AHIMS site card.

13.0 RECOMMENDATIONS

The following recommendations were based on consideration of:

- Aboriginal consultation process and results undertaken to date
- Statutory guidelines under the National Parks and Wildlife Act 1974
- SEARs SSD-10448
- The results of the background research and archaeological survey results
- The currently known nature of impacts of the proposal.

Overview of findings

- One Aboriginal site, MAM AS 1901 (AHIMS ID 45-5-5186), is located within the study area
- MAM AS 1901 (AHIMS ID 45-5-5186) includes a low-density, subsurface artefact assemblage and an artefact concentration, in additional to the previously recorded surface features
- MAM AS 1901 (AHIMS ID 45-5-5186) is assessed as being of moderate archaeological significance
- The proposed works will impact MAM AS 1901 (AHIMS ID 45-5-5186) and result in total loss of value

Recommendations

- The artefact concentration at A3 should be subject to a salvage excavation program to record the full extent of the intact artefact concentration after project determination
- The RAPs should be provided an opportunity to conduct a collection of Aboriginal objects across the extent of the surface sites that will be impacted by the project after project determination
- Following completion of archaeological investigation, analysis and reporting, the assemblage retrieved from the test excavation program, salvage excavation program, and surface collection should be reburied on site, in a location that will not be subject to future impact
- A methodology for the reburial of Aboriginal objects should be developed in consultation with the RAPs
- Any project redesign resulting in substantial changes to the extent of surface or subsurface impacts may require additional assessment. However, it is noted that the proposed works already includes landform modification and disturbance to the whole site and study area.

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15.0 APPENDICES

APPENDIX 1 - EXTENSIVE AHIMS SEARCH

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APPENDIX 6 - GLOSSARY

Aboriginal cultural heritage: The material (objects) and intangible (mythological places, dreaming stories etc) traditions and practices associated with past and present-day Aboriginal communities.

Aboriginal object: Any deposit, object or material evidence (not being a handicraft made for sale), including Aboriginal remains, relating to the Aboriginal habitation of NSW.

Aboriginal place: Any place declared to be an Aboriginal place under s.94 of the *National Parks and Wildlife Act 1974*.

Aboriginal stakeholders: Members of a local Aboriginal land council, Aboriginal groups or other Aboriginal people who have registered their interest with the RTA to be consulted about a proposed RTA project or activity

AHIMS: Acronym for **'**Aboriginal heritage information management system'. AHIMS is a register that contains information about NSW Aboriginal heritage, and it is maintained by DECCW.

Alluvium: A deposit left by the flow of water. It can include sediments of gravel, mud or sand.

Angular fragment: A flaked piece of stone that does not have characteristic features which allow for it to be positively identified as a flake, core or tool.

Archaeological site: A location that has evidence of past Aboriginal activity (both material and mythological/ritual).

Archaeology: The scientific study of human history, with focus on material remains and ethnographic evidence.

Area of archaeological sensitivity: A part of the landscape that contains demonstrated occurrences of cultural material. The precise level of sensitivity will depend on the density and significance of the material.

Artefact: An item of cultural material created by humans.

Artefact scatter: Where two or more stone artefacts are found within an area of potential archaeological deposit or a site.

Backed blade/ artefact: Bladelets that have one edge blunted by steep retouch to form a back.

Basalt: A common volcanic rock. It is fine grained (approximately 45-50 per cent silica) and rich in iron and magnesium.

Baseline: A line that is the base for measurement or for construction

Bedrock: A consolidated rock that is unbroken and un-weathered, located beneath soil or rock fragments.

Bifacial flaking: The removal of flakes from two faces of a single platform.

Bipolar: A method of flaking stone, especially quartz, where cores are rested upon an anvil during flaking.

Bipolar core: A core used to create bipolar flakes.

Blade: A stone flake that is at least twice as long as it is wide.

Bioturbation: Disturbance in soil profiles caused by living organisms, such as ants and roots.

Bora ground: These are usually identified as flat, mounded earth rings that were used for Aboriginal ceremonial activities.

Bulb of percussion: A partial cone of force produced when a flake is struck off a core. The cone occurs on the ventral (inside surface) of the flake.

Burials: Burial sites may be composed of a single burial, isolated individuals in a general area, or cemeteries containing many individuals.

Carved/ modified trees: Carved trees exhibit evidence of purposeful removal of bark but differ from scarred trees in that geometric patterns and figures are cut into the tree. The motifs of the mid-north coast region are mostly linear geometric patterns (Craib and Bonhomme 1995: 27).

Chalcedony: A mineral with high silica content that has a microcrystalline structure. It is often described as 'waxy' and can be translucent. It is found in a variety of colours such as white, grey, greyish-blue or brown.

Chert: A fine grained rock composed of cryptocrystalline silica. It exhibits a range of textures and colours including red, green or black. Chert is easy to work and retains a sharp edge for an extensive period of time before resharpening is required. It has a low to medium fracture toughness.

Clast: A broken fragment of rock or crystal particle that was created either through erosion or weathering.

Clay: A type of sediment with particles less than 4 microns in size and that is composed of clay minerals (Keary 2001: 49).

Conglomerate: Is a geological term used to describe clasts that are cemented in a fine-grained matrix. It is a sedimentary rock.

Core: A stone piece from which a flake has been removed by percussion (striking it) or by pressure. It is identified by the presence of flake scars showing the negative attributes of flakes, from where flakes have been removed.

Cortical platform: This term is used to describe a platform that has cortex present and may indicate that the core's surface (where the flake was struck) was previously un-worked.

Cortex: The outer weathered surface of stone; if smooth, it can indicate the source of stone was a pebble.

Crushed platform: This term is used to describe a flake that has a damaged platform and where the platform's attributes cannot be recorded as a result.

Cultural heritage assessment report: A report combining an Aboriginal archaeological assessment and Aboriginal cultural assessment, required to be submitted to DECCW for any Part 6 *National Parks and Wildlife Act 1974* approval or prepared for projects under Section 5.1 of the *Environmental Planning and Assessment Act 1979* where Aboriginal cultural heritage is identified as a key issue.

Debitage: Small, unmodified flakes produced as part of the flaking process, but discarded unused.

Distal: Term of view used to describe the lower portion of a flake in respect to where the striking force terminates.

Distal flake: A broken flake with the presence of a termination and the absence of a platform or impact point.

Dorsal: The side of a flake that was originally part of the core's outer surface (often referred to as the 'dorsal surface').

Easting: This is a measurement used to determine location. The easting is the x-coordinate and relates to the vertical lines on a map, which divide east to west. It increases in size when moving further east.

Edge damage: Where the edge of a tool has been used, resulting in microscopic fractures along the surface.

Exposure: The level of ground exposure is based on the whether the landform is eroding, aggrading or stable.

Faceted platform: A faceted platform has three or more flake scars present on its surface.

Feather termination: A feather termination has a 'minimal thickness at the distal end and an acute angle between the dorsal and ventral surfaces' (Holdaway and Stern 2008: 129). In appearance, a feather termination becomes gradually thinner towards the end of the flake.

Fine grained siliceous material: A rock that has a high content of silica and that is fine grained in appearance without any further identifying characteristics.

Flake: A stone piece removed from a core by percussion (striking it) or by pressure. It is identified by the presence of a striking platform and bulb of percussion, not usually found on a naturally shattered stone.

Flake scar: Often called a 'negative flake scar', it is the remnant of a previous flake that was struck from the core. This appears on the dorsal surface of a flake.

Flaked fragment: This is a chipped stone artefact which cannot be classed as a flake, core or retouched flake, the reason being that the defining attributes are missing. This often happens when a core contains a number of incipient fracture planes. Artefacts that are heavily weathered or which have been shattered in a fire are also difficult to categorise.

Flaked platform: This term is used to describe a platform that has been worked previously; one or more flakes were removed prior.

Floodplain: The area covered by water during a major flood and/or the area of alluvium deposits laid down during past floods.

Fluvial: Pertaining to or produced from a river.

Focalised platform: A small platform that is intentionally prepared for percussion by overhang removal.

Footprint: The scale, extent or mark that a development makes on the land in relation to its surroundings.

Geometric microliths: Backed at one end, the other end or both, these tools are made on geometric shaped flakes, <80 mm maximum dimension.

Geomorphic: Relating to the structure, shape and development of landforms.

Hammerstone: A piece of stone used to knock flakes from a core. Evidence of pitting or bashing can usually be seen along some part of the margins of this artefact.

Hinge termination: A hinge termination occurs 'when the fracture meets the surface of the core at approximately right angles to the longitudinal axis of the flake' (Holdaway and Stern 2008: 130). This can present as a rounded surface that curves downwards at the distal end of a flake.

Holocene: The Holocene epoch forms part of the late Quaternary period and extends from about 11,000 years ago to the present day.

Humic: Soil that contains organic matter (from 'humus').

Igneous: After magma or lava cools and solidifies, it forms igneous rock. This can happen in volcanic and plutonic (under the surface of the earth) scenarios. An example of this is basalt.

***In situ*:** A description of any cultural material that lies undisturbed in its original point of deposition.

Ironstone: A type of sedimentary rock that contains iron.

Knapping: The removal of flakes and flaked pieces from a stone core by the use of percussion.

Layer: In stratigraphy, it is used to describe a horizon (soil, rock, charcoal) that is distinct from its surrounds.

Landform: Description for an area of land based on an assessment of a series of environmental characteristics including geology, geomorphology, soils and vegetation.

Loam: Soil that contains roughly equal concentrations of silt, sand and clay.

Longitudinally split flake: This is a flake that is broken (split) from the point of percussion (the strike) through to the termination.

Manuport: An unmodified piece of stone transported to a site by humans.

Medial: Term of view referring to the intermediate section or middle section of a broken flake.

Medial flake: Absence of proximal and distal margins, but with an identifiable ventral surface.

Metamorphism: The process where an existing rock (which can be sedimentary or igneous) is transformed into another mineral through the application of temperature and pressure. An example of this is hornfels.

Mudstone: A sedimentary rock formed from mud/clay.

Muller: A large stone artefact which differs in construction depending on the environment. These were used as an aide for processing seeds and other low return plant material or ochre.

Multiple platform core: Is a core with more than one identifiable platform.

Munsell colour: This is a colour code chart used to standardise colour specifications.

Non-diagnostic: An amorphous piece of stone that is neither a flake, flaked fragment, core or retouched flake.

Northing: This is a measurement used to determine location. The northing is the y-coordinate and relates to the horizontal lines on a map, which divide north to south. It increases in size when moving further north.

Notched tool: Flakes that exhibit a small area of retouch, forming a concave edge on lateral or distal margin.

Oriented length: This is a measurement taken from the point of impact through to the termination.

Oriented thickness: This is a measurement taken from where the oriented width and oriented length intersect.

Oriented width: This is a measurement taken across the middle of a flake (halfway between the point of impact and the termination).

Overhang removal: This occurs when a platform is prepared for striking; small flakes are struck before a flake is detached, leaving visible scars behind.

Potential Archaeological Deposit (PAD): A PAD is a location that is considered to have a potential for sub-surface cultural material. This is determined from a visual inspection of the site, background research of the area and the landform's cultural importance.

pH: A measure of the acidity or alkalinity of the soil. Neutral is indicated by a pH of 7, with strongly acidic being 0 and strongly basic (alkaline) being 14. The 'pH' is said to stand for 'potential of hydrogen'.

Platform: On a flake, this is a core remnant from where the flake was struck off the core.

Platform width: This is a measurement taken across the width of a platform between the two lateral margins of a flake.

Platform thickness: This is a measurement taken from the ventral to dorsal surfaces of a flake (beginning at the point of impact/percussion).

Plunge termination: This occurs when the ventral surface 'curves markedly away from the face of a core...and continues directly into the core, removing the base of the core' (Holdaway and Stern 2008: 132). This can present as a 'J' shape when holding the flake in profile.

Proximal: Term of view used to describe the upper portion of a flake in respect from where it was initially struck off a core.

Proximal flake: A broken flake with the presence of a platform, but the absence of a termination.

Pot-lidded: The damage caused by exposure to extreme heat, resulting in a circular depression on the surface of a stone artefact.

Pressure flaking: A process to remove a flake from a core by applying pressure (from a piece of wood or bone) along the core's edge.

Quarry: In this report, 'quarry' can refer to a native source of stone that was mined by Aboriginal people in the past. Rock from these sites could be used to make artefacts.

Quartz: A mineral composed of silica with an irregular fracture pattern. The quartz used in artefact manufacture is generally semi-translucent, although it varies from milky white to glassy. Glassy quartz can be used for conchoidal flaking, but poorer quality material is more commonly used for block fracturing techniques. Quartz can be derived from water worn pebbles, crystalline or vein (terrestrial) sources.

Quartzite: A form of metamorphosed sandstone. It is often white or grey in colour but can occur in other shades due to mineral impurities.

Reduction: the process of fashioning stone from its natural state into tools or weapons by removing some parts.

Refit: Knapping is a reductive technology. As such, it is possible to 'refit' tools back together after breakage or knapping (i.e. refitting a proximal and distal flake back together or refitting a flake back to the core it was knapped from).

Resource area: An area of the landscape or part of the environment that provides a resource (be it food or material items such as a source of stone for making artefacts) for Aboriginal people. Swamps are good examples of rich resource zones.

Retouch: A flake, flaked piece or core with intentional secondary flaking along one or more edges.

Sand: A material composed of small grains (0.625-2.0 mm) (Keary 2001: 233). Sand is formed from a variety of minerals and rocks, but commonly contains silica, such as quartz.

Sandstone: Is a sedimentary rock formed from sand-sized grains.

Scarred trees: Trees that feature Aboriginal derived scars are distinct due to the scar's oval or symmetrical shape and the occasional use of steel, or more rarely, stone axe marks on the scar's surface. Scarred trees are identified by the purposeful removal of bark for use in the manufacture of artefacts such as containers, shields and canoes. The bark was also used for the construction of shelters. Other types of scarring include toeholds cut in the trunks or branches of trees for climbing purposes and the removal of bark to indicate the presence of burials in the area.

Sediment: Is a mineral that has undergone erosion or weathering and that is then deposited via aeolian, glacial or fluvial means.

Sedimentary: Sedimentary rock is formed through the accumulation of sediment deposits that are then consolidated. An example of this is mudstone.

Shale: A sedimentary rock of well-defined layers comprised of small particles (less than 4 microns in size) (Keary 2001: 16) sourced from weathered or eroded materials.

Significant ground disturbance: Means disturbance of (a) the topsoil or surface rock layer of the ground; or (b) a waterway, by machinery in the course of grading, excavating, digging, dredging or deep ripping, but does not include ploughing other than deep ripping.

Silt: A sediment with grains ranging from 4.0-62.5 microns in size (Keary 2001: 245). It can be found as a soil or in water.

Single platform core: Is a core with one identifiable platform.

Scraper: A stone tool, usually with steep retouch along its edges that was ethnographically used to make wooden implements or process foods and other resources.

Silcrete: Soil, clay or sand sediments that have silicified under basalt through groundwater percolation. It ranges in texture from very fine grained to coarse grained. At one extreme it is cryptocrystalline with very few clasts. It generally has characteristic yellow streaks of titanium oxide that occur within a grey and less commonly reddish background. Used for flaked stone artefacts.

Spit: Refers to an arbitrarily defined strata of soil removed during excavation (often 50 millimetres to 100 millimetres in depth).

Step termination: This occurs when a 'flake terminates abruptly in a right-angle break' (Holdaway and Stern 2008: 130).

Stratification: The way in which soil forms in layers.

Stratigraphy: The study of soil stratification (layers) and deposition.

Sub-surface testing: An archaeological method used to determine the cultural sensitivity of an area by excavating small (0.5 metre x 0.5 metre) pits and recording the stratigraphy, material remains (such as stone tools) and disturbance.

Survey: In archaeological terms, this refers to walking over a surface while studying the location of artefacts and landmarks. These are then recorded and photographed.

Termination: Refers to the shape of the distal end of a flake.

Tool: A stone flake that has undergone secondary flaking or retouch.

Usewear: A pattern of wear that is left on a stone artefact due to utilisation.

Ventral: The side of a flake that was originally attached to the core (often called the 'ventral surface'). Features such as the bulb of percussion are found on this surface of a flake.

Visibility: Refers to the degree to which the surface of the ground can be observed. This may be influenced by natural processes such as wind erosion or the character of the native vegetation, and by land use practices, such as ploughing or grading. It is generally expressed in terms of the percentage of the ground surface visible for an observer on foot.

artefact

Artefact Heritage

ABN 73 144 973 526
Suite 56, Jones Bay Wharf
26-32 Pirrama Road
Pyrmont NSW 2009 Australia

+61 2 9518 8411
office@artefact.net.au
www.artefact.net.au