Nepean Gardens
13 Park Rd, Wallacia, NSW
(Lot 2 DP 1108408, Lot 1 DP 1254545, Lot 3 DP 18701 and Lot 4 DP 18701)
Aboriginal Due Diligence Assessment

FINAL REPORT

PROJECT NUMBER 1724

Catholic Cemeteries Board

6 December 2019

Austral Archaeology

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EXECUTIVE SUMMARY

Austral Archaeology (Austral) has been commissioned by the Catholic Cemeteries Board (the Proponent) to undertake an Aboriginal Due Diligence Assessment in advance for a proposed development at 13 Park Rd (Lot 2 DP 1108408, Lot 1 DP 1254545, Lot 3 DP 18701 and Lot 4 DP 18701), Wallacia, New South Wales (the study area).

The study area is within the Penrith City Council Local Government Area (LGA) and is located approximately 13 kilometres south of Penrith and 50 kilometres west of Sydney. The study area is bounded by Park Road and residential lots to the south, rural properties to the north, and residential properties to the east and west (Figure 1.1 to

Figure **1.5**).

In order to best meet all requirements and statutory obligations with regards to Aboriginal cultural heritage, this assessment has been undertaken in accordance with the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales* (DECCW 2010) [the Due Diligence CoP], which provides a suitable framework for undertaking an appropriate investigation to determine the potential for Aboriginal cultural heritage to be present and provides a defence against the first instance of harm should any unexpected Aboriginal cultural material be disturbed.

Background

The present study area is thought to lie near the boundary of two major Aboriginal language

groups, with Darug speakers occupying the region to the north and east of the Mulgoa valley, while the Gundungarra speakers were located to the south and west.

The moderate climate of the Cumberland Plain and its location within the wider Nepean River catchment is likely to have been conducive to Aboriginal occupation in the past. The study area lies within a resource base associated primarily with the Jerry's Creek watercourse, itself a tributary of the Nepean River. Habitats associated with the river would have supported a wide range of animals, fish, birds and mammals.

Due to the environmental setting, the Nepean River landscape would have been subject to a variety of human activities. This primarily would have been due to the presence of permanent water sources, followed by the sheltered camping locations and good resources availability in the immediate area. Activities would have included camping, hunting, gathering, cooking, ceremonies, and other cultural activities associated with semi-permanent settlement sites in the region. Some of these activities, mainly stone tool knapping, are seen in the archaeological record

Conclusions

A search of the Aboriginal Heritage Information Management System (AHIMS) Database returned no sites the study area. This is likely due to a lack of any development within the study area rather than due to an absence of Aboriginal cultural material. However, several streams and creeks pass through the study area which suggests that parts of the study area may contain Aboriginal cultural material (Figure 4.3), although the level of archaeological potential is dependent on low levels of modern disturbance in the vicinity of these creeks. These areas may warrant further investigation through the preparation of a full Aboriginal cultural heritage assessment dependant on the nature of any proposed development which is to occur in these locations.

Recommendations

The following recommendations are derived from consideration of the legislative requirements of the National Parks and Wildlife Act 1974 (NP&W Act), the National Parks and Wildlife Regulations 2009 (NP&W Regs) and the Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales (DECCW 2010).

It is recommended that:

1) A pedestrian survey should be undertaken to groundtruth the results of this archaeological assessment in terms of potential for Aboriginal archaeological material to be present in the study area, and to identify areas of modern disturbance which can be discounted from further consideration. The results of the survey should be appended to this report as an addendum, and the mapping of areas of archaeological potential and sensitivity should be updated accordingly.

2) In the absence of having undertaken a pedestrian survey, in the event of any development being proposed in an area marked as being archaeologically sensitive on Figure 7.1, it will be necessary to prepare a full Aboriginal cultural heritage assessment prior to works commencing. This will require the identification of and consultation with Aboriginal stakeholders and may require undertaking a period of archaeological test excavations to confirm the nature of subsoil deposits within archaeological sensitive landforms.

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1 INTRODUCTION

Austral Archaeology (Austral) has been commissioned by the Catholic Cemeteries Board (the Proponent) to undertake an Aboriginal Due Diligence Assessment in advance for a proposed development at 13 Park Rd (Lot 2 DP 1108408, Lot 1 DP 1254545, Lot 3 DP 18701 and Lot 4 DP 18701), Wallacia, New South Wales (the study area).

The study area is within the Penrith City Council Local Government Area (LGA) and is located approximately 13 kilometres south of Penrith and 50 kilometres west of Sydney. The study area is bounded by Park Road and residential lots to the south, rural properties to the north, and residential properties to the east and west (Figure 1.4 & Figure 1.5).

The study area and location are shown in Figure 1.1, Figure 1.2 and Figure 1.3.

In order to best meet all requirements and statutory obligations with regards to Aboriginal cultural heritage, this assessment has been undertaken in accordance with the Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales (DECCW 2010) [the Due Diligence CoP], which provides a suitable framework for undertaking an appropriate investigation to determine the potential for Aboriginal cultural heritage to be present and provides a defence against the first instance of harm should any unexpected Aboriginal cultural material be disturbed.

1.1 Objectives

The objective of this report is to document the due diligence process undertaken by Austral Archaeology on behalf of the Proponent. This due diligence process is designed to ensure that the following steps are undertaken (DECCW 2010:2):

- Identify whether or not Aboriginal objects are, or are likely to be, present in an area.
- Determine whether or not development activities are likely to harm Aboriginal objects (if present).
- Determine whether an Aboriginal Heritage Impact Permit (AHIP) application is required.
- Make appropriate management and mitigation recommendations in relation to any future development which may occur within the study area.

The National Parks and Wildlife Act 1974 (NP&W Act) allows for a person who exercises due diligence in determining that their actions will not harm Aboriginal objects to have a defence against prosecution for the strict liability offence if they later unknowingly harm an object without an having obtained an AHIP. Therefore, as well as being suitable for submission to the CCC, this report also documents the due diligence process to provide evidence of a defence against prosecution if an Aboriginal object is harmed during any subsequent works undertaken by the Proponent in the event that no Aboriginal heritage values are identified from within the study area by this assessment.

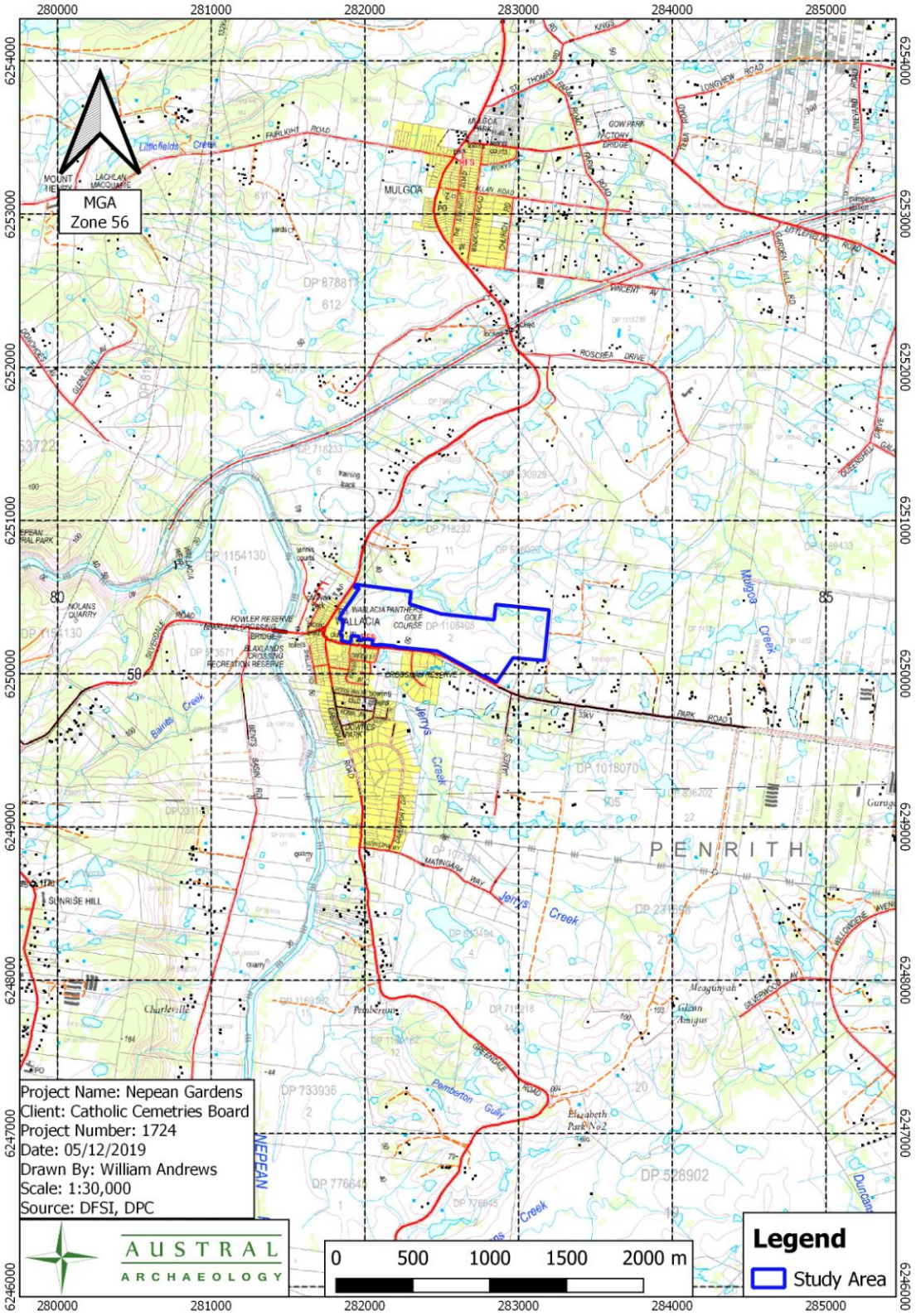

Figure 1.1 Topographic view of the study area.

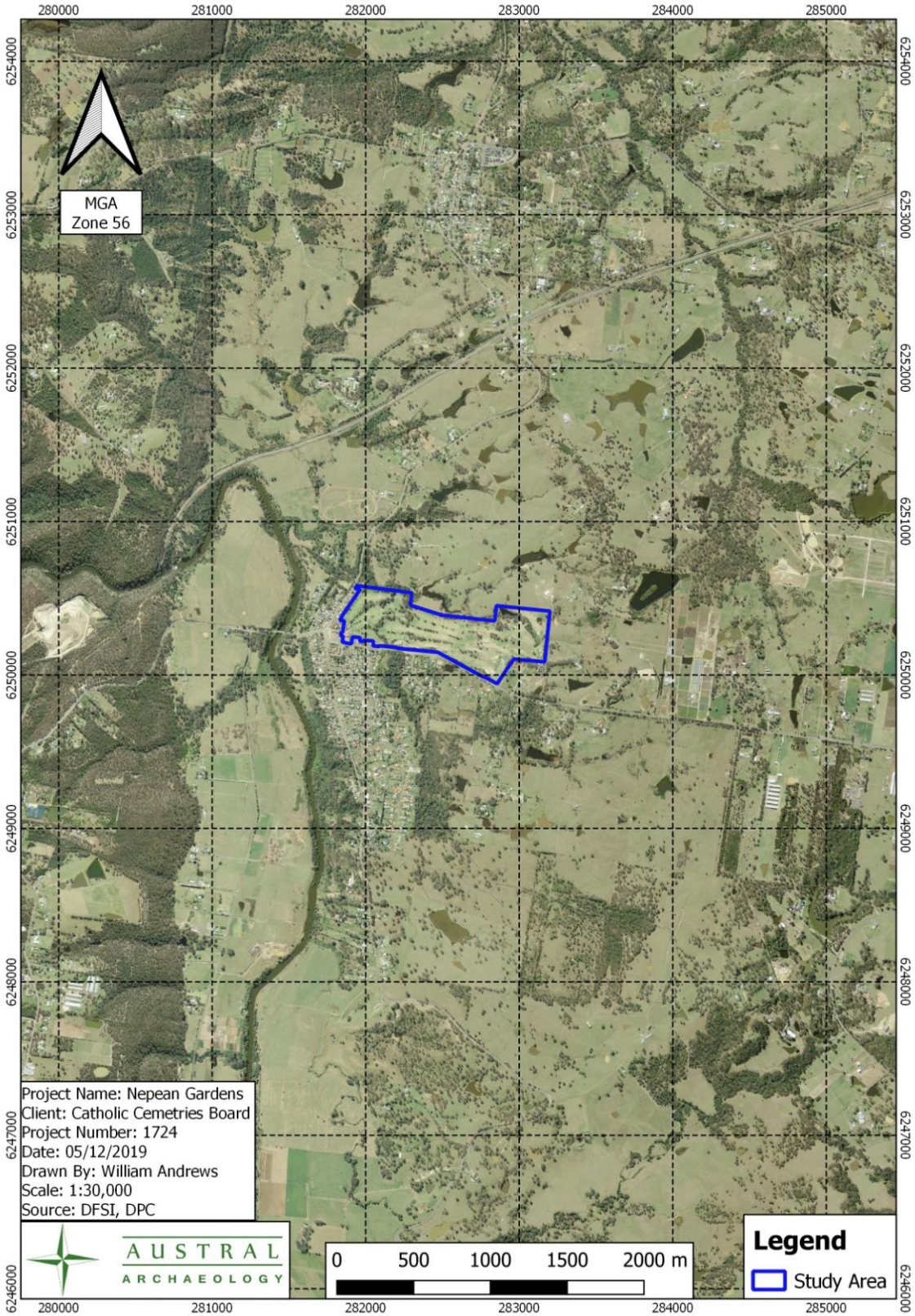

Figure 1.2 Aerial imagery of the study area in relation to surrounds.

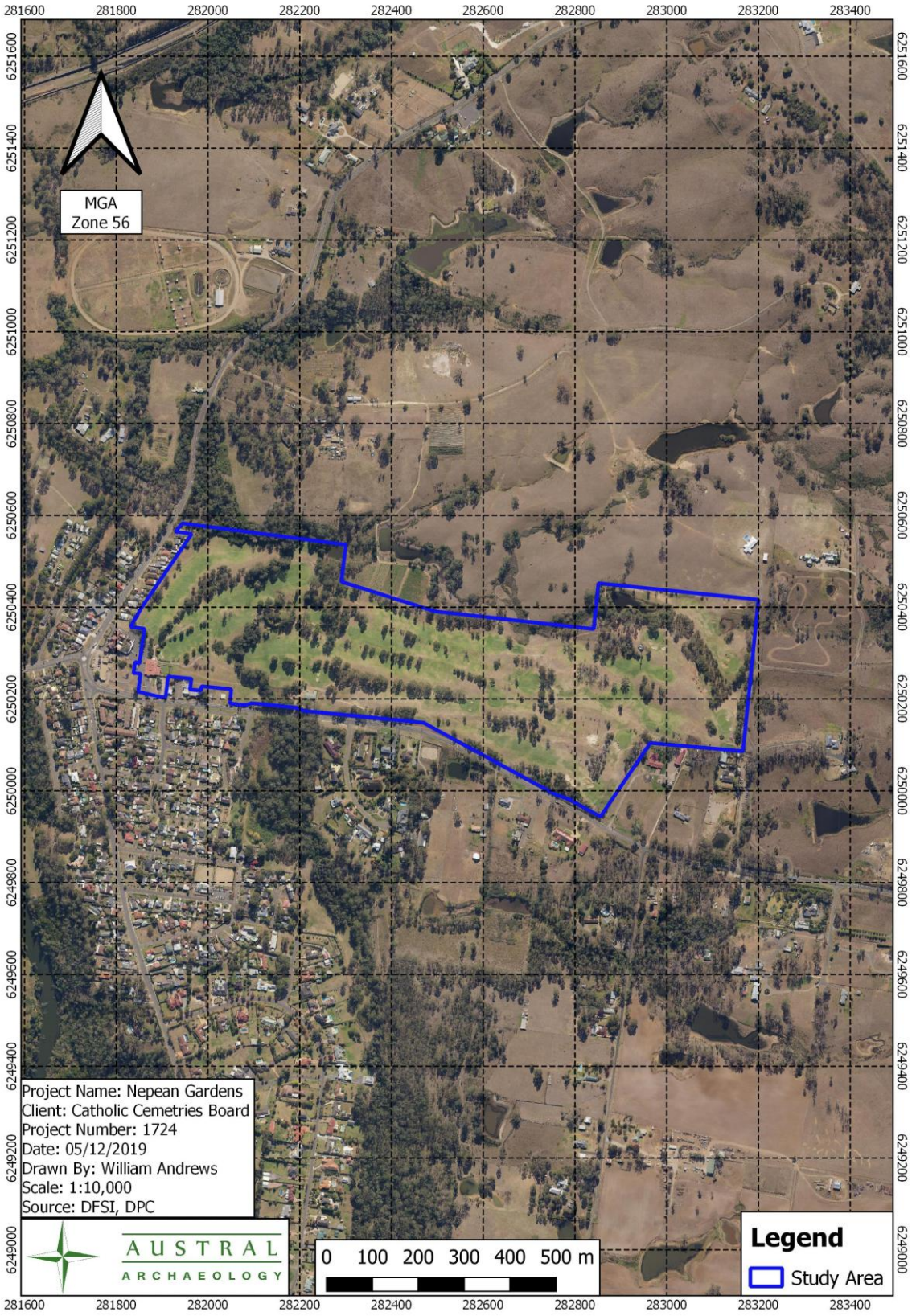

Figure 1.3 Detailed view of the study area.

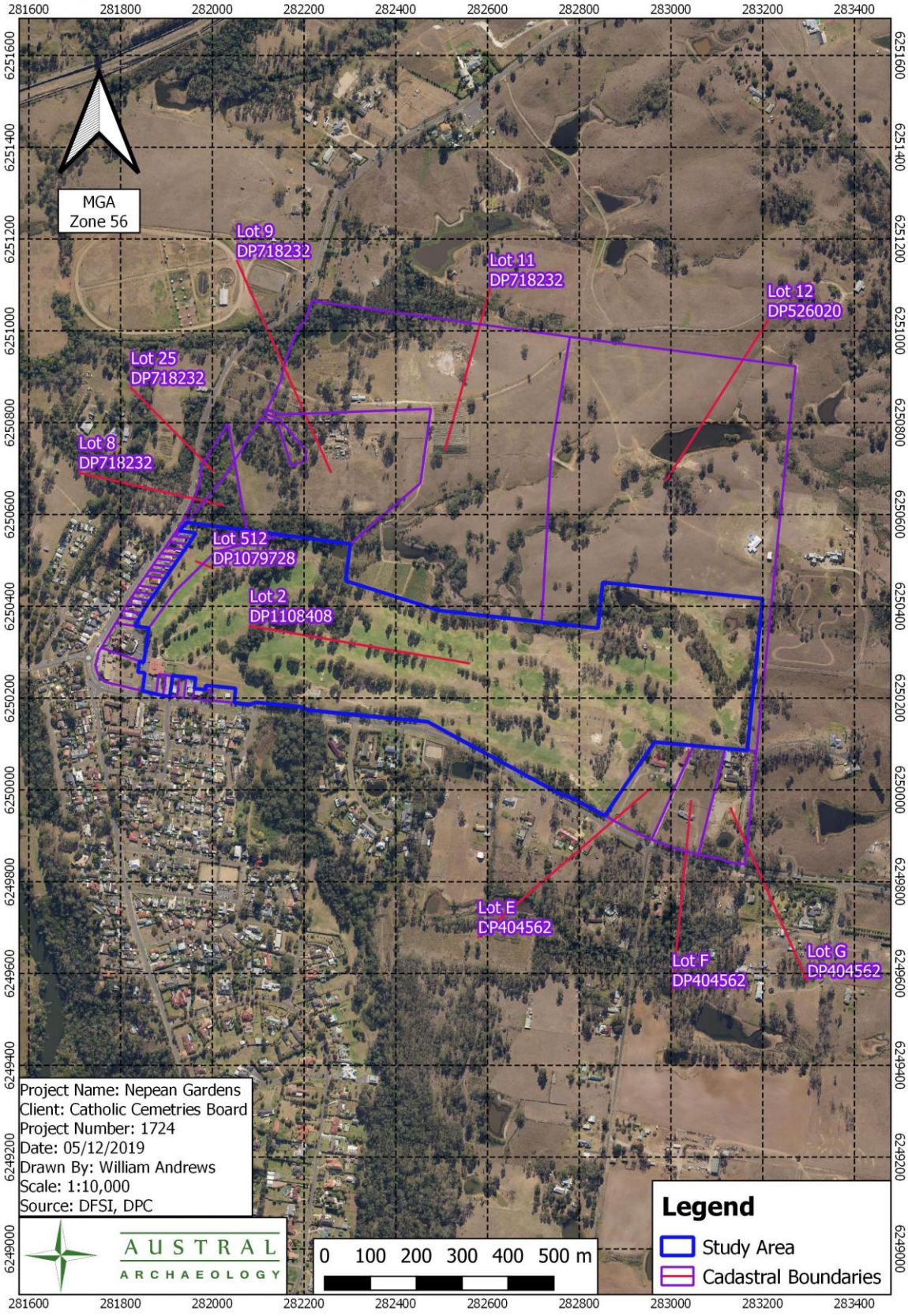

Figure 1.4 Cadastral boundaries neighbouring the study area to the north and east

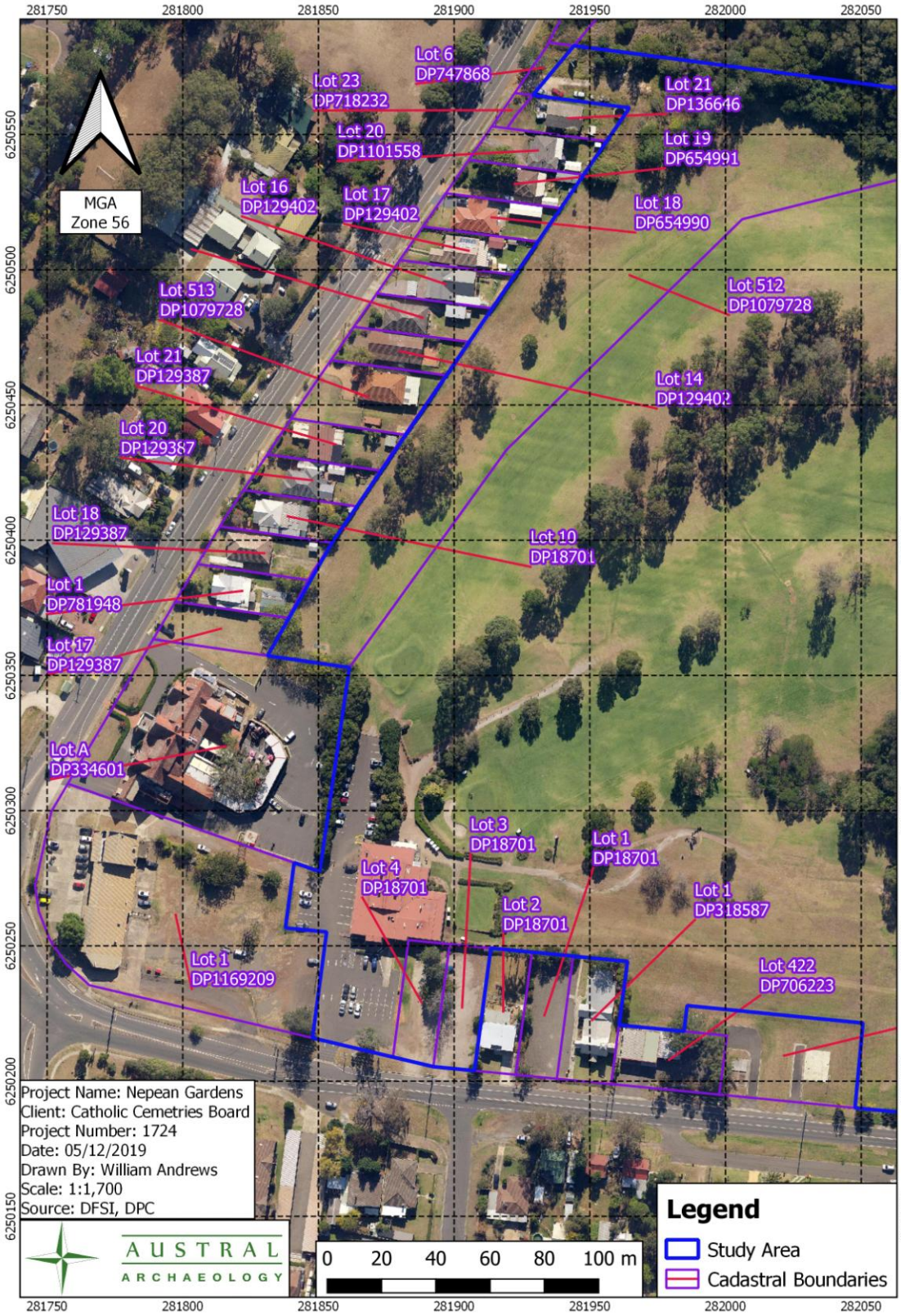

Figure 1.5 Cadastral boundaries neighbouring the study area to the south and west

1.2 Project Team

This project was managed and authored by David Marcus (Director, Austral Archaeology) with assistance from Miles Robson (Senior Archaeologist, Austral Archaeology). GIS Mapping was undertaken by David Marcus with assistance from William Andrews (Archaeologist, Austral Archaeology). Alexander Beben (Director, Austral Archaeology) reviewed the draft report and management recommendations.

David Marcus (B.A. (Hons.) Archaeology, Ma. Archaeology)

David is a Director of Austral with significant experience in both Aboriginal and historical cultural heritage projects. David started his career in archaeology in 2000 and has worked in all roles from field assistant through to project manager. He commenced work for Austral Archaeology in 2010 and has been responsible for all aspects of the day-to-day running of Austral Archaeology. David also has high level skills in both physical and digital mapping and integration of digital data into GIS.

Alexander Beben (B.A. (Hons.) Archaeology, Ma. Archaeology)

Alexander Beben is a Company Director with thirteen years' archaeological experience and has conducted over 500 heritage projects in Australia, the UK and Italy. He has significant experience and his skills include undertaking Aboriginal and historical assessments, archaeological surveys and excavations. He has made numerous successful permit applications under both the *National Parks and Wildlife Act 1974* and the *NSW Heritage Act 1977*,

With experience working throughout Australia across different industry sectors, Alex has a detailed understanding of assessing heritage values, especially within the Western Sydney region. This ensures that he provides advice which meets the requirements of all involved parties.

Miles Robson (B.A. (Hons.) Archaeology)

Miles is a Senior Archaeologist who has worked with Austral on various projects since 2013, before being taken on as a full time employee. He specialises in undertaking fieldwork and has a wide range of experience and skills in both Aboriginal and historical archaeology, working on projects in New South Wales, Tasmania and South Australia. Miles is also skilled in GIS mapping, report preparation and undertaking historical research.

William Andrews (B.A. (Hons.) Surveying)

William Andrews is a Graduate Archaeologist for Austral Archaeology. William is a pending graduate of a Bachelor of Engineering (Surveying) and has transitioned his career toward Archaeology in 2019.

Prior to his career change William had been working as a land surveyor for two years, which has provided him the skills to specialise in spatial and technological documentation techniques that relate strongly to Archaeology. William completed his thesis on these topics and is skilled at photogrammetry, laser scanning, GIS and in-field documentation methods.

1.3 Limitations

It should be noted that Austral has only undertaken limited consultation with the Aboriginal community via the Local Aboriginal Land Council and has not sought to identify potential Aboriginal stakeholders. Austral Archaeology has merely undertaken a desktop assessment to comply with the Due Diligence CoP (DECCW 2010) and therefore this document does not serve as a statement of archaeological significance nor does it seek to ascertain the cultural significance of the area.

The results, assessments and judgements contained in this report are constrained by the standard limitations of historical research and by the unpredictability inherent in archaeological zoning from the desktop. Whilst every effort has been made to gain insight to Aboriginal cultural heritage values of the study area, Austral cannot be held accountable for errors or omissions arising from such constraining factors.

1.4 Data Restrictions

This report contains descriptions and locational data relating to Aboriginal archaeological and cultural material and sites. This information is considered sensitive and of great importance to the Aboriginal community. As a result, public exhibition of this report in its present form would not be appropriate.

1.5 Abbreviations

The following are common abbreviations that are used within this report:

AHIMS	Aboriginal Heritage Information Management System
AHIP	Aboriginal Heritage Impact Permit
BP	Before Present
Burra Charter, the	ICOMOS Australia Burra Charter 1999
DECCW	Department of Environment, Climate Change and Water, now the OEH
Due Diligence CoP	Due Diligence Code of Practice for the Protection of Aboriginal Objects in
EP&A Act	Environmental Planning and Assessment Act 1979
LGA	Local Government Area (Penrith LGA)
LEP	Local Environmental Plan
NNTT	National Native Title Tribunal
NP	National Park
NP&W Act	National Parks and Wildlife Act 1974, amended 2010
NP&W Regs	National Parks and Wildlife Regulations 2009
NPWS	National Parks and Wildlife Service
NTSCORP	Native Title Services Corporation
OEH	Office of Environment and Heritage, formerly DECCW
PAD	Potential Archaeological Deposit
RNE	Register of the National Estate
SCA	State Conservation Area
SHI	New South Wales Heritage Office State Heritage Inventory
SHR	New South Wales Heritage Office State Heritage Register
Study Area	Nepean Gardens, 13 Park Road (Lot 2 DP 1108408, Lot 1 DP 1254545, Lot 3 DP 18701 and Lot 4 DP 18701), Wallacia, NSW
S90	Section 90 of the NP&W Act

Refer also to the document Heritage Terms and Abbreviations, published by the Heritage Office and available on the website: http://www.environment.nsw.gov.au/heritage/index.htm.

2 STATUTORY CONTEXT

Aboriginal archaeological and cultural heritage assessments in New South Wales are carried out under the auspices of a range of State and Federal acts, regulations and guidelines. The acts allow for the management and protection of Aboriginal places and objects, and the guidelines and recommendations set out best practice for community consultation in accordance with the requirements of the acts.

Table 2.1 details the Australian acts, guidelines and regulations which have been identified as being applicable or with the potential to be triggered with regards to the proposed development.

Table 2.1 Federal Acts

Acts	Applicability and implications
Environment Protection and Biodiversity Conservation Act 1999	This act has not been triggered and so does not apply. • No sites listed on the National Heritage List are present or in close proximity to the study area. • No sites listed on the Commonwealth Heritage List are present or in close proximity to the study area.
Aboriginal and Torres Strait Islander Heritage Protection Amendment Act 1987	Applies. • This Act provides blanket protection for Aboriginal heritage in circumstances where such protection is not available at the State level. This Act may also override State and Territory provisions.

Table 2.2 State Acts

Acts	Applicability and implications
National Parks and Wildlife Act 1974 (NP&W Act)	Applies. • Section 86 – Prohibits unknowingly causing harm or desecration to any Aboriginal object or place without an AHIP or other suitable defence from the Act. • Section 87 – Allows for activities carried out under an AHIP or following due diligence to be a defence against harm of an Aboriginal object. • Section 89A – Requires that the Office of Environment and Heritage (OEH) must be notified of any Aboriginal objects discovered within a reasonable time. • Section 90 – Requires an application for an AHIP in the case of destruction of site through development or relocation.
National Parks and Wildlife Regulations 2009 (NP&W Regs)	Applies. • Section 80A – States minimum standards of due diligence to have been carried out • Section 80C – Requires Aboriginal community consultation process to be undertaken before applying for an AHIP. • Section 80D – Requires the production of a cultural heritage assessment report to accompany AHIP applications.
The Environmental Planning and Assessment Act 1979 (EP&A Act)	Applies. • This project is being assessed under Part 4 of the EP&A Act. • Sections 86, 87, 89A and 90 of the NP&W Act will apply.
NSW Heritage Act 1977	This act has not been triggered and so does not apply. • No Aboriginal sites listed on the State Heritage Register are present or in close proximity to the study area.

Table 2.3 State and Local Planning Instruments

Planning Instruments	Applicability and implications
Local Environmental Plans (LEP)	The following LEP is applicable: • *Penrith Local Environmental Plan 2010*

2.1 The National Parks and Wildlife Act 1974

Aboriginal cultural heritage in New South Wales is protected under the NP&W Act, with additional clarification provided by the NP&W Regs.

All Aboriginal objects and places are provided blanket protection under Section 86 of the NP&W Act, which makes the harming of any Aboriginal object an offense, irrespective of intent. Several defences against prosecution are provided by Section 87 of the NP&W Act, including having undertaken a due diligence assessment which has "reasonably determined that no Aboriginal object would be harmed" by the proposed activity. The minimum standards for such a due diligence assessment are detailed in Section 80A of the NP&W Regs and in the Due Diligence CoP (DECCW 2010), which forms the basis of the tasks conducted in this Aboriginal due diligence assessment.

2.2 Section Summary

Searches of the Australian Heritage Places Inventory, the National Heritage List and the NSW Heritage Council State Heritage Inventory websites identified no recorded Aboriginal sites in close proximity to the study area.

At the state level, the works are to be assessed under the NP&W Act and the EP&A Act. The relevant sections of the NP&W Act are Section 86, Section 87, Section 89A and Section 90. The *Penrith Local Environmental Plan 2010* [the Penrith LEP], produced in accordance with the EP&A Act, makes provision for the protection of Aboriginal heritage, archaeological sites and potential archaeological sites, nut no such places or objects are recorded within the study area.

3 ABORIGINAL ARCHAEOLOGICAL CONTEXT

3.1 The Cumberland Plain and Nepean River Archaeological Context

Archaeological investigations on the Cumberland Plains and along the floodplains of the Nepean River have been conducted in direct response to the spread of urban development. The limited ethnographic accounts of early settlers and explorers were once considered the primary source for archaeological enquiry. However, with the recent spread of urban development within the Cumberland Plain environs, archaeological investigations have undergone a corresponding increase.

The major studies which have contributed to our understanding of the Cumberland Plains, and those with direct relevance to the study area through their proximity, are outlined below. Reference is made to the main trends garnered from these investigations which serve to provide a broad framework in which to base the current study.

Aboriginal occupation of the Cumberland Plain and Nepean River valley extends back well into the Pleistocene, around 10,000 years Before Present (BP). Currently the oldest accepted date for an archaeological site in the Sydney region is a date of about 14,700 years BP which was obtained from Shaws Creek Rockshelter K2, located to the north of Penrith and not far from the present study area (Attenbrow 2002:20). Relatively early dates were obtained by McDonald *et al* (1996) for artefact-bearing deposits at open site RS1 (45-5-982) at Mulgoa Creek, Regentville, but the reliability of these is uncertain (McDonald *et al* 1996: 61-62), while Austral Archaeology have also recorded similar dates within an aeolian sand body associated with the Hawkesbury River at Windsor (Austral Archaeology 2011).

3.1.1 Population and Contact History

Aboriginal people formed part of a dynamic culture which encouraged movement throughout the landscape in order to assist in the ceremonial and functional practicalities of daily life (Helms 1895:389; Niche 2010:17). As such, defined borders for tribal groups need to be recognised as an artificial constraint designed by anthropologists (Organ 1990:xliii).

With these constraints in place, it is possible to characterise the Aboriginal history of the study area. The present study area is thought to lie near the boundary of two major Aboriginal language groups, with Darug (alternatively spelt Dharug or various other spellings – see Attenbrow 2002:table 3.3) speakers occupying the region to the north and east of the Mulgoa valley while the Gundungarra speakers were located to the south and west (Kohen 2009:3). Anthropologist and linguist R.H. Mathews stated that:

> The *Dhar-rook* dialect, very closely resembling the *Gundungarra*, was spoken at Campbelltown, Liverpool, Camden, Penrith, and possibly as far east as Sydney, where it merged into the *Thurrawal* (in Mathews & Everitt 1900:265).

According to Kohen “the band that lived in the [Mulgoa] valley at the time of contact were Dharug, and were known from the early part of the 19th century as the Mulgoa Tribe” (Kohen 1982:3). ‘*Mulgoa*’, ‘*mulgowy*’ or ‘*mulgaway*’ meaning ‘black swan’ is also believed to be the Dharug name for the area (Kohen 1982:4), while an alternative origin for the name is also suggested based on the word *Mulgowrie*, meaning “a place for water” in a local dialect (*Nepean Times*, 18 May 1939; Reed 2010:59).

The pre-contact Aboriginal population numbers for the study area are not known and, due to epidemics often preceding the arrival of European settlers into a region (Attenbrow 2002:21), it is unlikely that the early European explorers were able to successfully grasp the traditional population size. However, in the early days of the Sydney Cove settlement, Governor Phillip estimated that about 1,500 Aboriginal people lived in the Sydney district. More recent estimates of the contact period population of the greater Sydney region place the number between 5,000 and 8,000, although other estimates are much lower (Kohen 1995:1; Turbet 2001:25-26). For the western Cumberland Plain, Kohen has estimated a pre-contact population of 500 to 1000 people, or a minimum overall density of about 0.5 persons per square kilometre (Attenbrow 2002:17; Kohen 2009:4).

The Aboriginal population of the Sydney district declined dramatically following European settlement even before European explorers reached Mulgoa, as many Aboriginal people had been were killed by the smallpox epidemic which spread through the area in 1789. The epidemic is thought to have caused the deaths of at least half of the Aboriginal population of the Sydney district, while some accounts testify that 90% of the population were decimated (Attenbrow 2002: 21; Kohen 1995:2).

3.1.2 Material Culture

The material culture of the Aboriginal people of the Mulgoa region at the time of European contact was diverse, and utilised materials derived from a variety of plants, birds and animals as well as stone. Below is only a short summary of the types of material known to have been used by the Aboriginal people across the Cumberland Plain.

Spears in the Cumberland Plain were usually made of a grasstree spike (for the shaft) with a hardwood point, or alternatively with a hardwood shaft and barbs made of stone, bone, shell or wood (Turbet 2001:40). Thin and straight spear-throwers, or *woomera*, were made from wattle and other hardwoods (Turbet 2001:40). Fishing spears were usually tipped with four hardwood prongs with bone points (Attenbrow 2002:117, 119; Turbet 2001:42), while fish were also caught by means of shell or bird talon fish hooks attached to twine (Attenbrow 2002:117; Turbet 2001:45).

Bark of various types were used for making such diverse items as wrappings for new-born babies, shelters (*gunyahs*), canoes, paddles, shields, water carriers (*coolamon*) and torches (Attenbrow 2002:Table 10.1). Resin from the grasstree was also used as an adhesive for tool and weapon making (Attenbrow 2002:116; Turbet 2001:36).

Various kinds of clubs and throwing sticks were made from hardwoods, as were other useful items such as digging sticks. The word '*boomerang*' is believed to be from the Darug language and the returning variety originated from the Sydney basin. In conjunction with larger, two-handed throwing sticks, it complemented the range of hunting tools available for taking down larger prey (Turbet 2001:37-39, 45; Attenbrow 2002:112).

Stone artefacts are often the only physical indication of Aboriginal use of an area. The knapping of stone artefacts can indicate one of two things, the knapping of stone to create tools and the discard of these tools once they have been used, or sometimes both. The knapping of stone creates a large amount of stone debris in very little time. Large knapping events tend to occur in proximity to sources of permanent water (McDonald 2000). This is probably because the availability and resources made these good places to camp for short periods of time. Small scale knapping events can occur anywhere in the landscape and are associated with the manufacture or maintenance of stone tools as a direct result of a specific need. This implies that locations of sites away from water courses will be more diffuse.

Stone was commonly used for tools and, apart from discarded shell in coastal middens, is the most common material found in archaeological sites of the Sydney region. Stone or stone tools were used for axe heads, spear barbs and as woodworking tools, amongst other things.

Aboriginal people made good use of local stone raw materials sourced from the known quarries on the Cumberland Plain and from the Hawkesbury-Nepean River gravels. Knowledge of source locations for raw materials such as silcrete, basalt, quartz, tuff and chert is of great importance in determining movements, trade and exchange patterns of the people who inhabited the area (Attenbrow 2002). There is evidence, in the form of stone artefacts and axes from inland sources (possibly the Nepean River gravels) for trade between the inland Darug people with the coastal Guringai (Smith 1989:20).

Archaeological investigation has resulted in the recognition of changes in the types of stone tools used by Aboriginal people in the Sydney region through time. A sequence of changes in stone tool types in eastern New South Wales was first noticed by archaeologist FD McCarthy who named it the 'Eastern Regional Sequence' (McCarthy 1976:96-98). McCarthy identified the '*Capertian*,' '*Bondaian'* and '*Eloueran'* phases of the sequence which together appear to span the last 15,000 years in the Sydney region.

McCarthy's sequence was argued against, and Stockton & Holland (1974:53-56) modified McCarthy's theory by proposing four phases of the Eastern Regional Sequence instead. After

Capertian, they described the Early Bondaian and Middle Bondaian phases, where Bondi points and other small tools become apparent in assemblages in Eastern New South Wales. Late Bondaian of Stockton & Holland's sequence referred to McCarthy's Eloueran phase. Stockton & Holland's terminology proved more useful to archaeologists and are used throughout the Sydney region today (Attenbrow 2002:156).

Broadly speaking, the earliest, Capertian period assemblages typically contain tools which are larger in size than later assemblages, although smaller tools, such as thumbnail scrapers and dentated saws can also be present.

In the late Holocene (from approximately 5,000 years ago), backed artefacts such as Bondi points, Elouera and geometric microliths appear in archaeological assemblages in the Sydney region and these tools are characteristically much smaller than those of earlier phases. McCarthy (1976) used these formal tools to define this period as Bondaian while for Stockton & Holland (1974:53-56) the appearance of these tools marked the Early Bondaian and Middle Bondaian phases. Edge ground implements also started appearing in regional assemblages for the first time at about 4,500 to 4,000 years ago.

From about 1,600 year ago, Bondi points and geometric microliths began to drop out of use in the coastal parts of the Sydney region, although Elouera continued to be used. This is known as the Late Bondaian phase. On the Cumberland Plain, however, dated archaeological sites suggest that all of these backed artefact types continued to be used "until at least 650-500 years ago, although probably not [as late as the time of] British colonisation" (Attenbrow 2002:156). In coastal areas, and possibly throughout the Sydney Basin, both the use of quartz and of the bipolar flaking technique increased through time, although this tendency is less marked on the western Cumberland Plain (Attenbrow 2002:153-159).

3.1.3 Food

A wide range of land mammals were hunted for food, including kangaroos, possums, wombats and echidnas as well as native rats and mice (Attenbrow 2002:70). Birds, such as the mutton bird and brush turkey, were eaten and it is recorded that eggs were a favourite food (Attenbrow 2002: Table 7.3, p75-76).

Attenbrow has noted that "Sydney vegetation communities include over 200 species that have edible parts, such as seeds, fruits, tubers/roots/rhizomes, leaves, flowers and nectar (Attenbrow 2002:76). Several other plants have medicinal functions, many of which have only recently been discovered by science, although these were traditionally known to the Aboriginal people.

Observations from the earliest European settlers describe Aboriginal people in the Sydney region roasting fern-roots, eating small fruits the size of a cherry as well as a type of nut and the root of "a species of the orchid" amongst other types of plant food, and it was noted that their diet consisted of "a few berries, the yam and fern-root, the flowers of the different Banksia, and at times some honey" (Collins 1804:361). At other times, the Aboriginal people living in woods would "make a paste formed of the fern-root and the ant bruised together; in the season, they also add the eggs of this insect" (Collins 1804:362).

However, as Attenbrow notes, the settlers' lack of knowledge of the local plant species make actual identification of the various plants being discussed difficult, beyond vague terminology which compared plants to those which were known to the settlers' (Attenbrow 2002:76-79). Of the numerous species which are known to have been used by Aboriginal people in the past, the '*murrnong*', or yam daisy (*Microseris lanceolata*), was the most important staple food and it was the destruction of these plants that contributed to an increased strain on the food resources available to Aboriginal people in the early 19th century (Kohen 1995:4). Other important species to the Darug people included the '*burrawang*' (*Macrozamia communis*), whose seeds had to be treated before being turned into flour, and the native yam (*Dioscorea transversa*) (Kohen 2009:5).

In summary, the Cumberland Plains and Nepean River provided a wide variety of plants and animals which were used by the local Aboriginal populations for artefact manufacture, medicinal purposes, ceremonial items and food.

3.1.4 Early Archaeological Models

Many of the earliest archaeological models were either developed for the entirety of the southern New South Wales coastline, stretching from Sydney down to Batemans Bay, or concentrated on the Sydney region (Navin 1987:29). These settlement models focussed on seasonal mobility, with exploitation of inland resources in winter and coastal resources for the remainder of the year (i.e. Attenbrow 1983; Poiner 1976).

Foley (1981) developed a general site distribution model for forager settlement patterns. The general principles described by Foley have been considered useful indicators of sites location across the Australian landscape and has been used as the basis for many later settlement models.

The model splits hunter gatherer sites into two main categories; 'residential base camps' and 'activities areas' (Foley 1981). People reside in one general location or locations, probably in proximity to a good source of permanent water with shelter from the elements, and travel throughout the local landscape to gather resources at known locations. The right hand side of Figure 3.1 shows how this settlement pattern would look in terms of artefact discard. The majority of artefacts are deposited in proximity to the residential base camp, fewer at the various resource locations and a general low, random scatter amount throughout the rest of the landscape, mainly on travelling routes between activity areas and the base camp. The model, however, does not take into account the use of more than one base camp in an area, or changing preferences of camping areas over time; nor does it account for the movement of resources over time.

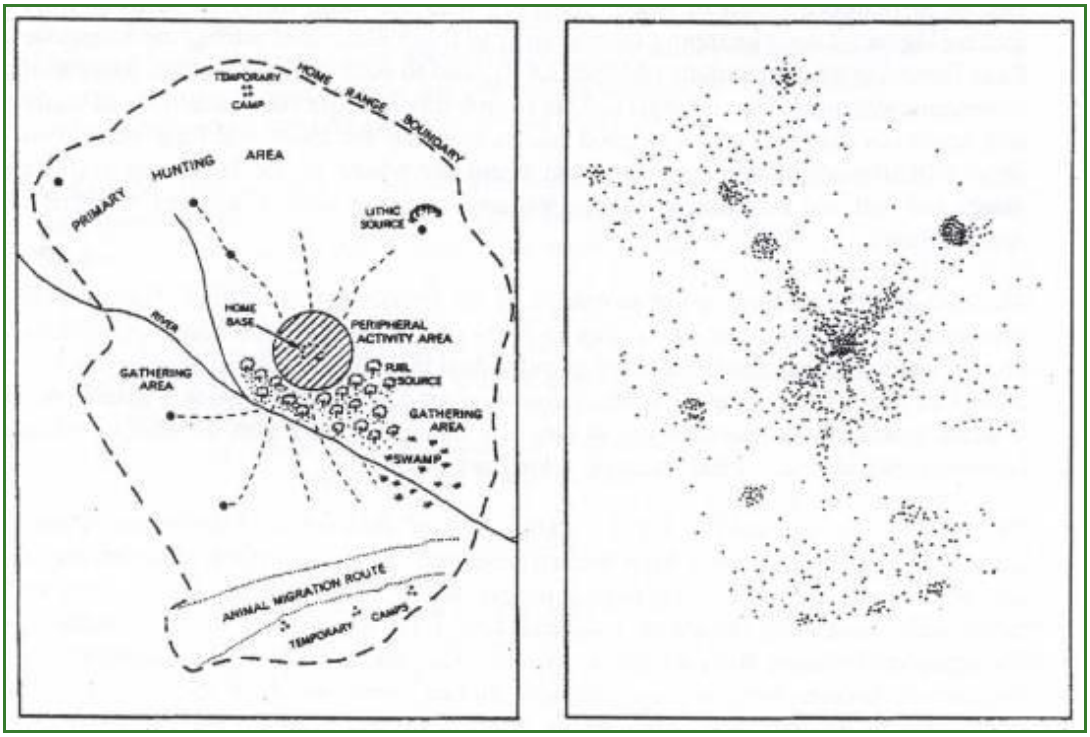

Figure 3.1 Foraging Model (Foley 1981)

Another early model was developed by Kohen in his 1986 study of the Cumberland Plain, where he created a general model of site occurrence, chronology and function for the region. The chronological component of his model posits that the Aboriginal occupation of the Cumberland Plain primarily occurred during the mid to late Holocene (approximately 4,500 BP) and was related to an increase in Aboriginal population in the area and the introduction of a new stone tool technology, the 'small tool tradition'. Prior to the mid Holocene, Kohen argues that Aboriginal occupation of the area was concentrated on and around the Nepean River and the coast.

Similarly, Smith's (1989) work represented the first stage of a National Parks and Wildlife Service (NPWS) Planning Study for the Cumberland Plain. At the time, Smith calculated that less than 0.5% of the Cumberland Plain had been surveyed and/or studied systematically and that only 17 sites had been excavated. A number of surveys were conducted as part of Smith's investigation and, in the 1,600 metre^2 area which she surveyed in the Rickaby's Creek and Londonderry area,

four sites and one isolated find were located. A predictive site location model was developed by Smith for the southern Cumberland Plain based the results of her study. This included the theory that sites would be most commonly found along permanent creeks and around swamp margins, which was later expanded upon. Creek flats and banks were considered to be focal topographical features for site location (Smith 1989:2).

3.1.5 Later Work

Despite a surge in the amount of archaeological assessments undertaken in the Mulgoa valley in the late 1980s and early 1990s, little current research has been undertaken to create predictive models which focus specifically on Jerry's Creek. Instead, it is necessary to focus on archaeological models which have been created for the wider Cumberland Plain.

One of the key archaeological models for the Cumberland Plain was created by McDonald (1997a) and was used in her initial assessment of the ADI site at St Marys to undertake a more detailed analysis of site types and their distribution over the wider region. McDonald's investigation identified artefact scatters (also known as open camp sites) to be the dominant site type (composing 89% of all sites) followed by isolated finds and scarred trees (totalling 2.1% of all recorded features). Her analysis was also able to highlight the disproportionate relationship between the lack of artefacts on the ground surface compared to their sub-surface presence.

This investigation revealed the fact that virtually none of the sites which had been excavated on the Cumberland Plain could have been characterised on the basis of surface evidence alone. In addition, McDonald noted that open sites were found in all landscape units and that the high proportion of sites located on creek banks reflected variables such as surface visibility and taphonomy rather than being indicative of cultural artefact distribution across the landscape (McDonald, 1997a:36).

As a corollary to these findings it was deemed that existing predictive models had relied heavily on surface evidence and were inadequate for usage in the Cumberland Plains (McDonald *et al* 1996). It was further assumed that sub-surface results would provide the necessary data on which a model could be based that could predict site location and/or site variability. After extensive salvage and test excavations carried out for the Rouse Hill Test Excavation Programme (McDonald & Rich 1993; McDonald *et al.* 1996) and the Rouse Hill (Stage 2) Infrastructure Project (McDonald 1999) several important characteristics relating to the Cumberland Plain were noted:

- *Most areas - even those with sparse or no surface manifestations – contain sub-surface archaeological deposits.*
- *Where open sites are found in aggrading and stable landscapes, some are intact and have the potential for internal structural integrity. Sites in alluvium possess potential for stratification.*
- *While ploughing occurs in many areas, this only affects top 30 centimetres of the deposit, and ploughed knapping floors have been located which are still relatively intact.*
- *Contrary to earlier models for open sites, many sites contain extremely high artefact densities, with variability appearing to depend on the range of activity areas and site types present.*
- *The complexity of the archaeological record is far greater than was previously identified on the basis of surface recording and limited test excavations. Intact knapping floors, backed blade manufacturing sites, heat treatment locations, a number of apparently specialised tool types, and generalised camp sites can all exist within the Plains.*
- *Two Early Bondaian dates (between 5,000 and 3,000 BP) provide a context for some backed blade manufacture.*
- *Gross site patterning is identifiable on the basis of environmental factors: sites on permanent water are more complex (i.e. they represent foci for larger groups or are used repeatedly by smaller groups over a long period of time) than sites on ephemeral or temporary water lines* (McDonald *et al.*1996:115).

McDonald was also able to argue that environmental factors were integral to developing a predictive model for the Cumberland Plain. As a consequence, she has successfully used stream order models to develop a predictive model for the Cumberland Plain. Stream order modelling as a predictive tool could be utilised to anticipate the potential for Aboriginal camp site locations in the landscape based on the order of water permanence.

According to McDonald, the range of lithic activities and the complexity of the resulting stone assemblage observed at a location of permanent water differ depending on stream order. Overall, artefact scatters in the vicinity of a higher order ranking stream reflect a greater range of activities (e.g. tool use, manufacture and maintenance, food processing and quarrying) than those located on lower order streams. Temporary or casual occupations of a site, reflected by an isolated knapping floor or tool discard, are more likely to occur on smaller, more temporary water courses (McDonald 1997a:134-135).

It is therefore possible, McDonald concluded, that Strahler stream order modelling could be utilised to make general predictions about the location and nature of Aboriginal sites on the Cumberland Plain. Water permanence (i.e. stream order), landscape unit (i.e. hill top, creek flat) as well as the proximity to artefact raw materials can result in variations in the density and complexity of an Aboriginal archaeological feature (McDonald 1997a; 2000:19). Site location and duration of occupation predictions therefore relate to stream order in the following ways:

- *In the headwaters of upper tributaries (1st order creeks) archaeological evidence will be sparse and represent little more than a background scatter;*
- *In the middle reaches of minor tributaries (2nd order creeks) archaeological evidence will be sparse but indicate focussed activity (e.g. one-off camp locations, single episode knapping floors);*
- *In the lower reaches of tributary creeks (3rd order creeks) will be archaeological evidence for more frequent occupation. This will include repeated occupation by small groups, knapping floors (perhaps used and re-used), and evidence of more concentrated activities;*
- *On major creek lines and rivers (4th order creeks) archaeological evidence will indicate more permanent or repeated occupation. Sites will be complex, with a range of lithic activities represented, and may even be stratified;*
- *Creek junctions may provide foci for site activity; the size of the confluence (in terms of stream ranking nodes) could be expected to influence the size of the site;*
- *Ridge top locations between drainage lines will usually contain limited archaeological evidence although isolated knapping floors or other forms of one-off occupation may be in evidence in such a location* (McDonald, 2000:19).

This model was refined by White and McDonald (2010), based on the results of the subsurface testing at the Rouse Hill development on the northern Cumberland Plains. The predictive model identified four main factors which the authors decided determined artefact density and distribution. These were:

1) *Stream order, with higher order streams tending to have higher artefact densities and more continuous distributions than lower order streams;*
2) *Landform, with higher densities occurring on terraces and lower slopes, and with sparse discontinuous scatters on upper slopes;*
3) *Aspect on lower slopes associated with larger streams, with higher artefact densities occurring on landscapes facing north and north-east; and*
4) *Distance from water, with higher artefact densities occurring 51 to 100 metres from 4th order streams, and within 50 metres of 2nd order streams* (White and McDonald 2010:36).

In agreement with Niche (2010:24), despite the relative distances from the data source, it is held that these results are directly transferable to other parts of the Cumberland Plains.

One final predictive model was recently prepared by Kayandel Archaeological Services (2017) for North Silverdale, which is located approximately 4 kilometres south-west of the study area. Their predictive model states that (Kayandel 2017:38):

- *Both low density surface and subsurface artefacts may occur across the entire Subject area;*
- *Subsurface archaeological deposits may be present in areas where no visible surface archaeological remains are evident;*
- *The size, density and significance of sites will vary, although it is anticipated that any sites will be considerably less complex and less dense at distances greater than 250m from major water sources (3rd/4th order streams) such as Warragamba River or the Nepean River, or along ridges and elevated positions overlooking water courses;*
- *Habitation sites will have associated open production and hunting/gathering sites, which will be present in close proximity, along the length of the flat behind the escarpment;*
- *No lithic raw material outcrops have been identified in the Subject Area. As such, any archaeological material present within the Subject Area may provide additional understanding to raw material selection in the Silverdale region;*
- *As past land use disturbance increases in intensity, the ability for Aboriginal objects to provide spatial and chronological information about past Aboriginal land use will decrease; and,*

Potential Archaeological Deposits may be located in portions of the Subject Area with minimal previous land disturbance

3.2 Database Search Results

3.2.1 Aboriginal Heritage Information Management System Search Results

A search of the Aboriginal Heritage Information Management System (AHIMS) database was undertaken on 06/09/19 (AHIMS client number 447436). The results from the AHIMS search identified 0 Aboriginal sites within the study area, and 8 Aboriginal sites recorded within a one-kilometre radius of the study area (Table 3.1 Summary of sites recorded within approximately 1 kilometre of the study area. There are 0 aboriginal places declared in or near the above location.

It should be noted that unless otherwise noted, the spatial integrity and data quality of sites located outside of the study area have not been checked for accuracy or contents and are presented directly as recorded in the AHIMS database.

Table 3.1 Summary of sites recorded within approximately 1 kilometre of the study area

Feature Type	Total	%
Stone Artefact (Isolated or Scatter)	6	75
Culturally Modified Tree	1	12.5
Shelter with Deposit	1	12.5
TOTAL	8	100%

Table 3.1 shows that there are three different site types represented by the search results: stone artefacts (isolated or scatter), culturally modified trees, and rock shelters with deposits. The spatial distribution of these sites is shown in

Figure **3.2**.

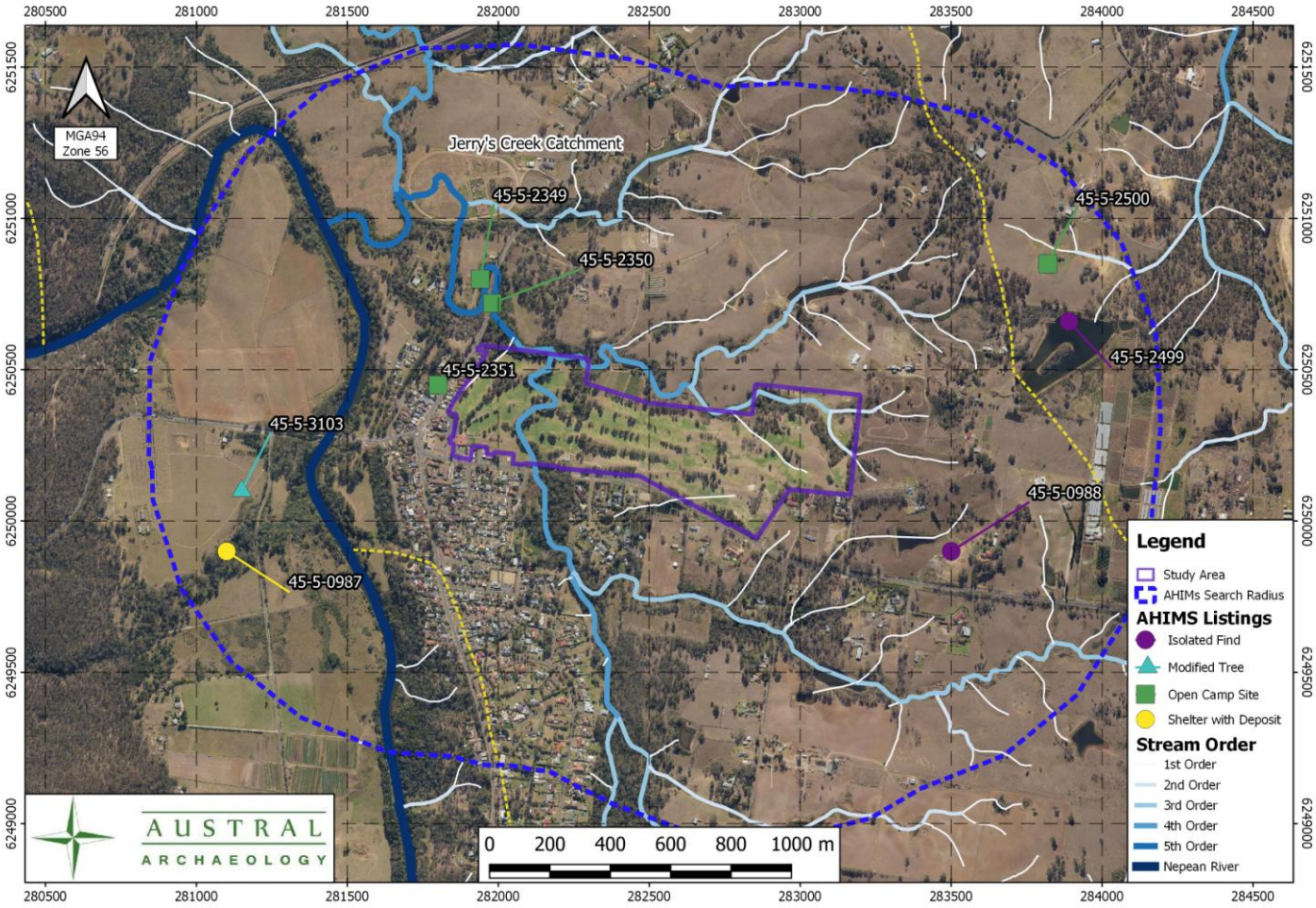

Figure 3.2 Locations of Aboriginal sites in relation to study area according to AHIMs database (Source: NSW Governmment).

The vast majority of the registered sites identified in the AHIMS database search are stone artefacts (both isolated finds and open artefact scatters). This site type represents 6 reported sites, or 75% of the overall site type frequency in the localised search. In comparison, the remaining 25% of sites represent a single example of a culturally modified tree (n=1, or 12.5%) and a rock shelter with an associated occupational deposit (n=1, or 12.5%).

The distribution of the sites shows a clear spatial differentiation which relates to geological and historical land use aspects of the landscape, with the rock shelter identified close to the Nepean River while the culturally modified tree was found in an area of old-growth vegetation adjacent to a road corridor on the western bank of the Nepean River. All recorded artefact sites are, as expected, within 100 metres of a recognised watercourse. While sites RC 12 (#45-5-2500) and RC 13 (#45-5-2499) are associated with the adjacent Mulgoa Creek catchment, the remaining four artefact scatters are associated with either 1st or 3rd order tributaries of Jerry's Creek or, in the case of site JC3 (#45-5-2351), the 4th order portion of the creek immediately after it has passed through the current study area.

3.2.2 Other Heritage Register Search Results

No Aboriginal objects or places are listed as significant in the *Penrith Local Environmental Plan 2010*.

New South Wales Heritage Branch SHR lists no Aboriginal objects or places as significant within the study area.

3.3 Previous Archaeological Investigations in the Vicinity of the Subject Land

Although European observers recorded various aspects of the lifestyles of Aboriginal people in Western NSW, from the beginning of European settlement of the area in the 19th century, it was not until the 20th century that archaeological investigations of Aboriginal archaeological sites were undertaken. Since then, archaeological sites have been frequently recorded across the region, and hundreds have been excavated. Most commonly, these contain open scatters of archaeological material such as stone artefacts, ovens, scarred trees ashy deposits or shell middens.

3.3.1 Archaeological Investigations in the Local Region

Much of the archaeological work in the local area has been undertaken as a result of development-driven archaeological studies or surveys. Table 3.2 below outlines the details and results of some relevant archaeological consultant's reports from the region. Please note that this is not a complete list.

Table 3.2 Summary of archaeological consultant reports from the region

Reference	Study Area Location/Description	Results	Site distribution
Brayshaw 1981	Lot 28, Mulgoa district, City of Penrith	Single broken basalt edge ground axe recorded.	N/a
Dallas 1981	South Penrith development site	20 surface artefact scatters and 7 isolated artefacts recorded.	Irregular, but sites recorded "either in hilltop or elevated situations or in close proximity to creeks" (Dallas 1981:22).
Brayshaw 1982	Lot 1, Bradley Street, Mulgoa (75ha)	One open artefact scatter and one isolated artefact recorded.	Sites located along main creek (tributary of Mulgoa Creek). Not clear whether site distribution was a "function of Aboriginal land use or other phenomena such as ground visibility and erosional process" (Brayshaw 1982:5).

Reference	Study Area Location/Description	Results	Site distribution
Kohen 1982	Mulgoa Valley contact-period desktop study (with limited surface survey).	Artefacts recorded in two locations, one of these contained 19th century glass and ceramic which may be associated with stone artefacts.	According to Kohen "these two small sites are certainly not significant in themselves, but considering the limited nature of the survey, it appears that many more sites would be found in any detailed investigation [of the Mulgoa valley]" (Kohen 1982:7).
Greer and Brayshaw 1983	Lot 1, DP541090, Mulgoa (1.5km x 0.5km)	One open artefact scatter and one isolated artefact recorded.	Artefacts located on hilltop, hill slope and creek bank.
Brayshaw 1983	Site 7770, Bradley Street, Mulgoa (19ha).	No sites or artefacts recorded.	"In view of the irregular distribution of archaeological sites in this part of the Cumberland Plain, the absence of sites from an area the size of the proposed quarry is not surprising, although it could not have been predicted (Brayshaw 1983:6).
Kohen 1986	'Winbourne,' Mulgoa, approx 1.2 x 0.5km	Stone artefacts recorded at 9 locations (8 open sites and one rockshelter), one axe grinding groove location recorded.	Open site artefacts generally located within 50 metres of creek lines, with one exception located near the crest of a low hill. Rockshelter site located in sandstone gorge. Grinding grooves found in sandstone outcrops adjacent to creekline.
McDonald 1987	Subsurface testing of site 45-5-0411, previously recorded by Greer and Brayshaw (1983) at Mulgoa	Sub-surface investigation "revealed that there was no intact, archaeological deposit at the site" (McDonald 1987:7).	Site consists of a sparse surface scatter located on a hill slope above a minor tributary.
Kohen 1988	'Fairlight Park' Mulgoa, approx 270ha	Stone artefacts recorded at five locations (including three isolated finds). One scarred tree and one axe grinding groove location recorded.	Five of the sites appear to be located within approximately 100 metres of creek lines, while two of the isolated artefacts are up to about 500 or 600 metres from a creekline (Kohen 1988:Figure 2). Kohen noted that 'the most unexpected result was the lack of evidence for the use of rockshelters in the sandstone gullies adjacent to the Nepean River…This may be partly explained by the lack of suitable shelters in the upper reaches of the gullies' (Kohen 1988:23).
Barton and McDonald 1995	Jerry's Creek Bridge, near Wallacia	Three low density stone artefact scatters recorded on eroded or exposed ground.	Barton and McDonald noted that the "information needed to categorise the nature of this artefact scatter is dependent upon sub-surface testing" (Barton and McDonald 1995:15).
McDonald 1997c	Proposed Telstra Base Station at Regentville, small area of 12 x 7m west of Mulgoa Creek	No sites recorded within study area, but one open site recorded nearby.	According to McDonald "the position of the site – i.e. in a saddle high above and some distance from permanent water is unusual in the local context – although slightly less so when taking into account similar types of environments slightly further afield" (McDonald 1997c:10).

Reference	Study Area Location/Description	Results	Site distribution
Brayshaw 1999	Warragamba Dam Spillway additional spoil emplacement area, western side of Nepean River, approx 3ha.	In common with an earlier survey of the spoil emplacement areas, no Aboriginal artefacts or sites were recorded.	'The survey indicates that there is unlikely to have been intensive use of the landscape within the boundaries of the study area" (Brayshaw 1999:6).
Austral Archaeology 2007	The study area lies just north of Mulgoa town. The study area is made up of two lots (Lot 1 DP 996994 & Lot 1 DP 1035490).	Five surface artefact scatters and two isolated artefacts were recorded.	Sites located in the northern lot close to the confluence of LIttlefields Creek and Mulgoa Creek were considered to be more significant. Sites located in southern lot were less significant due to their dispersed nature and their location further away from the confluence of Littlefields and Mulgoa Creeks.
AMBS 2009	Relocation of sites located at Theresa Park, Sharpes and Wallacia Weirs.	Relocation of three artefact scatters.	Located along the access tracks to Theresa Park Weir (lower slope), Sharpes Weir (floodplain) and Wallacia Weir (ridge).
Austral Archaeology 2010	St Thomas' Church, Mulgoa	Pedestrian survey identified five artefact scatter containing 40 artefacts and two isolated artefacts.	All artefacts were identified from lower slopes within 100 metres of Littlefields Creek. Test excavations were recommended to further define the artefact scatter.
Austral Archaeology 2013	Eastern Precinct, Fernhill Estate, Mulgoa	A total of 95 artefacts and 28 non-artefactual stone fragments recovered from 90 test pits.	The site contained a "widespread but unevenly dispersed and extremely low density deposit of Aboriginal cultural heritage, interspersed with occasional higher density clusters" (Austral Archaeology 2013:95). Three specific areas of high artefact concentrations were identified located on low ridges overlooking a 2nd order creek.
Kayandel Archaeological Services 2017	Silverdale Road, North Silverdale	A pedestrian survey identified two isolated artefacts; one made from silcrete and one from white quartz.	The silcrete fragment was identified in an area of high modern disturbance and was considered unlikely to be *in situ*, while archaeological testing was recommended at the location of the second artefact (Kayandel 2017:64).

4 LANDSCAPE CONTEXT

The natural environment of an area influences not only the availability of local resources, such as food or raw materials for artefacts, but also determines the likely presence and/or absence of various archaeological site types which may be encountered during a field investigation.

Resource distribution and availability is strongly influenced by the environment. The location of different site-types (such as rock-shelters, middens, open camp-sites, axe grinding grooves, engravings etc) are strongly influenced by the nature of soils, the composition of vegetation cover and the climatic characteristics of a region, along with a range of other associated characteristics that are specific to different land systems and bedrock geology. In turn this affects resource availability of fresh, drinking water, plant and animal foods, raw materials for stone tools, wood and vegetable fibre used for tool production and maintenance.

Therefore, examining the environmental context of an area is essential in accurately assessing potential past Aboriginal land-use practices and/or predicting site types and distribution patterns within any given landscape, cultural or not. The information that is outlined below is applicable for the assessment of site potential of the current study area.

4.1 Geological Context and Soil Landscape

The study area lies at the border of two different physiographic regions, with the Cumberland Lowlands (or Plains) in the east and the Blue Mountains Plateau in the west. The Cumberland Plains physiographic unit comprises low lying and gently undulating plains and low hills on Wianamatta Group shales and sandstones, with predominantly north-flowing water courses. The Blue Mountains Plateau consists of deeply incised Hawkesbury sandstone overlying Narrabeen sandstone, with occasional outcrops of the Narrabeen group on valley floors and rare volcanic intrusions. Wianamatta group shales and sandstones can occur as a thin capping on the eastern fringes of the plateau (Bannerman & Hazelton 1989:2).

The study area itself falls into three soil landscapes, with the majority of the study area lying on land associated with the Luddenham (**lu**) soil profile and the westernmost part of the study area lying on the Blacktown (**bt**) soil profile, separated by a thin band of the Richmond (**ri**) soil landscape associated with a creekline which bisects the study area. The soil landscapes are summarised below and shown on Figure 4.1.

4.1.1 Blacktown (bt) Soil Landscape

The underlying geology of the Blacktown (**bt**) soil landscape is described as belonging to the Wianamatta group, consisting of Ashfield shale and Bringelly shale; a shale with occasional calvareous claystone, laminate and coal inclusions (Bannerman & Hazelton 1990:28). The topography is usually of gently undulating rises, with local relief of between 10 to 30 metres and slopes of generally less than 5% but occasionally up to 10%. Crests and ridges are broad, measuring between 200 to 600 metres wide, and are rounded with convex upper slopes grading into concave lower slopes, with a general absence of rock outcrops (Bannerman & Hazelton 1990:23).
The A1 horizon generally consists of a friable blackish brown loam (**bt1**) that can contain rounded, fine shale fragments, with charcoal also occasionally present. This overlies a hard-setting brown clay loam (**bt2**) that is classed as the A2 horizon and which commonly contains ironstone shale fragments with charcoal and roots rarely present. Below this is a B horizon of a strongly pedal, mottled brown, light clay (**bt3**) which contains increasing amounts of gravel shale fragments in stratified bands. Finally, the soil profile includes a light grey, plastic mottled clay (**bt4**) which can occasionally contain weathered ironstone with occasional gravel shale fragments and roots (Bannerman & Hazelton 1990:29-30).

Soil depth, and even the presence of the different soil materials can vary considerably, dependant on location within the landscape. On crests, **bt1** can occasionally be absent, but the profile will otherwise consist of up to 300 millimetres of **bt1** overlying between 100 to 200 millimetres of **bt2** and up to 1 metre of **bt3**. On upper slopes and ridges **bt1** can also occasionally be absent, but the profile will otherwise consist of up to 300 millimetres of **bt1** overlying 100 to 200 millimetres of **bt2**, 200 to 500 millimetres of **bt3**, and up to 1 metre of **bt4**. Finally, on lower side-slopes, the soil profile can consist of up to 300 millimetres of **bt1** overlying 100 to 300 millimetres of **bt2**, 400 millimetres to 1 metre of **bt3** and over 1 metre of **bt4** (Bannerman & Hazelton 1990:30).

4.1.2 Luddenham (lu) Soil Landscape

The Luddenham (**lu**) soil landscape is an erosional landscape characterised by rolling to steep hills with relief of between 50 to 80 metres and slopes of between 5% and 20%, but generally averaging between 10% to 15%. Ridges are narrow and convex, often between 20 to 300 metres in width, with hillcrests which morph into moderately inclined slopes with narrow, concave drainage lines. The underlying geology is the Wianamatta group of Ashfield shale and Bringelly shale, but with fine to medium grained lithic sandstone from the Minchinbury sandstone type. Gully and rill erosion is common throughout the soil landscape, with sheet erosion occurring where topsoil removal has occurred (Bannerman & Hazelton 1990:63-64).

The Luddenham soils consist of the following soils (from Bannerman & Hazelton 1990:63-64):

- *A loose dark brown loam (lu1) which occurs as a topsoil. A few small, shale fragments occur and roots are common in the top 100 millimetres, while charcoal fragments are rare.*
- *A brown, clay loam (lu2) with frequent shale rock fragments, charcoal fragments and roots.*
- *A strongly pedal clay (lu3) which varies in colour from brownish black to dark reddish brown. Shale rock fragments are common while roots are rare and charcoal fragments are absent.*
- *A mottled bright brown plastic clay (lu4) which occurs as a deep subsoil. Shale rock fragments and gravels are common, while roots are rare.*
- *An apedal brown sandy clay (lu5) with up to 10% inclusions of small, well-weathered shale fragments. All other inclusions are absent.*

The occurrences and relationships between these soils vary considerably, dependant on location. On crests, 100 millimetres of **lu1** can overlie up to 400 millimetres of **lu5**, which lies directly on bedrock or, more rarely, **lu4**. Dependant on erosion, **lu1** can be absent entirely. On the upper slopes, **lu1** can be identified as a topsoil overlying **lu2**, **lu3** and **lu4**, while on lower slopes eroded soils can form a greyish brown loam overlying **lu5** and bedrock. In other examples, known sequences of the Luddenham soils can be **lu2**, **lu5**, **lu3** and **lu4** (Bannerman & Hazelton 1990:63-64).

4.1.3 Richmond (ri) Soil Landscape

The Richmond (**ri**) soil landscape is an alluvial or fluvial soil landscape which is found along Quaternary terraces along the upper reaches of the Nepean River, with an underlying geology of sand, silt and gravels which derive from sandstone and shale. The topography of the Richmond (**ri**) soil landscape is mostly flat, consisting of the terrace edges and levees associated with tributaries of the Nepean River, and offering local relief of no more than 10 metres (Bannerman & Hazelton 1990:75).

The A horizon generally consists of either a loose, reddish brown loamy sand (**ri1**) or a brown sandy clay loam (**ri2**), both of which are often slightly acidic. The B horizon is a brown mottled light clay (**ri3**), which may contain bands of gravel, overlying a brown mottled stiff medium-heavy clay (**ri4**). With the exception of a few roots in the upper parts of the soil profile, inclusions such as stones and charcoal are generally absent throughout the profile (Bannerman & Hazelton 1990:76).

Soil depth or the presence of the different soil materials can vary considerably, dependant on location within the landscape. Near terrace edges, up to 400 millimetres of **ri1** can overlie between 400 millimetres and 1 metre of **ri2**, with a subsoil of alternating layers of **ri3** and **ri4** and all soil boundaries being clearly defined. Further away from the watercourse, **ri1** can be absent, as can **ri2**, although when present, **ri2** may be up to 1 metre thick overlying up to 1.5 metres of **ri3**, and up to 1 metre of **ri4**. Boundaries between different soil profiles away from watercourses may be gradual and difficult to differentiate (Bannerman & Hazelton 1990:76-77).

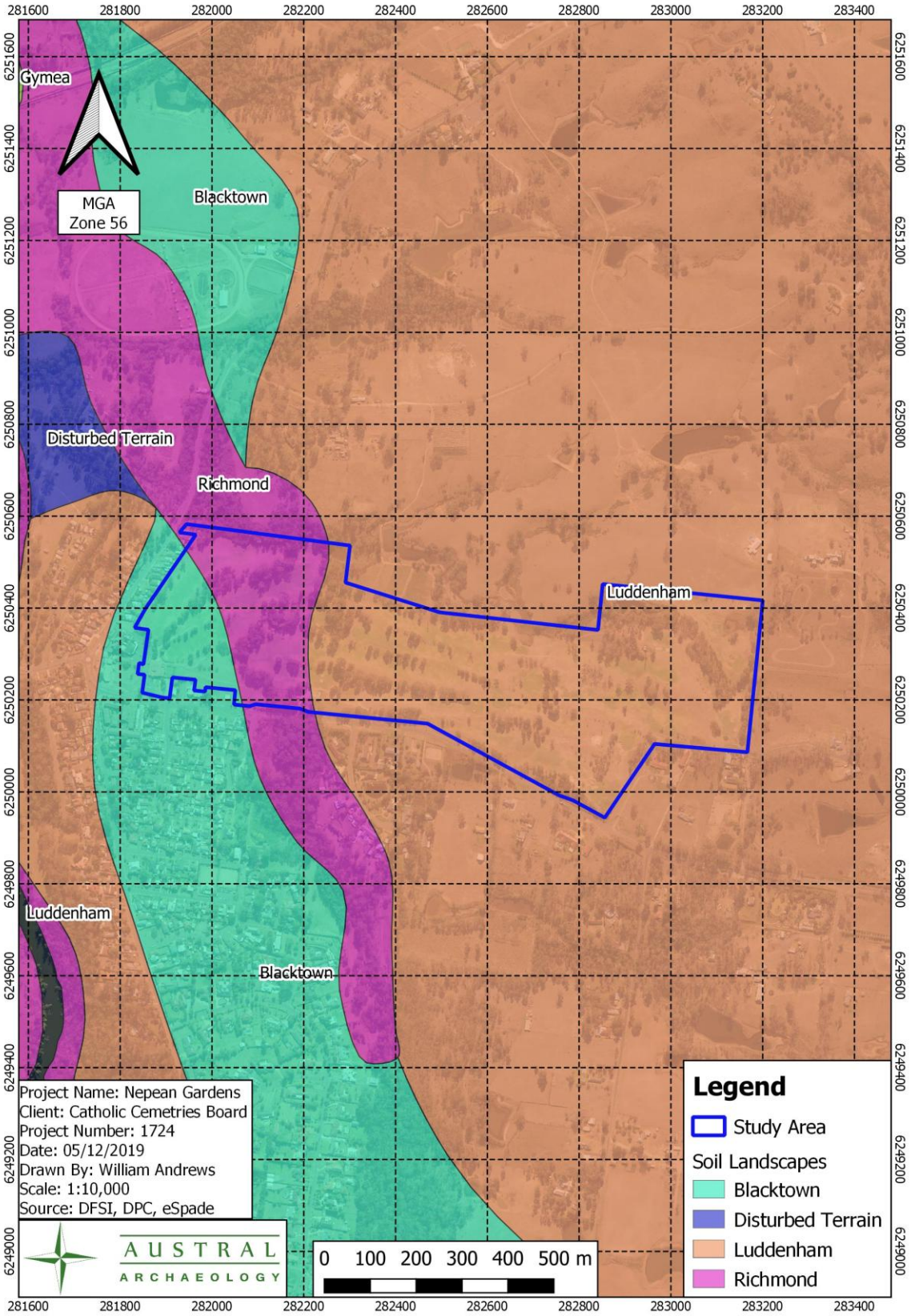

Figure 4.1 Soil landscapes of the study area.

4.2 Hydrology

The study area is located in the watershed of Jerry's Creek, which forms part of the Nepean-Hawkesbury River catchment along with the adjacent watersheds of Mulgoa Creek to the north-east and Duncan's Creek to the south (Figure 4.2).

The major watercourse in the vicinity of the study area is the Nepean River which flows approximately 400 metres west of the western boundary of the study area. While the Nepean River generally forms a deep, heavily forested gorge in the region, the river was fordable at Wallacia. The headwaters of the Nepean River rise near the town of Robertson on the western slopes of the Illawarra Escarpment, about 100 kilometres south of Sydney. The Nepean River flows northwards past Wallacia before turning westwards to join the Warragamba River and resuming its northwards flow to join the Grose River near Penrith, marking the point where the river changes its name to the Hawkesbury River. As the Hawkesbury River, it flows roughly north-east before it enters the sea approximately 50 kilometres north of Sydney at Broken Bay. The total length of the Nepean-Hawkesbury River from source to sea is about 265 kilometres.

Jerry's Creek is the major creekline in the local watershed and it passes through the western part of the study area as a 4th order stream. However, the creekline has been at least partially modified, as the creek enters an underground drain in order to pass below a fairway. The headwaters of Jerry's Creek lie predominantly to the south of the study area and the creek runs northwards before joining the Nepean River north of Wallacia. In the north-eastern corner of the study area is a lake which is formed through the damming of a 3rd order creek whose two 2nd order tributaries flow westwards through the north-eastern part of the study area. An unnamed 1st order drainage gully is also present in the northern part of the study area, flowing north-westwards to join the dammed creekline which then continues to flow westwards, re-entering the study area as a 4th order stream in the north-western corner before joining Jerry's Creek and flowing northwards out of the study area (Figure 4.2 and Figure 4.3).

For the discussion on stream order relevance for archaeological site patterning, please refer to Section 7. One point to consider is that while stream order modelling focuses on predicting the likely year-round permanence of a water source, the Cumberland Lowlands physiographic region contains a dense pattern of drainage channels (Bannerman & Hazelton 1990:2). This means that while a 1st or 2nd order streams would normally be considered semi-perennial and 3rd and 4th order streams would be a permanent water source, several creeks in the vicinity of the study area are considered semi-perennial but are rated as 3rd or 4th order streams.

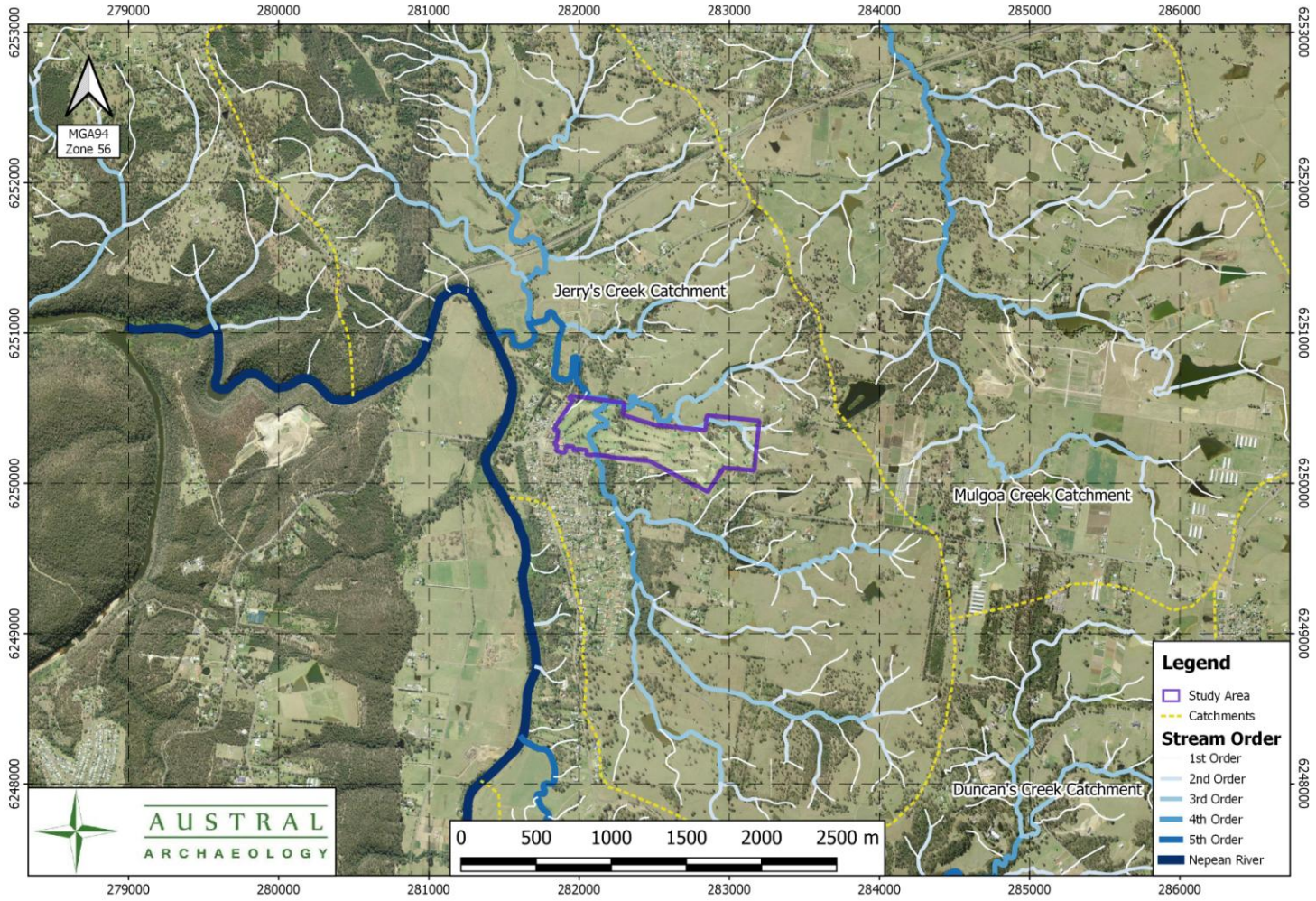

Figure 4.2 Hydrology and catchments of the area surrounding the study area (Source: NSW Spatial Services).

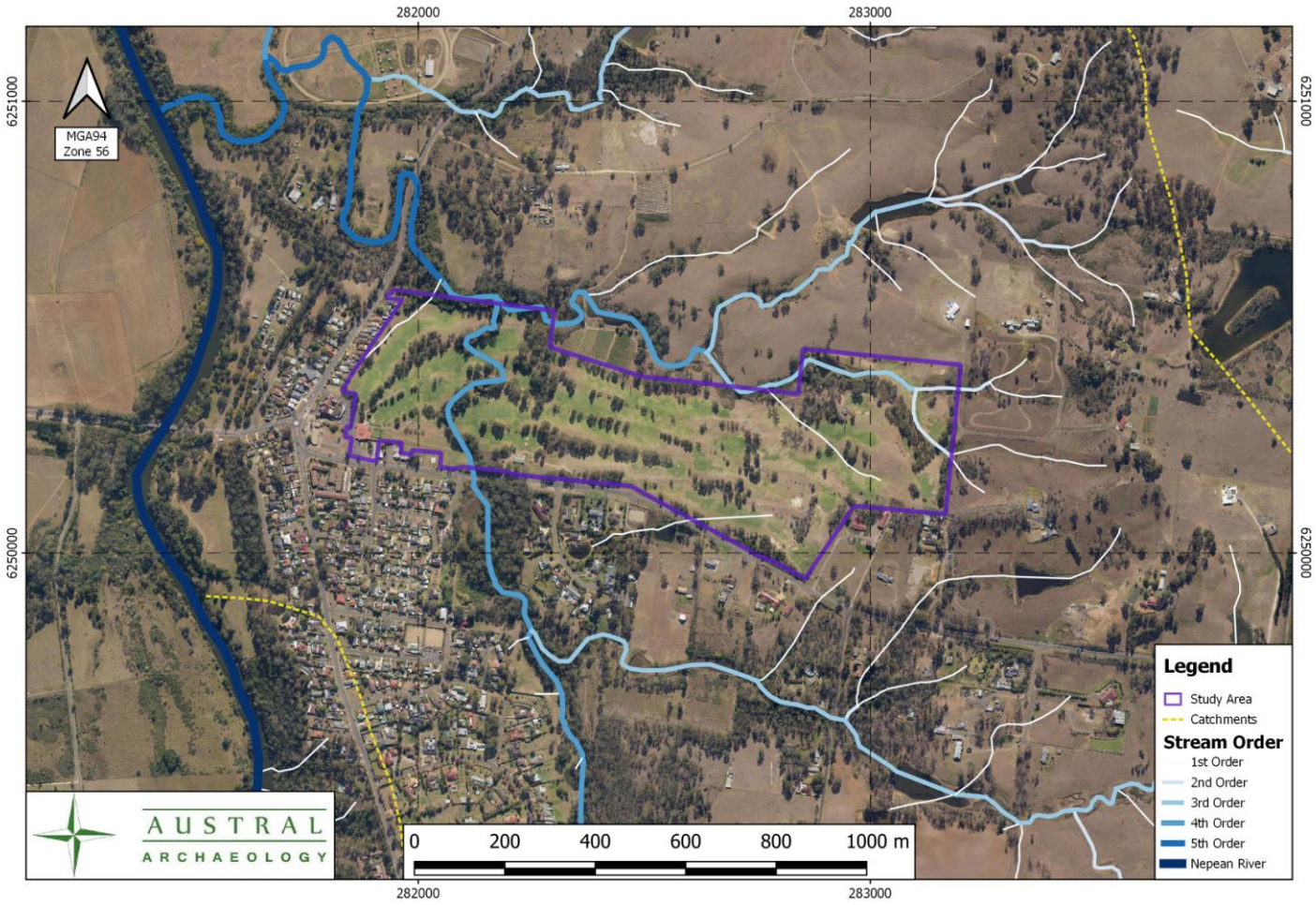

Figure 4.3 Hydrology of the study area (Source: NSW Spatial Services).

4.3 Climate

The climate of Wallacia is temperate with cool winters and warm to hot summers (Bannerman & Hazelton 1990:3-4). Average temperatures at the Badgerys Creek weather station, located approximately 10 kilometres to the east of the study area, are highest in January and can range from a daytime mean of 30.0°c to an overnight mean of 17.1°c. July is the coolest month with average daily temperatures of 17.4°c and mean overnight temperatures of 4.1°c (BOM 2017). The area lies within the rain shadow of the higher coastal plateaux that captures the prevailing south-east winds, thus the annual rainfall is considerably lower than Sydney to the east and the Blue Mountains to the west (Bannerman & Hazelton 1990:3-4). The mean annual rainfall for Badgerys Creek is about 683 millimetres per year, mainly in summer, with rain occurring on an average of 68.6 days per year (BOM 2017).

4.4 Flora and Fauna

Prior to the removal of the natural vegetation, the ecological diversity of the area would have provided a wide range of resources for Aboriginal people. Aboriginal people frequenting the study area would have exploited resources from the nearby Nepean River as well those within the smaller drainage lines such as Jerry's Creek.

The dominant native vegetation community in the region surrounding the study area is characterised as an "Alluvial Woodland" (NPWS 2002b: Map 4). This forest community is predominantly found on watercourses draining through soils which derive from Wianamatta shale (NPWS 2002a:41). Larger trees present within this vegetation community include cabbage gum (*Eucalyptus amplifolia*) and forest red gum (*E. Tereticornis*), with occasional occurrences of rough-barked apple (*Angophora floribunda*). Smaller trees can include Parramatta green wattle (*Acacia parramattensis* subsp. *parramattensis*), swamp she-oak (*Casuarina glauca*), and flax-leaved paperbark (*Melaleuca linariifolia*). A dense ground cover could include grasses such as Australian basket grass (*Oplismenus aemulus*), weeping grass (*Microlaena stipoides* var. *Stipoides*), bordered panic (*Entolasia marginate*) and forest hedgehog grass (*Echinopogon ovatus*), or herb species such as forest nightshade (*Solanum prinophyllum*), whiteroot (*Pratia purpurascens*) and *Commelina cyanea*. Although not as common, shrubs such as blackthorn (*Bursaria spinosa*) could also be present (NPWS 2002b:41).

Additional species present within the Nepean Gorge also include blackbutt (E. *deanei*), river oaks (*Casuarina cunninghamiana*) and red cedar (*Toona australis*) (Benson & Howell 1990:84).

The study area has been predominantly cleared of vegetation, although copses of trees are present along the course of Jerry's Creek, in the vicinity of the dam in the north-east corner of the study area and adjacent to various fairways throughout the golf course. However, the majority of the vegetation within the study area, excluding the trees lining Jerry's Creek, were planted in the latter part of the 20th century and are not shown on an aerial photograph dating from 1955.

The study area and its nearby surroundings would have provided habitats for the usual variety of macropods found in the Cumberland Plain, while the rivers and creeks would provide access to addition faunal resources such as fish species, a range of water birds and a variety of lizards. The Atlas of NSW Wildlife identifies 232 native species having been recorded within 10 kilometres of the study area. This is broken down into 34 mammals, 157 birds and 41 reptiles, amphibians and insects (OEH 2017). A large number of these species would have been hunted by Aboriginal people, including macropods such as the eastern grey kangaroo (*Macropus giganteus*), possums such as the common ringtail possum (*Pseudocheirus peregrines*), and myriad other species of bats, birds, and snakes (Attenbrow 2002:70-76).

4.5 Section Summary

The current flora and fauna inhabiting the study area is not indicative of the range and quality present prior to European settlement. Available plant and animal resources would have been sufficient for the needs of Aboriginal people and allowed for trade with neighbouring groups. Some of the same characteristics which made the area of use to past Aboriginal people also would have made it attractive to European settlers, leading to extensive clearing for residential, commercial and maritime use. The implications of these factors for the archaeological potential of the study area are discussed in Section 7.1.

5 HISTORICAL LAND USE AND DISTURBANCE

5.1 Development History

The earliest known occupation of the study area was in 1813 when the John Blaxland was granted 6,710 acres of land in the area, which he named 'Luddenham'. Blaxland primarily utilised the land for agricultural purposes, including the grazing of livestock.

The Luddenham estate remained in the hands of the Blaxland family and continued to be used for farming until 1859 when the estate was sold and subdivided. A contemporary plan of the subdivision shows either a U-shape house or driveway, with a detached stable block and two other buildings also present along with a detached kitchen and garden on the southern side of Park Road.

In the 1870s, the Wallace family moved into the cottage after Henrietta Wallace took over the lease after the death of her husband, Robert. During this time, the house was utilised as an unofficial receiving depot for any mail needing collection in the district on account of their property being the only residence to the south of Mulgoa.

By the start of the 19th century, the Wallace family were acknowledged as being the oldest continuous residents of the district, and the role of the Wallace's house as a post office and meeting place had meant that locals came to refer to the surrounding district simply as "Wallace".

By the early 20th century, the simple cottage which served as both residence and post office was no longer fit for purpose and in 1907 the post office was enlarged, although there is no confirmation as to whether this represented a repurposing of space or construction of a new building.

In 1938, a hotel was built on the northern part of the property, possibly on the location of the original farm buildings.

In 1932, the Wallacia Golf Course was founded, with the original club comprising a very simple tin shed. The golf club was disbanded during the war years as both the course and the neighbouring Wallacia Hotel were requisitioned with the hotel being used as a Radio Physics school and the golf course being used for exercises, and an air raid shelter was reportedly constructed below the green of the 10th hole.

While a replacement club house was constructed in 1967 which incorporated elements of the 1936 building, the club house currently in use appears to have been constructed between 1983 and 2011 which incorporates elements of the 1967 build.

5.2 Past Land Use Practices

The early settlement and economy of the Cumberland Plain relied heavily on farming and agriculture. Following the large scale clearance of native vegetation, the Wallacia region and surrounds gained a reputation for producing abundant crops of wheat and other cereals.

The study area formed part of John Blaxland's grant in 1813, and the land within the study area was primarily used for agricultural purposes. The land continued to be utilised for farming practices, including animal grazing, until the early 20th century.

In 1932, the study area functioned as a golf course following the establishment of the Wallacia Golf Course. The study area continues to be used as a golf course until the present day.

5.3 Potential Land Use Impacts on the Archaeological Resource

The main impacts on the subject land relate to the past use of the study area.

Land clearance would have resulted in soil disturbance and as a result, the archaeological resource is likely to have been affected to some degree by this activity. However, this is likely to have resulted in localised artefact displacement rather than widespread destruction of Aboriginal cultural heritage.

Later occupation within the study area would have impacted the existing landscape in a number of ways, resulting in artefact displacement and destruction. These activities include substantial clearing of the study area, construction of numerous buildings including homesteads,associated outbuildings and sheds, as well as major landscaping works for the construction of the golf course.

The past land uses of the subject land and their potential impact on archaeological resources are summarised in Table 5.1 below.

Table 5.1 Summary of past land uses within the study area

Past land uses	Potential impacts on archaeological resources
Historical vegetation clearance	The potential loss of scarred trees from the subject land as well as substantial erosion.
Construction of buildings	Significant ground disturbances within the footprint of the building, leaving to the potential disturbance distribution or destruction of artefacts and other subsurface Aboriginal cultural heritage.
Landscaping works for the construction of the golf course	Major clearing and manipulation of the ground surface leading to the potential disturbance and dispersal of ground artefact scatters.

6 THE LOCAL AND REGIONAL CHARACTER OF ABORIGINAL LAND USE AND MATERIAL TRACES

The range of environments and landscapes within the Cumberland Plain and along the Georges River and Nepean River had a profound influence upon the lives of the Aboriginal people who lived there. As hunters and gatherers, Aboriginal people were reliant on their surroundings to provide food. Their transitory lifestyle affected population size, social interactions and degree of mobility. This can be confirmed in the archaeological record. Ethnographic accounts were once the primary source of archaeological investigation. However, with the recent spread of urban development within NSW, archaeological investigations have increased in frequency.

The pre-European context of the Wallacia region is one of small bands of Aboriginal people living a mobile hunting and gathering lifestyle. The Darug people were the traditional owners of the area around Wallacia. Population estimations at the time of contact were difficult to estimate due to disease decimating populations. The social structure of pre-European groups was slightly stratified with elders of clans holding decision making capabilities. Subsistence activities were sexually dimorphic and the spirituality of groups is detailed and explained through an oral tradition of Dreamtime. Material culture, such as tools, was made of a variety of materials such as bark, resin, shell, bone and reeds. Hard stone raw material that was made into stone tools is the main element of this tool kit to remain in the archaeological record.

The pre-European environment of the Cumberland Plain provided an extensive resource base associated with the multitude of water sources. These water sources include fresh water rivers (the Hawkesbury River) and fresh water creeks (including Eastern and South creeks). Habitats associated with these water systems would have supported a wide range of animals, fish, birds and mammals, all of which would be rich in proteins and would have been in abundant supply. The pre-European Cumberland Plain landscape would have been the setting for a variety of human activity. This human activity would have included camping, hunting, gathering, cooking, ceremonies, and other cultural activities associated with semi-permanent settlement sites in the region.

Early archaeological investigations of the Cumberland Plain within the Sydney Basin by Haglund (1980), Kohen (1986) and Smith (1989) among others, and later work by McDonald et al (1993) outlined methods of predicting the location and likelihood for Aboriginal sites within the landscape. Through such studies the archaeological character, as determined by the distribution of site types across the Cumberland Plain, has been demonstrated to be distinct from that of the Sydney region (McDonald 1997a; Attenbrow & AMBS 2001).

This difference is a direct result of environmental factors, as patterns of activity are largely determined by the environmental setting. For instance, where localised Hawkesbury sandstone outcrops occur on the Cumberland Plain, rock art and grinding groove sites can be well represented, as they are in coastal Sydney. However, the Cumberland Plain is typified by undulating, open woodland that saw mobile hunting as a primary means of subsistence. Stone resources were not rich or concentrated, being largely sourced from within the network of watercourse beds and relict gravel bed exposures (Doelman *et al* 2015; Carter 2011). This has resulted in an archaeological record dominated by low density, open scatter sites and diffuse, discard of lithics across the landscape (Biosis 2006; Niche 2010).

McDonald (*et al* 1994, 1997a, 1997b, and 1999) also demonstrated that environmental factors, such as stream order, were integral to developing a predictive model for the Cumberland Plain. Stream order modelling as a predictive tool can be utilised to anticipate the potential for Aboriginal camp site locations in the landscape based on the order of water permanence, as the more permanent and reliable the water sources is, the more frequent and complex Aboriginal activities in those locales become (McDonald and White 2010:36).

Predictive modelling has also been used by McDonald with regards to the procurement and usage of stone material on the Cumberland Plain, with especial reference to the source of silcrete on Plumpton Ridge. The results of McDonald's (2007) salvage excavation at the Colebee Release Area have provided some insight into procurement, processing and dispersal trends associated with the quarry site. McDonald (2007:134) has noted, however, that these results do not necessarily indicate an increasingly conservative use of silcrete corresponding with an increased distance from Plumpton Quarry, as they are based on large-sized assemblages in a rich archaeological landscape and a number of sites with dense artefact distribution have also been recorded at Rouse Hill.

6.1 Summary of Aboriginal Material Traces Within the Local Region

Material traces of Aboriginal occupation exist throughout the landscape and are known as Aboriginal sites. The primary site types that are found in the Lower Blue Mountains region are as follows.

Burials can take a number of forms depending upon the customs of the indigenous inhabitants of the area. Common methods of burial practice used within Australia include, inhumation, cremation, desiccation and exposure. The entire burial process may involve a combination of the above procedures. This type of site is generally not identified by field surveys and is considered rare.

Ceremonial Grounds (bora rings): Ceremonial Grounds are where initiation ceremonies, marriages and other important social functions were held. They are places of great significance to Aboriginal people. Some are raised earth rings or rings of stone. Generally they are located in prominent locations. These sites are considered rare.

Grinding Grooves are abrasions in the surface of rocks from the repeated use of the rock surface for sharpening implements of stone, but also may have been used for bone and shell implements. Grinding grooves are generally situated near a water source and may consist of a single groove or a number of grooves on a sandstone slab. This site type is usually found in open contexts but has also been known to occur within rock shelters.

Open camp sites or isolated finds of durable material of flaked or ground stone that have been discarded across the site may be present. The presence of *manuports* potentially could occur at the study area. Manuports are stone artefacts of raw materials not naturally occurring within the soil profiles of a given site; essentially they have been brought onto the site by Aboriginal people from somewhere else.

PADs (Potential Archaeological Deposit) can be determined if there is potential for archaeological material existing below the ground surface or on the ground surface but obscured from view. An Aboriginal object does not need to be recorded for an area of PAD to be specified. It is possible that areas of PAD would be found within the study area.

Rock Shelter Sites are rock overhangs, which have artefacts on the surface of the deposit or within the deposit itself. Other forms of archaeological evidence commonly found within shelter sites are occupation deposit (i.e. stone artefacts, bone, shell, charcoal and artwork).

Scarred trees are the result of the removal of bark and/or wood for the purpose of manufacturing shelters, canoes and shields and/or for designs carved into wood for a range of aesthetic, functional and ceremonial reasons which are currently not fully understood. Evidence for tree scarification is more likely to be observed on large and mature trees (depending upon the species). Unless the tree is at least 100 years old, scarring is unlikely to be of Aboriginal origin.

Shell Middens range from thin scatters of shell to deep, layered deposits which have built up over time. They are generally found on the coast, but can be around inland lakes, swamps, and river banks. Shell middens are places where the debris from eating shellfish and other food has accumulated over time.

Stone Arrangements are human produced arrangements of stone usually associated with ceremonial activities, or used as markers for territorial limits or to mark/protect burials. Stone arrangements are considered rare site types across New South Wales but are generally found on escarpments and sandstone outcrops.

Stone Artefacts are the most common trace of Aboriginal occupation in the region. Aboriginal people used particular techniques to flake stone and these changed over time. The approximate age of a tool can often be diagnosed by the way that it was made. Stone artefacts are most often found in scatters that may indicate an Aboriginal campsite was once present. Stone artefacts may also be found as isolated finds. Stone tools in the Sydney region are most often made from raw materials known as silcrete, tuff and quartz. These are all easily flaked and form sharp edges, which can be used for cutting or barbing spears. It is possible that stone artefacts, either on the surface, or buried, exist within the study area.

7 ARCHAEOLOGICAL PREDICTIVE MODELLING

An assessment of archaeological potential usually considers the historic sequence of occupation in comparison to the structures which are currently extant, as well as the impact that the more recent constructions and works would have had on the earlier occupation phases and, as such, the likely intactness of the archaeological resource. This, in turn, is tied in with the extent to which a site may contribute knowledge not available from other sources to current themes in historical archaeology and related disciplines.

In regard to the assessment of the study area, the archaeological potential depends upon the anticipated likelihood for the survival of buried structural fabric and cultural deposits as well as an estimation of archaeological integrity. Structural fabric refers to what is generally regarded as building or civil engineering remnants. Cultural deposits refer to archaeological deposits, i.e. deposited sediments containing artefacts etc.

Having analysed the historical evidence in the previous chapters, the following section presents a summary of the potential for a physical archaeological resource to be present in the study area, that is, its archaeological sensitivity/potential.

7.1 Aboriginal Predictive Statements

The moderate climate of the Cumberland Plain and its location within the wider Nepean River catchment is likely to have been conducive to Aboriginal occupation in the past. The study area lies within a resource base associated primarily with the Jerry's Creek watercourse, itself a tributary of the Nepean River. Habitats associated with the river would have supported a wide range of animals, fish, birds and mammals.

Due to the environmental setting, the Nepean River landscape would have been subject to a variety of human activities. This primarily would have been due to the presence of permanent water sources, followed by the sheltered camping locations and good resources availability in the immediate area. Activities would have included camping, hunting, gathering, cooking, ceremonies, and other cultural activities associated with semi-permanent settlement sites in the region. Some of these activities, mainly stone tool knapping, are seen in the archaeological record.

In predicting site types within the study area, one would expect to find surface isolated artefacts and scatters on the ground surface of sensitive landforms, scarred trees in areas of remnant native vegetation, and grinding grooves on sandstone rock surfaces and platforms where available. Locations of likely site recordings predictably may occur in areas of high ground visibility such as around dams, the base of trees, tracks and around the disturbances of the building constructions. Surface sites will probably not be visible in the vast majority of the site as it is currently a combination of grassed spaces and areas covered with leaf litter.

If stone tools are recorded they are likely to conform to other known sites in the region. This means that tools are likely to be from a late Holocene occupation with stone technologies attributed to the Bondaian phase of the Eastern Regional Sequence. If stone tools are present on site they will predictably be made from chert, silcrete, or quartz sourced from local quarries. These sites may be the results of activities attributed to people of the Darug language or, less certainly, to the Gundungurra language groups.

In summary, the main trends broadly seen across the Cumberland Plain are that:

- Archaeological sites have the potential to occur on most landforms.
- Site frequency and density are dependent on their location in the landscape.
- There is a constant, or background, presence of low density surface open artefact scatters and isolated finds.
- There is a paucity of scarred trees due to land clearance.
- Aboriginal scarred trees may still be present in areas where remnant old growth vegetation exists, however these are relatively rare on the Cumberland Plain.

- Artefact scatters are commonly located in close proximity to permanent water sources along creek banks, alluvial flats and low slopes, largely concentrated within the first 100 metres of the creekline. More complex sites are usually located close to water sources with major confluences being key locations for occupation sites. Subsurface testing across the Cumberland Plain has established that archaeological material is also present beyond the immediate creek surrounds in decreasing artefact densities.
- Fewer sites occur on ridge tops and crests.
- Subsurface archaeological deposits often exist in areas where no visible surface archaeological remains are evident.
- The dominant raw material used in artefact manufacture is silcrete and fine grained siliceous material with smaller quantities of chert, quartz and volcanic stone seen.
- Artefact assemblages usually comprise a small proportion of formal tool types with the majority of assemblages dominated by flakes and Angular fragment.
- While surface artefact scatters may indicate the presence of subsurface archaeological deposits, surface artefact distribution and density may not accurately reflect those of subsurface archaeological deposits.
- PADs are most likely to occur along valley floors and low slopes in well-drained areas.
- Aboriginal occupation along the Nepean River is focussed around rock shelters.

As a result of these statements, it is reasoned that undisturbed areas within the Cumberland Plains are considered archaeologically and culturally sensitive, with frequent Aboriginal sites in the vicinity.

The general studies of the Cumberland Plains and the Nepean River region, the specific investigations surrounding the study area and the search of the AHIMS database have helped to predict what site types can be expected to occur within the study area. Specifically, the analyses undertaken by McDonald and White (2010) at Rouse Hill in relation to artefact distribution and density have assisted in further modifying these predictions. Based on the results of McDonald and White with regards to site density in relation to stream orders, the following predictive model is offered for the study area:

- Higher artefact densities are likely to occur within a zone of 51 to 100 metres from a 4th order stream, within 25 to 50 metres of a 2nd order stream, with a negligible number of artefacts found in association with a 1st order creek;
- McDonald and White did not have sufficient data to determine the likely distance of higher artefact densities from a 3rd order stream. However, by extrapolating the results from 2nd and 4th order creeks, an assumed zone of between 25 to 75 metres has been applied to 3rd order creeks; and
- Higher densities of artefacts occur on terraces and lower slopes, especially those facing north or north-east, with sparse, discontinuous scatters on upper slopes. As such, the remainder of the site may contain the standard disparate remnants which are common across the landscape.

As such, areas of highest archaeological potential are shown below on Figure 7.1.

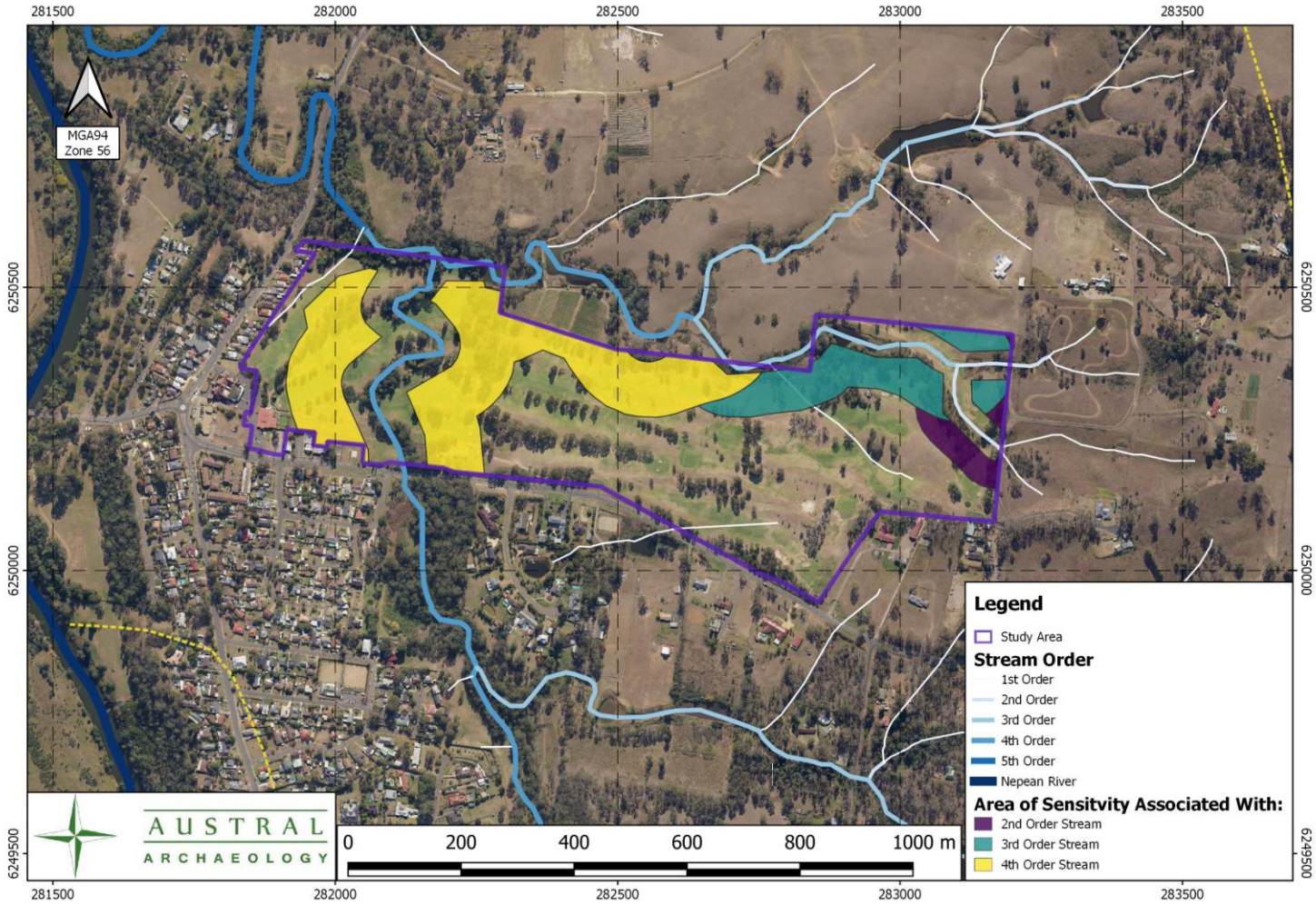

Figure 7.1 Areas of potential Aboriginal artefact distribution in relation to stream order (Source: Nearmap, DFSI).

In summary, the following statements outline the likelihood for various types of Aboriginal cultural material being present in the study area:

- Surface open camp sites or isolated finds of flaked or ground stone are likely to be present in areas associated with higher order streams and creeklines such as Jerry's Creek.
- PADs are likely to be present, but their identification is dependent on the correct recognition of an area with an absence of historical disturbance situated within a residual soil profile, such as the Blacktown (bt) profile present in the western portion of the study area;
- Scarred trees have a low probability of being present due to the widespread vegetation clearance in the study area, although old growth vegetation which may contain scar trees are present along the banks of Jerry's Creek;
- Grinding Grooves are unlikely to be present due to a lack of suitable requirements (i.e. exposed bedrock near to a water source);
- Burials are unlikely to be present, due the lack of sandy locations suitable for inhumation;
- Ceremonial grounds are unlikely to be present due to their general rarity within New South Wales;
- Rockshelter sites are unlikely to be present due to the lack of suitable rocky outcrops in the study area;
- Shell middens are unlikely to be present due to the distance from a permanent and deep water source; and,
- Stone arrangements are unlikely to be present due to their general rarity within New South Wales.

8 CONCLUSION AND RECOMMENDATIONS

8.1 Conclusions

A search of the Aboriginal Heritage Information Management System (AHIMS) Database returned no sites within the study area. This is likely due to a lack of any development within the study area rather than due to an absence of Aboriginal cultural material. However, several streams and creeks pass through the study area which suggests that parts of it may contain Aboriginal cultural material (Figure 4.3), although the level of archaeological potential is dependent on low levels of modern disturbance in the vicinity of these creeks. These areas may warrant further investigation through the preparation of a full Aboriginal cultural heritage assessment dependant on the nature of any proposed development which is to occur in these locations.

8.2 Recommendations

It is recommended that:

1) A pedestrian survey should be undertaken to groundtruth the results of this archaeological assessment in terms of potential for Aboriginal archaeological material to be present in the study area, and to identify areas of modern disturbance which can be discounted from further consideration. The results of the survey should be appended to this report as an addendum, and the mapping of areas of archaeological potential and sensitivity should be updated accordingly.

2) In the absence of having undertaken a pedestrian survey, in the event of any development being proposed in an area marked as being archaeologically sensitive on Figure 7.1, it will be necessary to prepare a full Aboriginal cultural heritage assessment prior to works commencing. This will require the identification of and consultation with Aboriginal stakeholders and may require undertaking a period of archaeological test excavations to confirm the nature of subsoil deposits within archaeological sensitive landforms.

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APPENDIX A: THE DUE DILIGENCE PROCESS

This information concerning the due diligence process is a summary of the applicable legislation. For a detailed description of the due diligence process and precise definition of terms refer to *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales* (DECCW 2010).

The due diligence code of practice is not required if:-

- The activity is exempt from NP&W Act or Regulation.
- The activity involves harm that is negligible or trivial.
- The activity is in an Aboriginal place or previously identified Aboriginal objects are present, but will not cause or permit harm to them.
- The activity is in an Aboriginal place or previously identified Aboriginal objects are present, will cause or permit harm to them, but will involve steps to avoid harm.
- The activity is not in an Aboriginal place and Aboriginal objects have not been previously identified, and the activity is a low impact one with a defence in the Regulations.
- The Proponent wishes to follow an industry specific code of due diligence.

Under the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales*, consultation with the Aboriginal community is not required, although it may assist in decision making.

Step 1 – Determine the Level of Impact

If the activity does not disturb the ground, proceed with caution.

Step 2 – Aboriginal Heritage Information Management System Basic Search

Regardless of AHIMS search, the activity area must be checked to see if it contains undisturbed land within 200 metres of water, within a sand dune system, on a ridge top, ridge line or headland, location within 200 metres of a cliff face or within 20 metres of a cave or rock shelter.

It is reasonable to conclude that after answering no to both steps, there are no known Aboriginal objects, and a low probability of objects. Proceed with caution. If the answer is yes, then it may be possible to avoid impacts within the relevant areas, in which case move to Step 3.

Step 3 – Mitigation.

If harm to Aboriginal objects or to the appropriate landscape can be avoided, proceed with caution.

Step 4 – Desktop assessment

Involves collating all readily available information and a visual inspection of the area to assess potential, and must include the entire area of activity – not just the area identified in Step 2. The visual inspection must be undertaken by a suitably qualified individual.

Should the desktop assessment indicate that work may not proceed without an AHIP, further investigation must proceed under the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (DECCW 2010).

APPENDIX B: AHIMS SEARCH RESULTS

Office of Environment & Heritage

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : 1724
Client Service ID : 298971

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
45-5-2499	RC 13 - "Roscrea 13"	AGD	56	283890	6250660	Open site	Valid	Artefact : -	Isolated Find	
	Contact	Recorders	Doctor.Jo McDonald,Stephanie Garling					Permits		
45-5-2500	RC 12 - "Roscrea 12"	AGD	56	283820	6250850	Open site	Valid	Artefact : -	Open Camp Site	
	Contact	Recorders	Doctor.Jo McDonald,Stephanie Garling					Permits		
45-5-0987	WAL 1;	AGD	56	281100	6249900	Closed site	Valid	Artefact : -	Shelter with Deposit	
	Contact	Recorders	Iain Stuart					Permits		
45-5-0988	WAL 2;	AGD	56	283500	6249900	Open site	Valid	Artefact : -	Isolated Find	
	Contact	Recorders	Iain Stuart					Permits		
45-5-2349	Jerry's Ck 1;	AGD	56	281940	6250800	Open site	Valid	Artefact : -	Open Camp Site	
	Contact	Recorders	Huw Barton,Tony Kondek					Permits		
45-5-2350	Jerry's Ck 2 (JC2);	AGD	56	281980	6250720	Open site	Valid	Artefact : -	Open Camp Site	
	Contact	Recorders	Huw Barton,Tony Kondek					Permits		
45-5-2351	Jerry's Ck 3 (JC3);	AGD	56	281800	6250450	Open site	Valid	Artefact : -	Open Camp Site	
	Contact	Recorders	Huw Barton,Tony Kondek					Permits		
45-5-3103	Siverdale Road 1	AGD	56	281150	6250100	Open site	Valid	Modified Tree (Carved or Scarred) : 1		
	Contact T Russell	Recorders	Emma Lees					Permits		

Report generated by AHIMS Web Service on 31/08/2017 for David Marcus for the following area at Lot : 2, DP:DP1108408 with a Buffer of 1000 meters. Additional Info : To form part of a due diligence assessment. Number of Aboriginal sites and Aboriginal objects found is 8

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

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APPENDIX C: CONCEPT DESIGNS

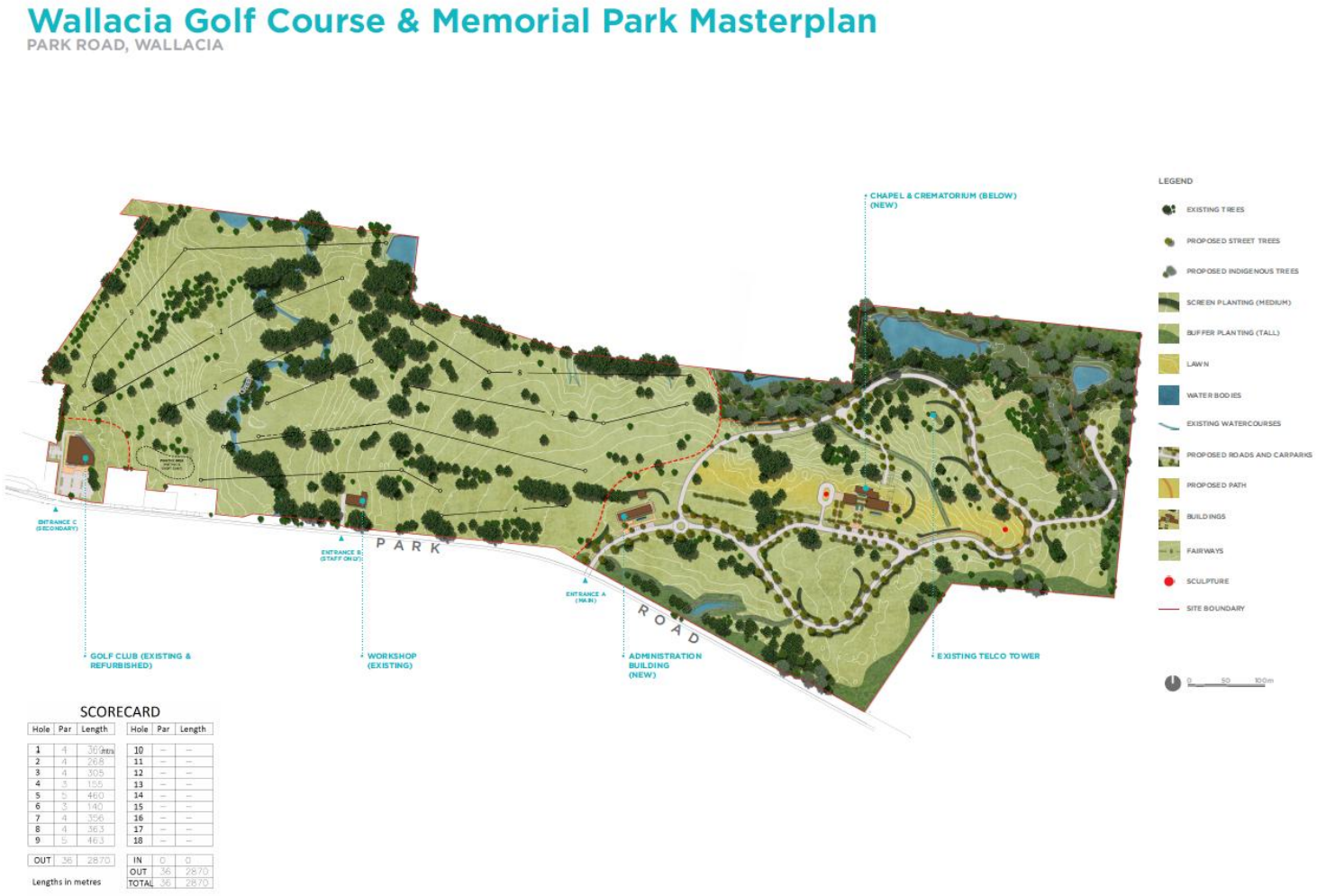

Figure 1: Wallacia Golf Course & Memorial Park Masterplan.