COMBER CONSULTANTS

ARCHAEOLOGY – HERITAGE – MEDIATION – ARBITRATION

TOGA PENRITH

Aboriginal Archaeological Assessment

87-91 Union Road/634-638 High Street in Penrith

PREPARED BY	JILLIAN COMBER
REPORT TO	TOGA
LGA	PENRITH
VERSION NO	C.2018
DATE	JANUARY 2020

COMBER CONSULTANTS

ARCHAEOLOGY – HERITAGE – MEDIATION – ARBITRATION

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EXECUTIVE SUMMARY

TOGA proposes the development of a site on the on the corner of Mulgoa Road and High Street, Penrith.

To ensure that the significant Aboriginal cultural heritage is not adversely impacted upon TOGA Penrith have commissioned Comber Consultants to undertake an Aboriginal archaeological assessment, Aboriginal consultation and archaeological testing.

The assessment of the site was undertaken in March 2018. That report recommended that Aboriginal consultation in accordance with DPIE's *Aboriginal Cultural Heritage Consultation Guidelines 2010* be undertaken. Once the consultation was completed, Aboriginal archaeological testing was required to determine if any Aboriginal objects were present on the site and, if so, their nature and extent. As recommended, Aboriginal consultation was undertaken. Once the consultation was completed Aboriginal archaeological testing was undertaken. The results of the testing indicated that no Aboriginal objects were located on Site 1. As the testing indicated that there are no Aboriginal objects on Site 1, the redevelopment of Site 1 can proceed without any further testing, salvage, monitoring or assessment. An AHIP is not required for Site 1 which is located on the western side of John Tipping Grove.

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BACKGROUND
LOCATION

1.0 INTRODUCTION

1.1 Background

TOGA proposes the construction of the High Street Penrith development which will create a new urban residential and mixed-use precinct and marker for the western gateway of the Penrith CBD. The development will draw inspiration from the historic role of the Nepean River as a place of meeting and gathering with its high quality public realm, civic and retail amenities.

The site is located at 87-91 Union Road / 634-638 High Street in Penrith (Site 1). Toga has another site at 640-652 High Street Penrith (Site 2) which will be progressed in a separate Development Application. Toga's sites are dissected by John Tipping Grove which is a council owned road. This document has been prepared for the Development Application on Site 1, 87-91 Union Road / 634-368 High Street Penrith.

The proposal for Site 1 (the subject of this report) will consist of one level of basement car parking, ca.356 apartments and 5 levels of podium containing commercial/retain tenancies and carparking.

To ensure that the significant Aboriginal cultural heritage is not adversely impacted upon TOGA Penrith have commissioned Comber Consultants to undertake an Aboriginal archaeological assessment and prepare this Aboriginal archaeological report. This report has been prepared in accordance with the Office of Environment & Heritage's (OEHs) *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW*.

1.2 Location

The study area is located on the corner of Mulgoa Road and High Street, Penrith. Penrith is located approximately 50km to the west of the Sydney Central Business District (CBD) (**Error! Reference source not found.**) within the Penrith City Council Local Government Area.

The site is bound to the east by a vacant block and factories, to the south by Union Road and to the west Mulgoa Road and to the north by High Street. The site is also known by the following Lot and DP's (**Error! Reference source not found.**).

- Part Lot 12
- Lot 13 DP 717196
- Lot 3 DP 242506
- Lot 36 DP 731213
- Lot 1 DP 544302
- Lot 2 DP 1202310

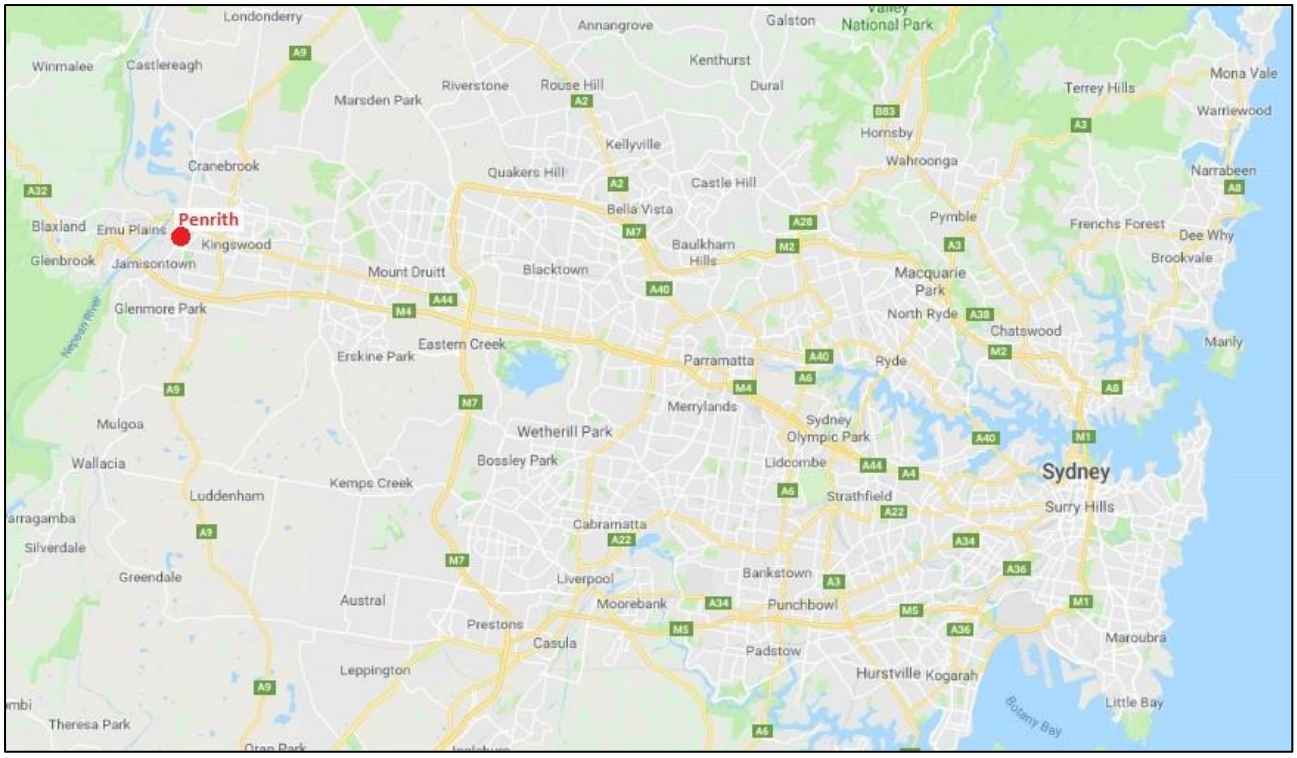

Figure 1: Location of Penrith.

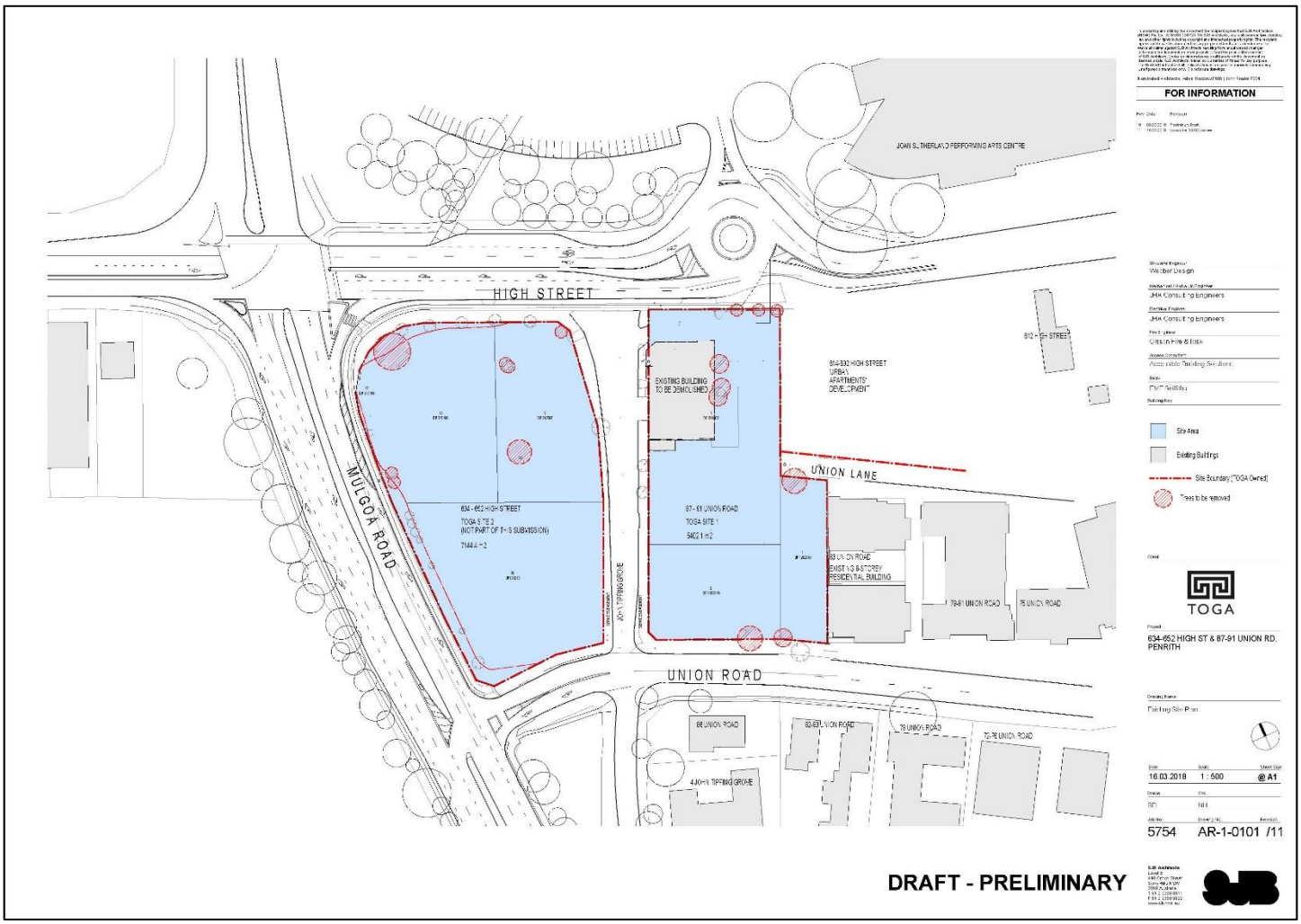

Figure 2: Sites 1 and 2 highlighted in blue.

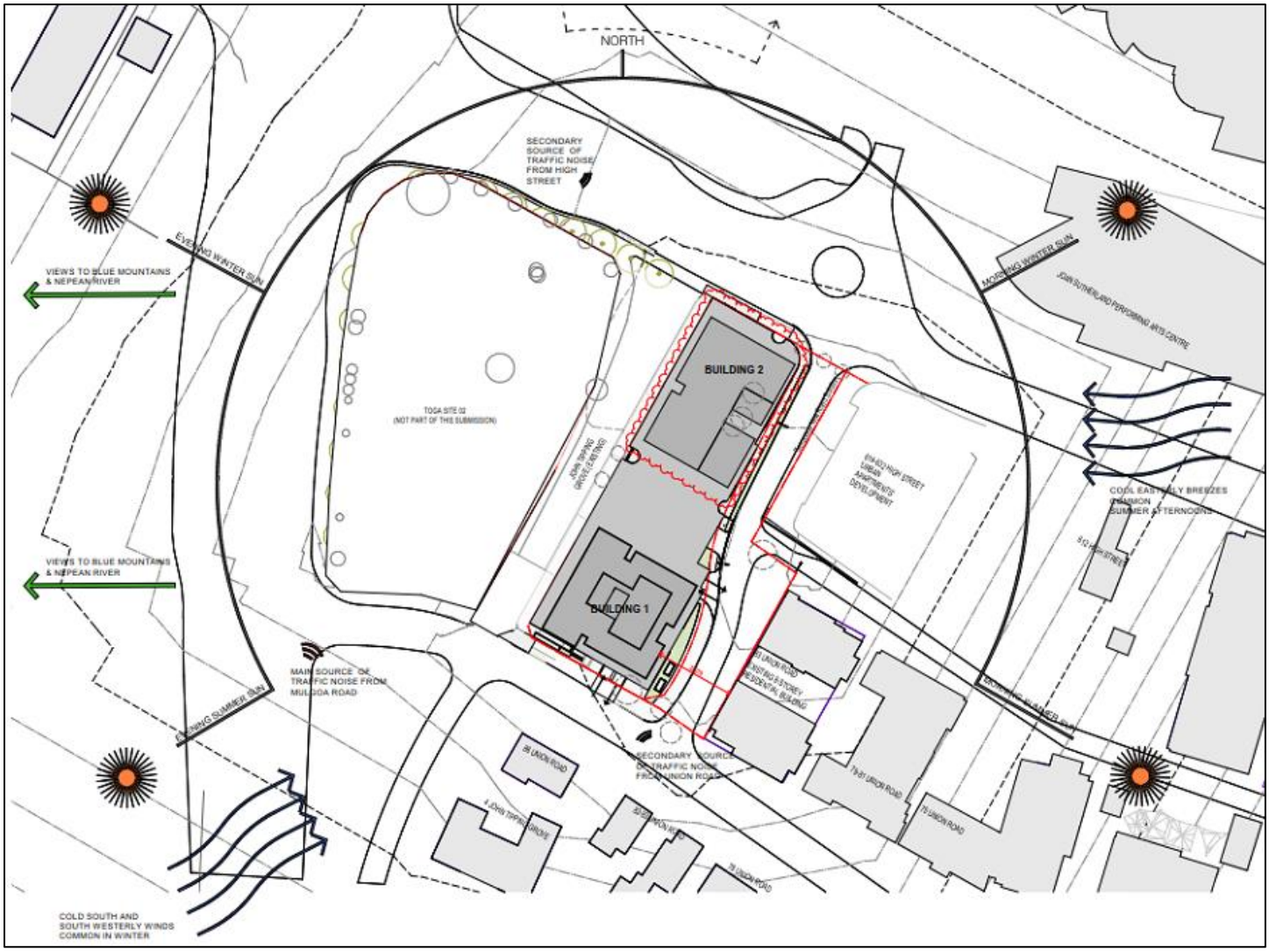

Figure 3: Proposed redevelopment of Site 1

2.0 METHODOLOGY

METHODOLOGY
SURVEY COVERAGE

2.0 METHODOLOGY

2.1 Methodology

This project was conducted in three stages, being background research, field survey and report preparation, as detailed below.

Stage 1: Background Research
Prior to the field component of this project, the Aboriginal Heritage Information Management System (AHIMS) of the Office of Environment and Heritage (OEH) was searched on 23rd February 2018. The extensive search is attached at Appendix A. Site data, associated documents and archaeological survey reports held by AHIMS were reviewed. Environmental information relating to Aboriginal land use was also researched. Such research facilitated an understanding of the potential nature of sites and site patterning in the region, which enabled a predictive statement to be made. It also provided an archaeological and environmental context within which a significance assessment could be made, if any Aboriginal sites were located during the field survey.

Stage 2: Site Inspection
The archaeological site inspection was undertaken on Monday 18th December with the following people:

- Ms Alandra Tasire, Archaeologist, Comber Consultants.
- Mr Rivers McEwen, Field Assistant, Comber Consultants.

The whole of the study area was inspected on foot.
The site inspection was undertaken on foot. The study area is comprised of two fenced property areas with an access road running north to south through the two properties. The eastern section is a caryard and carpark, the carpark has been closed to traffic since February 2018. The eastern side is a warehouse outlet with carpark. The carpark area is no longer in use (see Figure ***2*** for aerial of study area prior to discontinued use of carparks).

Stage 3: Report Preparation
Further archaeological research was conducted, where necessary, to clarify the results of the survey. This report was then compiled and provided to Toga.

2.2 Survey Coverage

OEH's *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (2010:16-19) requires that the survey coverage be presented in a table as detailed below.

The effective survey coverage is estimated at 3% as detailed in Table 3 below.

Survey Unit	Landform	Survey Unit area (sq. m)	Visibility %	Exposure %	Effective coverage area (sq. m)	Effective Coverage %
1	Plain	1500	10%	0%	0	0

Table 3: Survey Coverage

3.0 ABORIGINAL HISTORY

3.0 ABORIGINAL HISTORY

The Mulgoa clan of the Darug were the traditional owners of the land around the Penrith area on the Cumberland Plain. Knowledge of the names and boundaries of language groups and bands in Sydney is incomplete due to the scarcity of reliable data. Although exact figures for the Aboriginal population at the time Europeans arrived is not known, estimates for the greater Sydney region range from 2000-3000 to 4000-8000 (Attenbrow 2002:17). The population of the Darug occupying the Cumberland Plain was probably from 500-1000 (Hinkson 2001; Kohen 1986:76), who divided into smaller communities of from 35 to 60 people who camped, travelled, foraged, fished and hunted together. In April these communities would congregate around the swamps to catch eels whilst in summer when food was plentiful several of these communities would gather along the Nepean River. In winter these communities split into smaller extended family groups (Kohen 1993:3).

Aboriginal communities allocated responsibility for the care of different geographical areas to individuals, families or groups (Kohen 1986:9). Clan groups, who were one family consisting of husband, wife, children, grandparents, unmarried adult males and females etc., had a spiritual relationship to the land they regarded as their territory, or estate. However, on a daily basis several clans often hunted, fished and collected food together across the various clan territories. This not only ensured economic survival but provided a broader range of adults of marriageable age, as men and women of the same clan could not marry. These groups are known as bands. They had an economic relationship to the land and their range could overlap several clan estates. On special occasions such as initiations, funerals and other ceremonial occasions much larger groups from further afield would assemble (Attenbrow: 2002:28).

Clans in the Hawkesbury-Nepean area all claim membership through the father (patrilineal) and receive their clan design through him (Attenbrow 2002:72).

'Darug' is primarily a linguistic term used to describe the language or dialects spoken by many clan groups in the greater Sydney area, but with regional differences. The people of the Sydney coastal areas spoke a dialect of the Darug language and had many different cultural customs to the people of the Hawkesbury-Nepean/Cumberland Plain area. The people on the western side of the Hawkesbury-Nepean River also spoke a dialect of Darug and had different customs. Some linguists refer to 'coastal Darug" and 'hinterland Darug' to distinguish between the groups living in the Port Jackson-Botany Bay area, and those living in the Cumberland Plain area. The land of the "hinterland Darug" stretches from Appin in the south to the Hawkesbury River in the north, and west of the Georges River, Parramatta, Lane Cove River and Berowra Creek (Attenbrow: 2002:34). The people of central Sydney, sometimes called the Eora, spoke a Darug dialect (Kohen 1986 9) and could converse with people living near the Nepean, but did have many different words (Attenbrow 2002:31).

"Darug" was used by the Aboriginal people along the Nepean River to describe themselves to Colonial ethnographer R H Mathew in the late nineteenth century (Kohen 1986:60). The word Darug was recorded by early Colonists as a word for "a kind of wild yam" and it was noted that the yam was a stable diet of the people living along the banks of the Hawkesbury River (Kohen:1986:60).

Spiritual belief permeated every aspect of Darug culture. Every aspect of the life for the Darug was governed by religious beliefs which were based on their skin (sometimes referred to as a "totem". However, the term "totem" tends to trivialise a highly complex spiritual life. Each skin (or clan) had their own clan design which was based on *skin names* ie, the name of a plant animal or object given to each child at birth and passed on through the father. People could not marry anyone with the same skin name; a hunter would not kill any animal whose skin name he carried; no-one would eat a plant or animal of their skin name. In this way it was thought to protect and encourage the increase of a persons particular name-sake. There were specific male and female skin names. These clan designs were represented in the body marking, the designs on possum skin cloaks, necklaces, hair-styles and on carved trees (Attenbrow 2002:108).

Members of the Darug clan believed that in the Dreaming all the animals existing today had human attributes (Kohen 1993, 39). They lived in trees, clouds, mountains and other natural features of the landscape.

Some beliefs applied to all people, but others were specifically for male or females only. Similarly, some ceremonies were celebrated by all while others were performed by segregated groups (Kohen 1993:33).

A large bird, possibly the white-whinged chuff, was regarded by the Darug as a deliverer of bad messages (Kohen 1993, 35).

Different burial practices were carried out depending on the status of the person. Burials occurred along the banks of the Hawkesbury and Nepean Rivers. Ground-edge hatchets and other personal items were often buried with their owners (Kohen 1993:33), whilst trees were carved with the persons clan or skin design to mark a burial

As early as 1793 it was recorded that the people who lived between Parramatta and the Blue Mountains were more dependent upon plant food and the hunting of small animals rather than fishing although fresh-water mullet and eel were seasonally available (Kohen 1986:77). A paste of yam, and ants was mixed together, sometime with ant eggs as well (Collins 1802:462).

More plant foods were available in spring, summer and autumn than in winter. Yams and tubers were present all year but they have greater nutrient value at different times of the year. Seeds of two species of macrozamia were a major source of carbohydrate. However, as the macrozamia seed is poisonous they needed careful preparation to remove the toxins. These were leached out either by soaking the nuts in rain water for several days in nets made from possum fur, or placing them under rocks at the bottom of a stream. The nuts were then baked into “cakes about 15 inches in diameter to be eaten when hungry” (Kohen 1986:40).

There were many tuberous plants which grew in the rich soil deposited on the banks of the Nepean when the river flooded, including orchids, lilies and several sorts of ferns. The common bracken was also a food source. Other edible tubers came from *Glycine tabacina,* which had a licorice flavour, *Eustrephus latifolia* and *Geitonoplesium cymosum* (Kohen 1986:41).

William Dawes, who recorded extensively in the early days of the colony, suggested that the Sydney region Aborigines grouped plants in three categories: *wigi,* fruit or berries, like the macrozamia; *watangal,* plants with honey-bearing flowers like the grevilleas and melaleucas, and plants which came from under the ground, although there was no single word for this group (Kohen 1986:43). Plants provided a varied and nutritional diet.

Governor Phillip recorded that the Aborigines regularly burned areas of the Cumberland Plain to catch small animals for food, but regular burning also reportedly resulted in larger macrozamia berries, and the regeneration of tuberous plants may also have benefited (Kohen 1986:51).

A large variety of small animals was available along the banks of the Nepean and in the adjacent woodlands, such as the eastern grey kangaroo (*Macropus giganteus),* wallabies and the brush-tailed possum which still exist in the Castlereagh Nature Reserve on the eastern side of The Northern Road near Penrith (Plan of Management Agnes Banks etc Nature Reserves 1999, 12). Small birds such as quail were trapped along the river, and there were emus as well in the early days of European settlement possibly providing eggs (Kohen 1999:52).

Possums provided a significant source of protein in the diet. Toe-holds were cut into trees with an axe or hatchet, to assist in tree-climbing, or to hollow out the base of trees so fires could be lit to drive the possums into the open. Large fruit bats, or flying foxes, were also caught in this way (Kohen 1986:79).

Women and children were responsible for collecting yams, fruit, roots and small game such as lizards and birds, which formed the basis of the diet, while the men hunted for wallabies, possums, and quails with traps and snares. Pitfall traps were also dug for larger animals. It is thought that kangaroo hunting was pursued more as a social function than as a source of food. Fires were lit to drive the kangaroos in the required direction and, watched by a large crowd, the men threw spears at the animals as they rushed past (Kohen 1986:78).

Fish were trapped in small pools formed in the rivers and streams by arranging logs and stones into retaining walls, then speared with a multi-pronged spear made specifically for the purpose. Mussels, yabbies, tortoises and water birds also contributed to the diet (Kohen 1993:78).

Hatchets used to cut trees were made from the basalt pebbles collected from the gravel beds of the Hawkesbury and Nepean Rivers. This raw material was highly valued and possibly formed part of a trade system between the coastal and inland Darug.

The sandstone country around the Hawkesbury-Nepean provided a range of stone materials for manufacturing tools. Small quartz pebbles, about 10mm-15mm across, formed in the sandstone and were used to make small sharp points or cutting implements. They could be gathered from along the banks of the river and small creeks. In the western part of the Cumberland Plain, a number of stone outcrops contained silcrete, a highly siliceous material suitable for small tool manufacture. Quartzite and quartz was also available as pebbles, stones or boulders. Silcrete outcrops are located at Luddenham approximately 20km

to the south, Plumpton approximately 15km to the west, St Clair approximately 15km to the south-east and Erskine Park approximately 20km to the south-east. Other material used in the manufacture of stone tools on the Cumberland Plain, such as chert, tuff, quartz, basalt and quartzite, are located within the Rickabys Creek Formation, which is located between Cranebrook and Windsor, to the north of the survey area with some outcrops just to the west of the survey area (Jones & Clark 1991:32-33; Smith 1989a:9-11 & 1989b:6-7). In addition the St Mary's Formation, occurring in the valleys of Mulgoa Creek, South and Eastern Creeks contains silcrete. Rickaby's Creek Gravels, also containing hornfels, porphyry and tuff, occurs over a similar wide area, and Maroota Sands, which in addition to the quartz and silcrete materials, contains jasper, agate, and chert (Attenbrow 2002, 44). Plumpton Ridge, running near Richmond Road between Bells Creek and Eastern Creek, contains such large amounts of silcrete that Aboriginal people travelled long distances to collect it. Local Darug histories suggest that the ridge may have been a winter camping site (Hinkson: 2001:149).

Food was collected by the women with digging sticks, then placed into string bags and in wooden dishes (*coolamons)* made from various eucalyptus trees to be carried back to the camp site (Kohen 1993:28). The women's toolkit consisted of a digging stock, string bags, woven baskets and coolomons. With this toolkit a woman could collect sufficient food to ensure that her family was well fed.

Canoes, suited to the gentle flow of the Hawkesbury, were constructed from large pieces of bark cut from a tree and tied at both ends with vines (Kohen 1986:80). These, as well as well-worn paths, were used to travel up and down the river.

People lived in small huts made of bark, usually along the shores of rivers and streams, or in the valley bottoms. Smaller huts were probably used for a few days only while collecting provisions from hunting or fishing, while larger more permanent places were used for longer periods, perhaps during winter camps. In 1816, a 'village' of about 70 huts was recorded near present-day Bent's Basin on the Nepean River (Kohen 1986:71).

Rock shelters in the sandstone hills were used, sometimes for accommodation and sometimes for ceremonial purposes. Paintings made with coloured ochres in the rock shelters were often linked to ceremonial occasions and in areas near the Hawkesbury stone arrangements may have been used as directional indicators pointing to the rock art galleries (Kohen 1993:7).

Red (iron oxide) and yellow (limonite) ochres occurring in the ironstone layers of the St Mary's Formation have been suggested as possible sources for ochres used for decorating peoples' bodies, weapons and tools, and for making pigments used in rock shelters and burials. White pipeclay, found in the clays beside rivers and streams, was used to adorned the heads and shoulders of male mourners if a man suffered a violent death (Kohen 1993:32).

Fibre for string and ropes was obtained from several different plants, the most important belonging to the families Sterculiaceae and Malvaceae. These included *Abutilon oxycarpum, Hibiscus spp., Camersonia fraseri, Rulingia pannosa,* and both species of *Brachychiton.* The roots of *ficus spp.* were also a source of fibre, while baskets for collecting various foods, were woven from *Dianella laevis, Doryanthes excels, Lomandra spp., Livistona australis and Phragmites communis (*Kohen 1986:47).

Adhesives were obtained from the grasstree *Xanthorrhoea resinosa var resinosa* and from wax from the hives of the small black bee, *Trigona spp.* The flower stalk of the grasstree were often used for spear shafts, topped with a hardwood point. The resin would be used to fasten the point to the tip of the shaft, to fasten hatchets into a hafted handle, to patch canoes and baskets, and also for fastening decorative objects into hairstyles (Attenbrow 2002:117). Nets made of possum fur in which the Macrozamia. were soaked to leach out the toxins (Kohen 1986:40)

Winters around the Nepean and the foot of the Blue Mountains could be quite chilly, and people from this area are shown in early colonial drawings wearing long, enveloping cloaks made from sugar glider, possum or kangaroo skins, one of which was described by Governor Phillip as "neatly sewn together, the inside ornamented with diamonds of curved lines, by raising the skin with the point of a small bone needle". Bark cloaks were also used as protection from the rain (Attenbrow 2002:107).

The soft papery bark of the *Melaleuca* was used by women to wrap their babies (Kohen 1986:47), until the babies were old enough to grab onto the mother's hair when carried on her back

4.0 ENVIRONMENTAL CONTEXT

TOPOGRAPHY
GEOLOGY
STREAM ORDER MODELLING
VEGETATION
CURRENT LAND USE & DISTURBANCE

4.0 ENVIRONMENBTAL CONTEXT

4.1 Topography

The survey area is located within the Cumberland Plain which is characterised by low gently undulating slopes. The Cumberland Plain covers approximately 600 square kilometres. It is bordered on the west by the Blue Mountains and on the east by the Georges River and headwaters of the Parramatta Rivers. To the north is the Hornsby Plateau and to the south is the Woronora Plateau (Smith 1989a:8).

The study area is located on The Cumberland Lowlands which consists of low lying, gently undulating plains and low hills on Wianamatta Group shales and sandstone with a dense drainage net of predominantly northward flowing channels (Bannerman & Hazelton 1989:2). The study area is located on a high river terrace overlooking the Nepean River with the land gently sloping to the east towards Peachtree Creek.

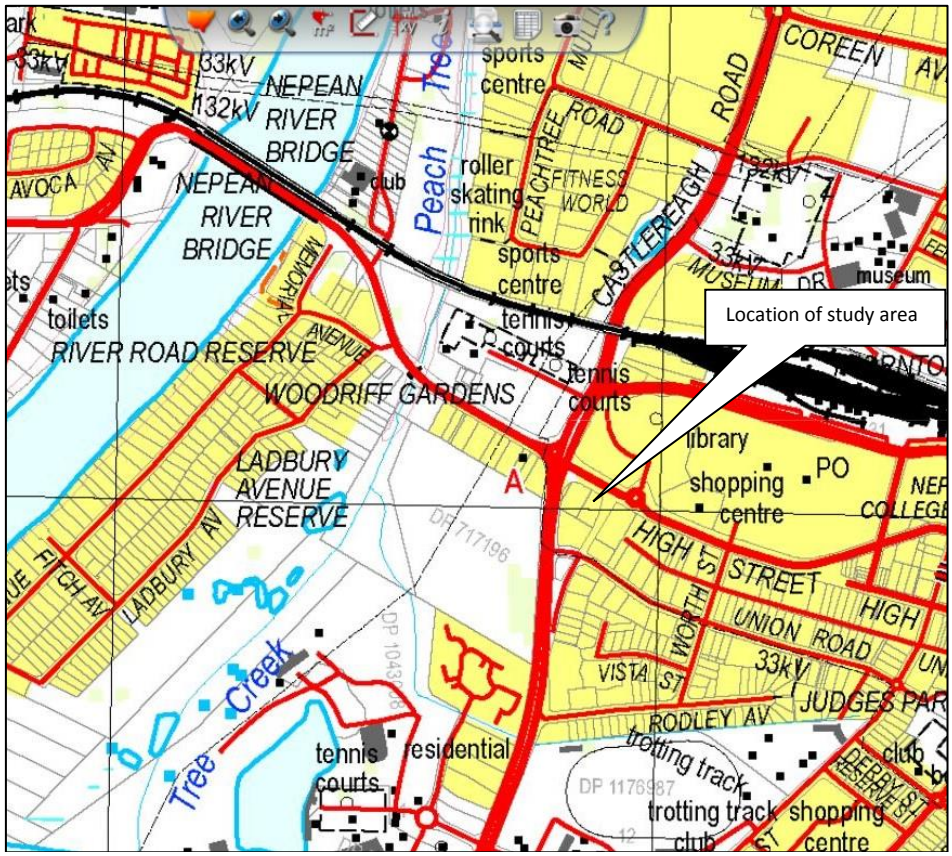

Figure 3: Location of study area indicated

4.2 Geology

The Cumberland Plain overlies the Wianamatta Group of Shales. Within the study area the Wiamanatta Group of shales overlies Hawkesbury Sandstone (sandstone with some quartz). Hawkesbury Sandstone provides materials suitable for the manufacture of ground edge axes and weathers to provide rockshelter suitable for habitation or surfaces for art.

Surrounding the study area is the Liverpool Sub-group which includes Bringelly Shales, Ashfield Shales and Minchinbury Sandstone (Sydney 1:250,000 Geological Map). This sub-group is comprised of shales, carbonaceous claystones, claystones laminate, fine to medium grained lithic sandstone and some coal (Smith 1989a:8).

Several locations on the Cumberland Plain within the vicinity of the study area contain suitable material for stone tool manufacture, such as silcrete. Silcrete outcrops are located at Luddenham approximately 15kms to the southwest, Plumpton approximately 25kms to the north-west, St Clair approximately 15km to the north-west and Erskine Park approximately 10km

to the north-west. Other material used in the manufacture of stone tools on the Cumberland Plain, includes chert, tuff, quartz, basalt and quartzite, which are located within the Rickabys Creek Formation, approximately 5km to the north of the study area (Clarke & Jones 1988, Smith 1989a:9-11 & 1989b:6-7). It is also likely that volcanic materials were obtained from the dolerite quarry just east of Prospect Reservoir.

The Rickaby's Creek Formation is located between Cranebrook (approximately 5km to the north of Penrith) and Windsor (approximately 18km north east of Penrith) and forms the basalt layer of the high-level river terrace of the current study area. It is comprised of quartz, quartzite, silcrete, chert, porphyry and basalt in a sandy clay matrix (Penrith 1:100,000 geological sheet; Jones & Clark 1991:32 – 33), materials which are all suitable for the manufacture of stone tools.

The Tertiary Cranebrook Formation covers an area of approximately 25km^2, adjacent to the Nepean River between Mulgoa (approximately 9km to the south of Penrith) and Castlereagh (approximately 7km to the north of Penrith), which includes the present study area. This feature forms the Cranebrook Terrace, 14 -16m above the level of the Nepean River (Jones & Clark 1991:43). The Cranebrook Formation consists of pebbles and cobbles of quartz, quartzite, chert, porphyry, granite, hornfels and silcrete (Penrith 1:100,000 geological map; Jones & Clark 1991:43-49). The quartz, chert, tuff, hornfels and silcrete of the Cranebrook Formation would have provided materials for the manufacture of small stone tools. The basalt from the Cranebrook Formation would have been suitable for the manufacture of ground edge axes. Excavations by Comber (2010) at Penrith Lakes where over 2,000 predominantly silcrete artefacts were retrieved indicates the importance of the Cranebrook Formation in respect of lithic resources.

Lithic materials such as quartz, quarzite, chert, silcrete, tuff are all suitable for small tool manufacture whilst sandstone and basalt is suitable for axes. The sandstone also provides shelter and a suitable surface for art and sharpening axes.

4.3 Stream Order Modelling

Stream order can be used to predict Aboriginal land use patterns.

A first order stream is the smallest and is a small tributary that flows into and feeds larger streams but does not normally have any water flowing into it. The joining of two first order streams creates a second order stream and when two second order streams join they form a third order stream. In addition, first and second order streams generally form on steep slopes and flow quickly until they slow down and meet the next order waterway. First order streams are intermittent (Horton 1945; Strahler 1952).

Modelling undertaken by McDonald and Mitchell (1994) on the Cumberland Plain indicates that stream order can be used to predict areas of archaeological potential. The model hypothesis is that in any particular climate and landscape, a threshold catchment area is necessary to allow permanent stream flow or the establishment of waterholes with extended longevity (i.e. months to years). The critical point where these conditions are met appears to be at the junction of two second or third order streams. Such a location is likely to contain more complex sites with a high density of artefacts, whilst second and third order streams are also likely to contain large sites within 100 metres of the watercourse.

The study area is located approximately 700m to the east of the Nepean River, a third order stream, and less than 2km south of the wetland area at the junction of the Nepean River with Peachtree Creek and Boundary Creek – both second order creeks. Peachtree Creek is located approximately 100m to the west and Boundary Creek is approximately 1km to the north of the study area. The site is about 3km south of the wetlands associated with Penrith Lakes. Such a location near the junction of a third order and two second order creeks is predicted to contain more complex sits with a high density of artefacts (McDonald and Mitchelll (1994).

4.4 Vegetation

The present distribution of vegetation on the Cumberland Plain is more a result of European land use management activities. The study area itself is now devoid of precontact vegetation and is covered in pasture grasses and introduced weeds.

The vegetation of the study area was mapped by Benson (1989, 1981 & 2002) and the NSW National Parks & Wildlife Service (2002). Historically, the undulating slopes of Western Sydney would have supported a tall open-forest of Cumberland Plain Woodland. The area immediately around the Nepean River would have supported an Alluvial Woodland characterised by

Eucalyptus moluccana (Grey Box) in association with *Eucalyptus tereticornis* (Forest Red Gum). The understorey would have consisted of *Acacia parramattensis*, *Acacia floribunda* and other acacia sp., *Casuarina cunninghamiana* (River Oak) and *Bursaria spinosa* (Sweet Bursaria, Blackthorn) with grasses of *Themeda australis* (Kangaroo Grass) and *Lomandra longifolia*.

Such a vegetation community would have provided a variety of edible plant species and plants suitable for artefact manufacture. For example, the tall Grey Box and Red Gum would have provided bark to make coolamons, shields or canoes, whilst the long Lomandra leaves would have been used for basket weaving (Baker et al 1986:136). Acacia gum was a sweet nutritious food source and the acacia seeds were a valuable source of protein. The dried seeds were ground between stones and baked as a bread/damper and the green seeds eaten like peas (Low 1992:86). In addition, Cumberland Plain vegetation provided habitat for a variety of marsupials and birds whilst the Nepean River and associated creeks would have provided eels, fish, yabbies and other crustaceans.

The study area is located close to wetland areas of seasonal or semi-permanent freshwater swamps and lagoons. These would have been important for fresh water whilst supporting waterfowl and seafood. They would also have provided the environment for sedgelands dominated by members of the Cyperaceae and Restionaceae families which provided a variety of food sources including woody rhizomes which were ground and eaten (Low 1992).

4.5 Current land use and disturbance

The 1943 aerial photograph shown at Figure 4 shows the study area to contain houses with outbuildings. Site 2 contains vacant land. There is a road running between Sites 1 and 2. Ploughed agricultural land is located to the west and south. By 2018 the study area recently contained a car yard and parking lot paved in cement, although the study area is now vacant. The road shown in the 1943 aerial is still located within the centre of the site. The disturbance would have included minor excavation for the foundations of the houses plus levelling of the site with the introduction of fill to raise the site prior to the pouring of the current concrete paving. As indicated by previous archaeological excavations within the Penrith area such disturbance would not have been sufficient to destroy any subsurface archaeological deposits.

Figure 4: 1943 aerial with the study area edged in red.

4.0 ARCHAEOLOGICAL CONTEXT

SYDNEY
PENRITH
THE STUDY AREA
PREDICTIVE MODEL

5.0 ARCHAEOLOGICAL CONTEXT

5.1 Sydney region

Many surveys have been undertaken in the Sydney region which indicate the richness of the archaeological resources and which provide information about Aboriginal occupation within the region. In particular, Attenbrow (2003) has excavated a range of sites within the Sydney Basin. The aim of her study was to identify local geographic variation and temporal changes in the subsistence patterns and material culture of the people of this area. She excavated sites at Balmoral Beach, Cammeray, Castle Cove, Sugarloaf Point (Lane Cove River), Darling Mills State Forest, Winston Hills, Vaucluse and Cumberland Street in the Rocks. Dates for initial occupation range from approximately 10,000 years BP at Darling Mills to approximately 450 years BP at Cumberland Street, the Rocks.

One of the oldest dated occupations for the Sydney region is 15,000 years BP from the Shaws Creek K2 rockshelter on the Nepean River (Kohen 1984; Nanson et al. 1987). The dates obtained by Kohen (1984) and Attenbrow (2003) must be considered in association with environmental data related to sea level rises. The Sydney region that we know today was vastly different to the landscape of 15,000 years ago.

The period of maximum glaciation was 15,000 – 18,000 years BP. Therefore the date of the K2 rockshelter and Attenbrow's Darling Mills site indicate that Aboriginal people lived throughout a period of extreme environmental change. During this period, sea levels were up to 130m below current sea levels (Nutley 2006: 1). About 10,000 years ago, as temperatures began rising at the end of the last ice age, the polar ice started melting and sea levels rose. The rising sea levels forced people to abandon coastal sites and move inland, with the result that the oldest coastal sites were inundated.

By about 6,000 years ago, rising water levels had flooded the coastal plain forming the Sydney landscape that we know today. The vast majority of sites in the Sydney region date to around 5,000 years BP, after sea levels had stabilised. Whilst research into submerged indigenous sites is now being undertaken (Nutley 2006), there are few sites in the Sydney area that are known to date beyond 10,000 years BP. Therefore research undertaken to date has focused on subsistence patterns and cultural change, e.g. Attenbrow (2003).

Many archaeological surveys have been conducted within the Sydney region, particularly on the Cumberland Plain, in relation to Environmental Impact Statements. As a result of those studies, which were occasioned by the burgeoning urban expansion extending into the Cumberland Plain, the NPWS recognised the need for a coherent study of the area to fully assess the impact of urbanisation on the natural and cultural heritage of the Cumberland Plain. Smith (1989a) was commissioned by the NPWS to undertake an Aboriginal Site Planning Study to be utilised in the management of Aboriginal sites on the Cumberland Plain. Prior to her study, 307 sites had been recorded on the Cumberland Plain, mainly open artefact scatters (297) with four scarred trees, one carved tree, four axe-grinding grooves and a Mission site (the Blacktown Institute). Smith (1989a:2) added 79 open sites and 29 isolated finds from field surveys related to her study.

Smith's (1989a:3) analysis indicated that site location and site densities were influenced by the availability of water and raw materials. She concluded that other factors such as topography, natural vegetation and soil types did not influence site location.

She also identified that the majority of sites recorded have been in the northern sector of the Cumberland Plain, during site surveys of areas threatened by development (Smith 1989a:21). Her field studies (1989a & 1989b:10) confirmed that site densities in the southern Cumberland Plain appear to be lower overall to site densities on the northern Plain.

Since Smith's study, there has been a dramatic increase in development in Western Sydney, resulting in a great deal more archaeological survey and excavation (Comber 1990, 1991, 2006; McDonald 1997, 2002 & 2005a). This further work has indicated the complexity in the archaeological record of the area that was not previously recognised. For example, sites on permanent water are more complex than sites on ephemeral drainage lines with major confluences being prime site locations. However, McDonald (2005a) reports that archaeological sites are found in a range of landscapes and that their condition is dependent on the amount of impact from European land practices.

McDonald's 2005a report demonstrates the dynamic nature of stone tool technologies on the Cumberland Plain. She reviewed previous work within a theoretical framework to identify intra and inter-regional variation. She not only identified change over time in the stone tool technology, but the manner in which "stone technologies were organised in relation to landscape"

(McDonald 2005a: np). Her report provides a framework to tentatively date sites through technological analyses and to identify cultural changes.

Her study also indicated that the surface representation of a site on the Cumberland Plain does not necessarily reflect the actuality of that site. Of the excavations conducted by her, sub-surface deposits were present even when there was no surface indication of a site. According to McDonald (2005a:5), "despite artefacts being rare or completely absent on the surface at each of the sites investigated, all six sites were found to contain intact archaeological deposit. Almost 500 square metres were excavated during this Project and almost 35,000 artefacts retrieved." McDonald (2005) also considers that Aboriginal occupation was focussed on the major river systems and characterised by mobility between a small number of sites. As a result of her various studies and applying stream order modelling she (2005) further predicts that the density and complexity of archaeological sites will vary according to stream order, as follows:

- Fourth-Fifth order creeks (or rivers): Archaeological evidence will be more complex and possibly stratified, reflecting more permanent and repeated occupation on major creeks.
- Third order creeks: Evidence of more frequent occupation such as knapping floors or higher artefact densities will be found in the lower reaches of tributary creeks.
- Second order creeks: Sparse archaeological evidence will be found which indicates occasional use and/or occupation.
- First order creeks: Due to the intermittent nature of water flow only very sparse evidence would be found in the headwaters of upper tributaries such as background artefact scatter.

Kohen's studies at Penrith confirmed the importance of fifth order creeks and rivers. He recorded over 50 sites in the Penrith area which included open artefact scatters, axe grinding grooves and rock shelters. Kohen (1997:7) indicates that sites occurring throughout the Penrith area "are particularly likely to occur adjacent to the rivers and creeks. The distribution of raw materials associated with the manufacture of stone tools suggests that chert and basalt were carried or traded east from the river gravels and that silcrete was traded or carried from sources near South Creek and Eastern Creek, west towards the Nepean flood plain".

Comber (2010d&e) also recorded open artefact scatters and scarred trees within the Cumberland Plain. She undertook excavation at two sites at Penrith Lakes known as Camenzulis (2010e) and PL9 (2010d). At PL9 she retrieved more than 1,500 artefacts, including backed blades and an edge ground axe. Her work confirms McDonald's (2005) and Kohen's predictive model that sites are more likely to occur adjacent to the rivers and high order creeks. These excavations (Comber 2010d&e) at Penrith Lakes further indicates the possibility that sub-surface archaeological deposits will remain despite disturbance by non-Aboriginal activities and the complexity of such sites. Surveys (2006c & d) undertaken prior to the excavations recorded the areas as being disturbed by agricultural activities. They had been grazed, ploughed, planted with crops and a dam constructed. Only a small number of artefacts were recorded on the surface but over 2,500 artefacts retrieved during excavation.

A survey undertaken by Comber (2008) and subsequent excavations undertaken by Stening (2011) at Doonside demonstrated that although no surface artefacts were recorded (Comber 2008) substantial subsurface deposits did exist on the site with over 1,000 artefacts being recovered from a highly disturbed context (Stening 2011). This site was located beside Eastern Creek an important 4th or 5th order creek. It is an important watershed with extensive evidence of Aboriginal occupation.

5.2 Penrith

A large number of sites have been recorded by Kohen (1997; 1981; 1984a and 1984b) and Comber (2006a and b; 2007; 2008; 2010) within the Penrith area.

Kohen recorded over 50 sites which included open artefact scatters, axe grinding grooves and rock shelters. Kohen (1997:7) indicates that sites occurring throughout the Penrith area "are particularly likely to occur adjacent to the rivers and creeks. The distribution of raw materials associated with the manufacture of stone tools suggests that chert and basalt were carried or traded east from the river gravels and that silcrete was traded or carried from sources near South Creek and Eastern Creek, west towards the Nepean flood plain".

Comber (2006a; 2010) also recorded open artefact scatters and scarred trees. She undertook excavation at two sites at Penrith Lakes known as Camenzulis (2006a) and PL9 (2010). At PL49 she retrieved more than 1,500 artefacts including backed blades and an edge ground axe. Her work confirms the predictive model developed by Kohen that sites are more likely to occur adjacent to the rivers and creeks. She also undertook an assessment (2006b) at Emu Plains on the banks of the Nepean River, but did not record any sites, although she did recommend sub-surface testing.

In 1986 Rich (1986) undertook a survey for Aboriginal sites for the proposed transmission line between Regentville and Penrith. She identified five open artefact scatters, none of which were recorded within the present study area. A Section 90 Consent to Destroy was issued for all of these sites in August 1987.

Dallas recorded an open artefact scatter (AHIMS 45-5-2414) comprising a hammerstone and a "mudstone" flake which was located approximately 700m to the south west of the present study area along a fence line of a trotting track.

Dallas also recorded an open campsite and potential archaeological deposit (AHIMS 45-5-2416) in close proximity to 45-5-2414. However, the AHIMS site card for AHIMS 45-5-2416 is a replication of the site card for 45-5-2414. Therefore, it is not clear whether these are two separate sites.

An isolated find (AHIMS 45-5-3317), comprising a chert flaked piece and an artefact scatter (AHIMS 45-5-3318) comprising two "mudstone" flakes and three "mudstone" flaked pieces were recorded in a sportsfield located 3km to the north east of the study area in a moderately disturbed context. During a survey by Stening (2013) these sites could not be relocated in the field (Stening 2013).

An isolated find and potential archaeological deposit (AHIMS 45-5-3319) was recorded approximately 2km to the north east of the present study area. The site comprised a red silcrete flake which was located on a dirt walking track (Figure 5).

Within 1.2 km of the study area 4 sites have been recorded: AHIMS 45-5-0539, 45-5-0540, 45-5-0541 and 45-5-4361 all open artefact scatters. Figure 5 shows the location of these sites.

The evidence from the above brief review of previous work within Penrith area indicates that sites are located throughout the area with larger more complex sites occurring near the confluence of the Nepean River and along creeks and rivers. The archaeological evidence also indicates that subsurface deposits can exist even if there is no evidence on the surface and despite subsequent disturbance.

5.3 The study area

The AHIMS search indicates that no known sites have been recorded within the study area. The study area is not a registered Aboriginal Place.

5.4 Site prediction

The above information indicates that it is possible that sites will be located in areas close to water and lithic resources, such as the location of the present study area. The area provided an abundance of resources including lithic material for stone tool manufacture and rock outcrops for art and to sharpen axes, a variety of plant and animal material for food and fresh water for drinking and the provision of fish and other seafood. The study area would have been an ideal camping and foraging location given its proximity to fresh water and located above the Nepean River.

It is expected that subsurface archaeological deposits which include stone artefacts, will be located across the study area. It is possible that *in situ* evidence might remain despite the construction of the car yard.

As there are no sandstone outcrops or platforms located within the study area, it is not expected that art sites, shelters or rock engravings would be located.

In addition, as the area has been cleared of original vegetation, it is not expected that scarred or carved trees would be located within the study area.

Figure 5: Sites 1 and 2 edged in red. Registered sites indicated

5.0 SITE INSPECTION

RESULTS
IMPACTS
MITIGATION

6.0 SITE INSPECTION/RESULTS

6.1 Site Inspection

The site inspection was undertaken on 18th December 2018. Both sites 1 and 2 were inspected on foot. No natural surfaces were observed. Weeds and grass are forcing their way through the concrete and bitumen. Please see photographs below.

Photograph: Looking north east from south west corner of study area.

Paved carpark area, no longer in use.

Figure 3: looking south from north eastern section of study area.

Carpark area with introduced sand and overgrown with grass and weeds.

Figure 4: Looking north west from south east corner of study area.

Carpark area overgrown with weeds and grass.

6.2 Impacts

The archaeological evidence indicates that it is possible that subsurface archaeological deposits, and possibly *insitu* deposits could exist within the subject property. Bulk excavation in relation to the proposed redevelopment has the potential to adversely impact on such deposits.

6.3 Mitigation

Once the assessment was completed it was recommended that archaeological testing be undertaken to determine if subsurface archaeological deposits Aboriginal objects were located on the property and if so, their nature and extent. Archaeological testing was undertaken from 6th to 17th August 2018 in accordance with OEH's *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW*. No Aboriginal objects were found on Site 1 on the eastern side of John Tipping Grove. Therefore, development of Site 1 can proceed without any further archaeological assessment, testing or salvage.

Please note that Aboriginal objects were located on Site 2 – on the western side of John Tipping Grove. Therefore, an AHIP and salvage will be required on the western side of the John Tipping Grove.

7.0 SIGNIFICANCE ASSESSMENT

PREAMBLE
CRITERIA
ASSESSMENT
STATEMENT OF SIGNIFICANCE

7.0 SIGNIFIANCE ASSESSMENT

7.1 Preamble

Significance assessment is the process whereby sites or landscapes are assessed to determine their value or importance to the community.

A range of criteria have been developed for assessing the significance which embody the values contained in the Burra Charter. The Burra Charter provides principles and guidelines for the conservation and management of cultural heritage places within Australia.

Following are the criteria which will be used to assess the significance of the study area.

7.2 Criteria

Social Value (sometimes termed 'Aboriginal' value) which refers to the spiritual, traditional, historical or contemporary associations or attachments which the place or area has for the present day Aboriginal community.

Historic Value refers to the associations of a place with a person, event, phase or activity of importance to the history of an Aboriginal community.

Scientific Value refers to the importance of a landscape, area, place or object because of its potential to provide information which is of value in scientific analysis and the ability to answer scientific or technical research questions.

Aesthetic Value refers to the sensory, scenic and creative aspects of the place.

Representativeness refers to whether the site demonstrates the principal characteristics of that site and is a good representative example of that site type.

Rarity refers to the degree to which such as site is known elsewhere and whether the site is uncommon, rare or endangered.

7.3 Assessment

Social Values
The study area with its proximity to several creeks, wetlands and the Nepean River and with the potential to contain subsurface archaeological deposits will most likely be significant to the local and broader Aboriginal community. This will be confirmed through Aboriginal consultant and subsurface testing.

Historic Values
This site does not appear to meet this criterion

Scientific Values
The study area has the potential to yield further information through detailed scientific and archaeological research into the nature of Aboriginal occupation and techniques utilised in subsistence activities. As indicated, the site has the potential to contain sub-surface archaeological deposits.

Aesthetic Values
The site does not contain Aboriginal aesthetic values, however, after excavation the objects uncovered might meet this criteria.

Representative Values
Until the excavation has been completed it is not known if the site contains representative values.

Rarity Values
Until the excavation has been completed it is not known if the site contains rarity values.

7.4 Statement of Significance

The study area with its proximity to several creeks, wetlands and the Nepean River and with the potential to contain subsurface archaeological deposits will most likely be significant to the local and broader Aboriginal community. This will be confirmed through Aboriginal consultant and subsurface testing. The study area has the potential to yield further information through detailed scientific and archaeological research into the nature of Aboriginal occupation and techniques utilised in subsistence activities. As indicated, the site has the potential to contain sub-surface archaeological deposits. Until subsurface testing has been undertaken it is not known if this site contains aesthetic, representative or rarity values

8.0 LEGISLATION

NATIONAL PARKS AND WILDLIFE ACT 1974

8.0 LEGISLATION

National Parks & Wildlife Act 1974

The *National Parks & Wildlife Act 1974* (NPW Act) provides statutory protection to all Aboriginal sites within New South Wales. The Office of Environment and Heritage (OEH) is the State Government agency responsible for the implementation and management of this Act.

Part 6 of the NPW Act provides for protection of all "Aboriginal objects" which are defined as:

> *Any deposit, object or material evidence (not being a handicraft made for sale) relating to the Aboriginal habitation of the area that comprises New South Wales, being habitation before or concurrent with (or both) the occupation of that area by persons of non-Aboriginal extraction, and includes Aboriginal remains.*

In particular Part 6 of the Act states that it is an offence to harm or desecrate an Aboriginal object or Aboriginal place, without an Aboriginal Heritage Impact Permit (AHIP). It is highly likely that subsurface archaeological deposits, which are protected by the provisions of Part 6 of the NPW Act, will be located within the study area. To confirm whether subsurface deposits do exist within the study area and the nature and extent of such deposits, the OEH *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (the Code) allows archaeological testing prior to applying for an AHIP. Such testing should be in accordance with the Code and can be no greater than 0.5% of the study area.

Prior to undertaking such testing Aboriginal archaeological consultation must be undertaken in accordance with OEHs *Aboriginal cultural heritage consultation for proponents 2010.* A methodology for the testing must be prepared in association with the Registered Aboriginal Parties (RAPs). Such consultation is a lengthy process which includes advertising the project, writing to Government agencies and Aboriginal stakeholders seeking Aboriginal people to register an interest, holding a meeting with Registered Aboriginal parties, presenting the methodology and preparing an Aboriginal Cultural Heritage Assessment Report. It takes approximately four months to undertake the consultation and prepare the Aboriginal Cultural Heritage Assessment Report.

If no Aboriginal objects are uncovered during the above testing, the project can proceed without the need to apply for an AHIP. However, If Aboriginal objects are uncovered it will be necessary to apply for an AHIP with salvage.

Aboriginal consultation was undertaken in 2018 and archaeological testing undertaken from 6th to 17th August 2018 on both Sites 1 and 2, with the following results:

Site 1:

- No Aboriginal objects were retrieved from Site 1.
- No further Aboriginal archaeological testing, salvage or assessment are required for Site 1.
- The redevelopment of Site 1 can proceed without an AHIP and without any further archaeological testing or salvage.

Site 2:

- A very limited program of test excavation was undertaken and a total of 42 artefacts were retrieved from Site 2.
- It will be necessary to apply for an AHIP and undertake salvage excavations at Site 2.
- The redevelopment of Site 2 cannot proceed until the salvage has been undertaken.

9.0 RECOMMENDATIONS

9.0 SUMMARY

An assessment of the site was undertaken in March 2018. That report recommended that Aboriginal consultation in accordance with DPIE's *Aboriginal Cultural Heritage Consultation Guidelines 2010* be undertaken. Once the consultation was completed, Aboriginal archaeological testing was required to determine if any Aboriginal objects were present on the site and, if so, their nature and extent. As recommended, Aboriginal consultation was undertaken. Once the consultation was completed Aboriginal archaeological testing was undertaken. The results of the testing indicated that no Aboriginal objects were located on Site 1. As the testing indicated that there are no Aboriginal objects on Site 1, redevelopment of Site 1 can proceed without any further testing, salvage, monitoring or assessment. An AHIP is not required for Site 1 which is located on the western side of John Tipping Grove.

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APPENDIX A

EXTENSIVE SEARCH

AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : Penrith

Client Service ID : 330986

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
45-5-0539	RP3 Peach Tree Creek	AGD	56	284920	6262050	Open site	Valid	Artefact : -	Open Camp Site	1018,103155,103360
	Contact	Recorders	Elizabeth Rich					Permits		
45-5-0540	RP4 Peach Tree Creek	AGD	56	284960	6262120	Open site	Valid	Artefact : -	Open Camp Site	103155,103360
	Contact	Recorders	Elizabeth Rich					Permits		
45-5-0541	RP5 Penrith Leagues Club	AGD	56	285350	6262560	Open site	Valid	Artefact : -	Open Camp Site	102450,103155,103360
	Contact	Recorders	Elizabeth Rich					Permits		
45-5-4361	Peachtree Creek PAD	GDA	56	285590	6263560	Open site	Valid	Artefact : -, Potential Archaeological Deposit (PAD) : -		103360
	Contact	Recorders	Mr.Oliver Brown					Permits	3664,3688	

Report generated by AHIMS Web Service on 01/03/2018 for David Nutley for the following area at Lat, Long From : -33.7617, 150.6791 - Lat, Long To : -33.7437, 150.6971 with a Buffer of 50 meters. Additional Info : Archaeological Assessment. Number of Aboriginal sites and Aboriginal objects found is 4

GLOSSARY

GLOSSARY

Adze: an axe like bifacial tool with a bevelled bit or blade edge usually used to work wood, or sometimes to dig for root crops.

Alluvium: material which is transported by a river and deposited at points along the flood plain of the river.

Artefact: any object made by human agency. All lithic tools and lithic debitage are considered artefacts.

Artefact scatter: also known as a surface scatter or open site, where prehistoric material such as artefacts and waste debris are lying exposed on the surface of the ground.

Assemblage: a collection of artefacts from an archaeological site.

Australian small tool tradition: a mid Holocene tool industry of the Australian Aborigines that appeared about 5,000 years ago when a new ensemble of small, flaked stone tools began to come into use. The types consisted of backed blades and flakes, Unifacial and bifacial points, and small adze flakes. There are some regional distributions of tools, including Bondi points, geometric microliths, Pirri points and Tula adzes.

Axe: a stone artefact that has been ground on one or more sides to produce a sharp edge.

Backed blade: a blade flake that has been abruptly retouched along one or more margins opposite an acute (sharp) edge. Backed pieces include backed blades and geometric microliths. They are thought to have been hafted onto wooden handles to produce composite cutting tools or spears. Backed blades are a feature of the "Australian small tool tradition", dating from between 5,000 and 1,000 years ago in south eastern Australia (Mulvaney 1975).

Bifacial flaking or retouch: when flakes have been removed from two opposing faces.

Biomantle: the upper part of soil produced by biodynamical agents and processes of which bioturbation is normally hierarchically dominant. By definition, it contains at least 50% biofabric, a condition met in essentially all topsoils.

Bioturbation: the alteration of a site by non-human agency, eg. burrowing animals, tree and grass roots, insects

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

Bondi point: a small, asymmetric backed point, named after Bondi Beach where it was first found, which is a component of the Australian small tool tradition. It is usually less than 5cm long and is sometimes described as a backed blade.

Broad platform flake: a flake which has a platform which is as wide as, or wider than, the body of the flake.

Bulb of percussion: a rounded bulge where the force from the hammerstone has radiated through the stone and split it from the core.

Burin: a flake tool that was produced by the removal of two flakes at right angles to one another to produce a very fine sharp and durable edge.

Carved trees: trees which have had designs carved into the bark or heartwood and in some areas may have been used to mark burial or initiation sites.

Chert: a very fine crystalline aggregate of silica.

Context: the time and space setting of an artefact, feature or culture. The context of a find is its position on a site, its relationship through association with other artefacts, and its chronological position as revealed through stratigraphy. An artefact's context usually consists of its immediate matrix (the material surrounding it, eg. clay, gravel or sand), its provenience (horizontal and vertical position within the matrix), and its association with other artefacts (occurrence together with other archaeological remains, usually in the same matrix). The assessment of context includes study of what has happened to the find since it was deposited.

Core: a piece of stone bearing one or more negative (concave) flake scars. A stone which has obviously had flakes and flaked pieces struck from it.

Cortex: refers to the original weathered outer surface of the rock used to manufacture an artefact.

Debitage (debris): detached pieces that are discarded during the reduction process.

Distal end: the end opposite to the platform or the point end of a blade.

Dorsal surface: the 'back' of the artefact or the side that was once part of the outside of the core or shows evidence of previous flake removals.

Edge-ground artefact: an artefact (generally an axe or adze) whose cutting edges have been ground, rather than flaked, to form a sharp edge.

Eraillure scar: the small flake scar on the dorsal side of a flake next to the platform. It is the result of rebounding force during percussion flaking.

Erosion: the wearing away or loosening and transportation of soil or rock by water, wind and ice.

Fabricator: a stone or bone artefact used in the manufacture of other tools. Often rod shaped and worn heavily on one end, it is used to chip flakes from a core, or to retouch a flake.

Flake: any piece of stone removed from a larger mass (core) by application of force (percussion), and having a striking platform and bulb of percussion.

Flaked piece: any stone struck from a larger mass by percussion but not containing all or any of the characteristics of a flake.

Focal platform flake: a flake which has a platform narrower than the body of the flake.

Grinding groove: a depression resulting from the sharpening of stone tools such as axes and adzes, usually located on surfaces of fine homogenous sandstone and near water.

Grinding stone: a thick stone used as a mortar for grinding seeds, roots, tubers, or ochre.

Hammerstone: the stone that is used to remove flakes from the core.

Holocene: that portion of geologic time that postdates the latest episode of continental glaciation. The Holocene Epoch is synonymous with the recent or postglacial interval of Earth's geologic history and extends from 10,000 years ago to the present day. It was preceded by the Pleistocene Epoch and is part of the Quaternary Period, a time characterised by dramatic climatic oscillations from warm (interglacial) to cold (glacial) conditions that began about 1.6 million years ago. The term Holocene is also applied to the sediments, processes, events, and environments of the epoch.

Horizon (or soil horizon): the layers of the upper crust of the earth. The top, or O, horizon is the layer of undecomposed litter; the A horizon is topsoil, where most roots grow; B is the subsoil; and C is the parent rock material, broken into chunks. Although some roots can penetrate into the C horizon, few microorganisms live there.

Isolated find: a single stone artefact found on the surface of the land not in association with any other artefact.

Knapping: the process of hitting one stone (core) with another (hammerstone) to produce a flaked artefact.

Lamellate flaked piece: thin and wedge shaped, similar to a flake, but without the diagnostic features of a flake. A lamellate may by the distal end of a flake which has had its platform broken off.

Lithic: anything made of stone. Derived from the Greek word meaning stone or anything pertaining to stone.

Manuport: piece of stone intended to be, or used as, a core that has been carried to the area from somewhere else.

Microlith: a small (1 – 3cm long) flake with evidence of retouch. Bondi points, scrapers and backed blades are all types of microliths.

Midden: a prehistoric refuse site chiefly composed of shell fragments.

Multidirectional core: a lithic mass (core) with evidence of flaking originating from more than one direction and with more than a single striking platform.

Negative flake scar: the scar left by the removal of a flake. The scar may also show a rounded depression which is the negative of the bulb of percussion.

Open site: also known as a surface or artefact scatter, where prehistoric material such as artefacts and waste debris are lying exposed on the surface of the ground.

Pirri point: a symmetrical leaf-shaped point, up to 7cm long, unifacially flaked all over its dorsal surface. The striking platform and bulb of percussion are sometimes removed to produce a rounded, thinned butt. Pirri points are a component of the Australian small tool tradition, found generally in inland Australia. The term pirri is an Aboriginal word for 'wood engraving tool'.

Platform: the flat surface which receives percussion or pressure in the removal of a flake or flaked piece.

Pleistocene: a geochronological division of geological time, an epoch of the Quaternary period following the Pliocene. During the Pleistocene, large areas of the northern hemisphere were covered with ice and there were successive glacial advances and retreats. The lower Pleistocene began about 1.8 million years ago; the Middle Pleistocene about 730,000 years ago; and the Upper Pleistocene about 127,000 years ago; it ended about 10,000 years ago. The Pleistocene was succeeded by the Holocene.

Potential archaeological deposit (PAD): any location considered to have a moderate to high potential for subsurface archaeological material

Potlid: small circular piece of stone that has literally "popped off" the surface of the artefact due to exposure to extreme heat.

Proximal end: the 'top' of the artefact, or the part that the knapper hit to remove it from the core, where the platform is expected to be.

Quarry: a location from which stone has been extracted in order to make stone artefacts.

Retouch: refers to the secondary working of an artefact after it has been struck from the core. Retouch is used to sharpen the edges. It is the intentional modification of a stone tool edge by either pressure or percussion flaking techniques.

Scarred trees: trees from which bark has been removed for the manufacture of everyday items such as containers, canoes or shields.

Scraper: a generalised term used to describe a flake tool that has a retouched edge angle of approximately 60 to 90 degrees.

Silcrete: silica rich duricrust identified by the presence of complete granules or even pebbles within the matrix.

Stratigraphy: the study and interpretation of the stratification of rocks, sediments, soils, or cultural debris, based on the principle that the lowest layer is the oldest and the uppermost layer is the youngest. The sequence of deposition can be assessed by a study of the relationships of different layers.

Taphonomy: Literally, 'the laws of burial'. In archaeology, it is the study of the processes by which archaeological remains are transformed by human and natural processes during their incorporation into archaeological deposits, their subsequent long-term preservation within those deposits, and their recovery by archaeologists. The aim is to understand the processes resulting in the archaeological record.

Thumbnail scraper: a small flake with a convex scraper edge, shaped like a thumbnail and located opposite the flake's platform. They exhibit unifacial retouch (usually on the ventral surface) and are usually less than 30mm in length.

Transect: an arbitrary sample unit which is a linear corridor of uniform specified width. A straight line or narrow sections through an archaeological site, along which a series of observations or measurements is made.

Tuff: a rock formed of volcanic fragments (generally ash).

Typology: a scheme to order multiple types in a relational manner. A common typology orders types in a hierarchical manner.

Unidirectional core: a core with only one striking platform surface and with flake scars extending in only one direction.

Unifacial flaking or retouch: where flakes have been removed from one face only.

Use-wear: the physical changes to the edges of an artefact as a result of its use. Modification of a tool resulting from its use.

Ventral surface: the 'front' of the artefact, or the side that was once part of the interior of the core.

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