Document Information

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Executive Summary

Roads and Maritime Services (Roads and Maritime) propose to build the Spring Farm Parkway to link the Camden Bypass, the M31 Hume Motorway (Hume Motorway) and Menangle Road, Menangle Park. The Spring Farm Parkway proposal is split into two stages to support housing development and better connectivity for the region. The proposed works for Stage 1 of the Spring Farm Parkway proposal involves the construction of a 2.5 kilometre road which would connect the Menangle Park development area to the M31 Hume Motorway and Menangle Road.

Aboriginal archaeological survey, undertaken as part of Roads and Maritime Stage 2 Procedure for Aboriginal Cultural Heritage Consultation and Investigation (PACHCI) identified three areas of potential archaeological deposit within the Stage 1 area. The assessment recommended a program of archaeological test excavation at the areas of potential archaeological deposit to determine the nature, extent and archaeological significance of each area.

Concept design development and a Review of Environmental Factors (REF) are currently being undertaken for the proposal. Roads and Maritime engaged Kelleher Nightingale Consulting Pty Ltd (KNC) to prepare an Aboriginal cultural heritage assessment report (CHAR) for Aboriginal heritage within the proposal area as part of the REF for the proposal and including a test excavation program.

An archaeological test excavation program was undertaken at the three areas of potential archaeological deposit (Spring Farm PAD-03, Spring Farm PAD-04 and Spring Farm PAD-05) located within the Stage 1 area in accordance with the Office of Environment and Heritage Code of Practice for the Archaeological Investigation of Aboriginal Objects in New South Wales and Roads and Maritime PACHCI.

The archaeological test excavation identified the presence of subsurface archaeological deposit at the three areas of potential archaeological deposit:
- Spring Farm Parkway AFT 1 (formerly Spring Farm PAD-03)
- Spring Farm Parkway AFT 2 (formerly Spring Farm PAD-04)
- Spring Farm Parkway IF 1 (formerly Spring Farm PAD-05).

Archaeological significance of the identified Aboriginal sites was defined by the information exhibited by each site. The three archaeological sites (Spring Farm Parkway AFT 1, Spring Farm Parkway AFT 2 and Spring Farm Parkway IF 1) displayed low archaeological significance (due to soil disturbance from erosion and flooding resulting in a paucity of artefacts) and do not warrant salvage excavation. No intact archaeological deposit remains within the study area.

An AHIP is being sought for the entirety of the lands subject to the proposed development and specifically for Aboriginal objects associated with sites:

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<td>Total</td>
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The CHAR has been prepared in accordance with Stage 3 of the Roads and Maritime PACHCI and NSW Office of Environment and Heritage Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW.
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1 Introduction

NSW Roads and Maritime Services (Roads and Maritime) is proposing to deliver the future Spring Farm Parkway in two stages. When complete, Stages 1 and 2 would provide a 6.1 kilometre east-west arterial road link between Camden Bypass, the M31 Hume Motorway (Hume Motorway) and Menangle Road.

Spring Farm Parkway would service existing and future residential land releases including Spring Farm, Elderslie, Menangle Park and Mount Gilead. It would provide an alternative east-west route to Narellan Road, with direct access to the Hume Motorway. The section of road linking to the Hume Motorway would be designated as a State or Regional Road due to the intersection with the Hume Motorway. It is assumed the remaining section of road would remain a local road.

Roads and Maritime proposes to build Stage 1 of Spring Farm Parkway, which would provide the principal arterial route between Glen Alpine and Spring Farm. Roads and Maritime engaged Kelleher Nightingale Consulting Pty Ltd (KNC) to prepare an Aboriginal cultural heritage assessment report (CHAR) for Aboriginal heritage for the Stage 1 of the proposal (hereafter known as the study area).

1.1 Location and scope of activity

The proposed works for Stage 1 of Spring Farm Parkway would provide the principal arterial route between Glen Alpine and Spring Farm. The Stage 1 works would be undertaken within Menangle Park in Sydney’s south west, 11 kilometres south of Campbelltown and 70 kilometres from Sydney CBD (Figure 1).

Key features of the proposal include:
- A new four lane divided road (Spring Farm Parkway) extending about 0.9 kilometres from Menangle Road west to Menangle Park land release
- Capacity for widening Spring Farm Parkway to an ultimate six lanes in the future
- Inclusion of a shared-use path on the southern side of Spring Farm Parkway and the south-eastern side of Menangle Road through to Broughton Anglican College at the southern limit of works
- Provision of access to the Menangle Park land release area at the western end of Spring Farm Parkway
- A grade separated interchange to connect Spring Farm Parkway with the Hume Motorway with north facing entry and exit ramps designed to be compatible for future implementation of Smart Motorway requirements. The length of the entry and exit ramps would be about 1.6 kilometres
- A bridge about 20 metres wide and 76 metres long bridge over the Hume Motorway with provisions for future widening to accommodate a six lane Spring Farm Parkway and turn lanes for south facing ramps to allow access to and from the Hume Motorway
- Four signalised intersections including:
  - an intersection between Spring Farm Parkway and Menangle Road
  - a north facing exit ramp from the Hume Motorway onto Spring Farm Parkway
  - a north facing entry ramp from Spring Farm Parkway to the Hume Motorway
  - an intersection providing access to the proposed Menangle Park land release area at the western end of Spring Farm Parkway (Stage 1) including a stub for the future connection of Spring Farm Parkway (Stage 2)
- Upgrade of Menangle Road near the proposed Spring Farm Parkway intersection including widening to four lanes, and tie-ins to suit the new intersection to cater for forecast traffic demand
- Installation of new drainage infrastructure and upgrade of existing drainage infrastructure including kerb and gutters, pits, pipes and open drains
- Ancillary work associated with the proposal including:
  - Relocating, adjusting or protecting existing utility services that are in conflict with the proposal
  - Installation of new street lighting to improve the night-time visibility of intersections and various road furniture
  - Delineation including signage, line-marking and other items to facilitate road user safety of the new infrastructure
  - Urban design improvements, amenity planting and landscaping.
  - Property adjustments where necessary.

The study area for this CHAR is shown on Figures 1 and 2.
1.2 Statutory controls and development context

The proposal is for road infrastructure carried out by Roads and Maritime assessed under Division 5.1 of the *Environmental Planning and Assessment Act 1979*. Aboriginal objects would be harmed by the proposal and an application for an Aboriginal Heritage Impact Permit (AHIP) would be made under section 90A of the *National Parks and Wildlife Act 1974*.

This Aboriginal CHAR has been prepared to support the AHIP application. It has been prepared in accordance with the Office of Environment and Heritage *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW* (OEH 2011a). The CHAR complies with the Roads and Maritime PACHCI (Roads and Maritime 2011).
Figure 1. Location of the study area
Figure 2. Study area details
1.3 National Parks and Wildlife Act 1974

The National Parks and Wildlife Act 1974 (NPW Act) is the primary statutory control dealing with Aboriginal heritage in New South Wales. Items of Aboriginal heritage (Aboriginal objects) or Aboriginal places (declared under section 84) are protected and regulated under the NPW Act.

Under the Act, an “Aboriginal object” is 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”. As such, Aboriginal objects are confined to physical evidence and are commonly referred to as Aboriginal sites.

Aboriginal objects are protected under section 86 of the Act. It is an offence to harm or desecrate an Aboriginal object, either knowingly [section 86 (1)] or unknowingly [section 86 (2)].

There are offences and penalties relating to harm to, or desecration of, an Aboriginal object or declared Aboriginal place. Harm includes to destroy, deface, damage or move. Penalties are tiered according to offences, which include:

- a person must not harm or desecrate an Aboriginal object that the person knows is an Aboriginal object
- a person must not harm an Aboriginal object (strict liability offence)
- a person must not harm or desecrate an Aboriginal place (strict liability offence)
- failure to notify Office of Environment and Heritage of the location of an Aboriginal object (existing offence and penalty)
- contravention of any condition of an AHIP.

Under section 87 (1) it is a defence against prosecution if “[a] the harm or desecration concerned was authorised by an Aboriginal heritage impact permit and (b) the conditions to which that Aboriginal heritage impact permit was subject were not contravened”.

Section 87 (2) of the Act provides a defence if “the defendant exercised due diligence to determine whether the act or omission constituting the alleged offence would harm an Aboriginal object and reasonably determined that no Aboriginal object would be harmed”.

Section 89A of the Act relates to the notification of sites of Aboriginal objects, under which it is an offence if the location of an Aboriginal object is not notified to the Director-General in the prescribed manner within a reasonable time.

Under section 90 (1) of the Act “the Director-General may issue an Aboriginal heritage impact permit”. The regulation of Aboriginal heritage impact permits is provided in Part 6 Division 2 of the Act, including regulations relating to consultation (section 90N).

An AHIP is required for an activity which will harm an Aboriginal object.

1.4 Objectives of the CHAR

The proposed infrastructure works would impact on some Aboriginal objects (sites). Approval obtained under the National Parks and Wildlife Act 1974 is required for these Aboriginal objects prior to any impact or harm. The proponent would apply for an AHIP under section 90A of the Act.

Clause 80D of the National Parks and Wildlife Regulation 2009 requires that an application for an AHIP is accompanied by a CHAR. The CHAR is to provide information on:

- The significance of the Aboriginal places that are the subject of the application
- The actual or likely harm to those Aboriginal objects or Aboriginal places from the proposed activity that is the subject of the application
- Any practical measures that may be taken to protect and conserve those Aboriginal objects or Aboriginal places
- Any practical measures that may be taken to avoid or mitigate any actual or likely harm to those Aboriginal objects or Aboriginal places.

The OEH Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW (OEH 2011) provides further guidance on the preparation of a CHAR. This report has been prepared in accordance with the requirements of the Regulation and the OEH guide.

This CHAR has been prepared to accompany an application for an AHIP made by Roads and Maritime for Aboriginal objects within the study area, including those associated with Aboriginal sites: Spring Farm Parkway AFT 1, Spring Farm Parkway AFT 2 and Spring Farm Parkway IF 1.
2 Landscape Context

The study area is located on the south eastern margin of the Cumberland Plain, a low lying and gently undulating subregion of the Sydney Basin. The Sydney Basin is a large geological feature stretching from Batemans Bay in the south to Newcastle in the north and Lithgow in the west. The formation of the basin began between 250 to 300 million years ago when river deltas gradually replaced the ocean that had extended as far west as Lithgow (Clark and Jones 1991).

The study area encompasses the lower slopes and flats adjacent to Howes Creek and several unnamed tributary creeks that drain from of several western and southern spurs of major north running ridge located to the east (Figure 3). The study area traverses the east flowing Howes Creek and two east flowing tributaries which join within the study area and flow into Howes Creek along the western boundary of the study area. Howes Creek flows into the Nepean River approximately 1.6 kilometres to the west of the study area. The Nepean River is a permanent watercourse and major landscape feature of the Cumberland Plain which is bound by an extensive floodplain.

The underlying geology is predominantly Brinelly Shale (Rwb) while a small area of Quaternary Alluvium (Qa) is located in the western portion of the study area (Figure 4). Brinelly Shale is a late Triassic deposit from the Wianamatta Group and is generally composed of shale, carbonaceous claystone, laminate, rare coal and tuff. Quaternary Alluvium comprises fine-grained sand, silt and clay deposited in association with fluvial activity along the Nepean River and creeks. Raw materials suitable for artefact manufacture occur widely across the Cumberland Plain, in the form of rock outcrops, large cobbles and various river gravels, with cobbles and clasts deposited across the landscape by the complex network of stream channels.

The Blacktown soil landscape occur across the majority of the study area while the Theresa Park soil landscape occurs in the low lying western portion of the study area (Figure 4). The residual Blacktown soil landscape developed in situ on the slopes from underlying Brinelly Shale geology and consists of shallow to moderately deep hard-setting red, brown and yellow podzolic soils. It is subject to minor erosion where surface vegetation is not maintained. The soil landscape is often close to water sources and associated resources without being within flooding areas. Areas within close proximity to permanent water sources are more likely to contain Aboriginal archaeological sites because the area would have provided a relatively stable environment throughout the year for resource gathering.

The Theresa Park soil landscape formed within the low lying areas adjacent to the Nepean River and several creeks from sediment derived from the surrounding geology. Theresa Park soils are highly variable and include poorly structured red to orange silty loams, brown loams, and sandy loams (Hazleton and Tille 1990). Soils generally contain significant amounts of fine sand. The erodibility of these soils is moderate, although the surface sands are generally stable when not subjected to concentrated flows or flood events. Soils are moderately deep to deep on floodplains and near terrace edges, while those along drainage lines are shallow to moderately deep. Archaeologically, these soils are conducive to artefact survivability, with the depth of sand bodies and alluvial terrace soils lending itself to the possibility of deep, stratified sites; however, they are often found in dynamic landscapes which are prone to high energy flooding events that remove, mix and redeposit sediments.

The distribution of native vegetation within the proposal area has been affected by historic and contemporary European land use practices in the region. Prior to 1788, a mixture of native vegetation communities would have extended across the entirety of the Cumberland Plain with distribution determined by a combination of factors including soil, terrain and climate (NSW National Parks and Wildlife Service (NPWS) 2002). The clearance of native vegetation across the majority of the study area by European settlers has left pockets of native vegetation in the vicinity of creeks. Prior to the clearance of native vegetation, the study area would have comprised Shale/Sandstone Transitional Forest, Cumberland Plain Woodland (both Shale Hills and Shale Plains variants) and Sydney Coastal River Flat Forest (alluvial forest) (NSW National Parks and Wildlife Service (NPWS) 2002). The wide variety of native vegetation and sources of permanent water would have made the region an attractive locale for past Aboriginal people. The variety of habitats would also have encouraged a diverse population of fauna.

European settlement of the region began in the in the early 19th century with several land grants made along the Nepean River including a grant of 5,000 acres, known as ‘Camden Park’ made to John Macarthur in 1805 approximately three kilometres south of the current study area. The majority of the grants in the Menangle Park area were laid out in smaller portions of 30 or 40 acres in the first half of the 19th century, with some larger ones made out to more prominent individuals, such as Robert Campbell and Mary Reiby (Casey and Lowe 2010:17). It was during this time that several properties such as Sugarloaf Farm, which is located adjacent to the eastern boundary of the study area, and Glenlee, located approximately 550 metres north west of the current study area, were established.

Land use practices have had a variable impact on the landscape within the study area. Road corridors have modified the landscape by creating cuttings and artificial embankments in addition to modifying the course of several waterways. The properties have been predominantly cleared of native vegetation and utilised for grazing cattle and cultivating crops. A number of large dams have been constructed throughout the area within former creek channels, altering the area’s hydrology and drainage patterns.
Figure 3. Topography of the study area
Figure 4. Geology and soil landscape of the study area
2.1 Ethnohistoric and historic context

Aboriginal people living in the Sydney region at the time of first European contact were distinguished by various language groups. Languages recorded across the region included the Darug, Darkung, Gandangarra and Dharawal. Included in these were various dialects spoken across territorial ranges. People appear to have been organised into economic units of small residential groups or ‘bands’ who had an association with certain areas of land and spoke the same language. There is still some debate over the territorial boundaries of people living on the Cumberland Plain. Ethnohistorical sources suggest that despite differences in words used, customs and material culture, these groups would have interacted for ceremonies, intermarriage, dispute resolution, trade and access to certain resources.

Three different Aboriginal linguistic groups were recorded by Mathews (1897) in the Camden region near Menangle Park, including the Darkung, Gandangarra (including Darug language families) and Dharawal. Early European accounts from the 1830s mention the “Cowpastures tribe” to broadly describe clans or bands then living in the Camden and Campbelltown area. Tindale (1974) mapped tribal boundaries in the Camden region and placed the Dharawal language group within the subject area. Dharawal people are thought to have covered an area stretching from the east coast (i.e. Botany Bay) to as far west as Camden and south as far as the Shoalhaven River (Liston 1988:49). The Gandangarra are thought to have inhabited areas westward and south west of the Dharawal (i.e. west of the Nepean River and into the Blue Mountains). The geographic extent of the Darug speaking groups is still debated, but Mathews records Darug dialects spoken at “Campbelltown, Liverpool, Camden, Penrith and possibly as far east as Sydney, where it merged with Thurrrawal [Dharawal]” (Mathews and Everitt 1900:265).

Dharawal people were generally divided into two groups: the Sweet (fresh) Water Dharawal and the Salt Water Dharawal, alluding to inland or coastal peoples respectively. Kohen claims that clans living around Camden were part of the ‘inland’ clans (as distinct from coastal people). In the Camden area, Sweet Water Dharawal people were represented by approximately 40 to 50 clans, with individuals numbering between 30 and 60 per clan. A study of 1830s blanket returns, the 1828 census and other accounts lists the Muringong of Cowpastures, the Cobbitty Barta of Camden and the Gomerigal or ‘South Creek Tribe’, all grouped as ‘inland’ (Kohen 1993:21). The words “Cobbitty” or “Cobbitch” and “Barta” meaning “white pipeclay” and “plenty” are mentioned in an accompanying Gandangarra wordlist (Kohen 1993:25). Cobbitch Barta, a clan of the Dharawal, is recognised as inhabiting the area.

Kohen (1986:77) explains that the Aboriginal people who lived between Parramatta and the Blue Mountains were not as dependent on fish and shellfish as groups closer to the coast, but relied on small animals and plant foods in addition to seasonally available freshwater mullet and eels. Tench (1793:230) observed that ‘they depend but little on fish, as the river yields only millets and that their principal support is derived from small animals which they kill and some roots (a species of wild yam chiefly) which they dig out of the earth’. These wild yams were found in considerable quantities along the banks of the Nepean and Hawkesbury Rivers. Berries, Banksia flowers and wild honey were also recorded as foods of the local inhabitants (Collins 1798 [Kohen 1985-9]). A particularly important plant food was the Burrawong (Macrozamia communis), which provided a nutritious nut that was pounded and soaked in running water to leach out toxins before the flour-like extract was made into small cakes and baked over a fire (Kohen 1993:8).

Small animals provided the protein component of the Aboriginal diet on the Cumberland Plain, with hunting comprising a major economic role of the men. Along the river, traps and snares were set for bandicoots and wallabies, while decoys for snaring birds were also a commonly employed technique, ‘these are formed of underwood and reeds, long and narrow, shaped like a mound raised over a grave, with a small aperture at one end for the admission of the prey’ (Tench 1793 [Kohen 1985-9]). Possums and gliders were particularly common in the open woodland across the Cumberland Plain and probably formed the main sources of animal food. These were hunted in a number of ways, including smoking out the animal by lighting a fire in the base of a hollow tree, burning large tracts of land and gathering the stranded animals, as well as cutting toe-holds in trees to reach their burrows (Kohen 1993:10; Tench 1793:82).

Menangle Park is in the general vicinity of an area known to early European settlers as ‘the Cow Pastures’. This originally referred to an area of open forest on the opposite (western) side of the Nepean River near Camden, known also as the ‘Cow pasture plains’ (Mann 1811). Some of the earliest British interest in the vicinity of the study area revolved around a herd of runaway cattle that escaped from the colony in July 1788 (Collins Vol 1, 1798: 365). The cattle were extremely valuable to the fledgling colony and after numerous attempts to locate them they were finally tracked down in 1795 to an area south of the Nepean (Liston 1988: 4). It was evident that in the seven years the cattle were missing from the colony, the local Aboriginal inhabitants of the Nepean area had come into contact with the cattle numerous times. There was a reported sighting of the cattle with Aboriginal people in 1790 and there are large paintings of cattle in a rock shelter site near Campbelltown, called ‘Bull Cave’ (Liston 1988:3-4).

European settlement in the region began with several land grants in the early nineteenth century. The first land grant in the area was in 1805 to Lieutenant John Macarthur, who was given a grant of 5,000 acres to breed sheep and export wool to England. The grant covered an area bordering the Nepean River at what is now called ‘Camden Park’. The increasing settlement of the area by the British colonists led to conflict during the drought of 1814 – 1816, by which time many traditional Aboriginal resource-gathering areas had been engulfed by farmland and pasture. A spate of
retaliatory killings between Aboriginal groups and settlers across Sydney eventuated in the dispatch of a punitive expedition to capture or kill those Aboriginal people involved in the skirmishes (Brook and Kohen 1991:23). Many officials, including Governor Macquarie, often recognised that these conflicts were initiated by the settlers, but with the colony on a tentative footing, especially during periods of drought, he was more inclined to protect the interests of the farmers. Contact with Europeans introduced diseases, such as smallpox, that drastically altered the size and structure of the Aboriginal population, whilst the expansion of settlements and establishment of farmland subsumed the traditional areas used to meet subsistence needs (Attenbrow 2002).

Not all interactions with settlers were hostile, and friendly contact was maintained between the Dharawal and a number of land owners, most notably the Macarthurs, who documented corroborees taking place on their property and marked out a portion of land for Aboriginal people who wished to settle there under the family’s protection (Liston 1988:24). However, these interactions illustrate the effect of colonisation on the Aboriginal people living within the boundaries of the colony, who were subsequently restricted to living in European-allocated areas within a landscape which was previously theirs. Later government policies would further affect the lives of Aboriginal people living on the Cumberland Plain by dictating how and where they lived.
3 Archaeological Context

3.1 Database Search (AHIMS)

The Aboriginal Heritage Information Management System (AHIMS) is a database operated by the (NSW) Office of Environment and Heritage (OEH) and regulated under section 90(Q) of the (NSW) National Parks and Wildlife Act 1974 (NPW Act). AHIMS contains information and records related to registered Aboriginal archaeological sites (Aboriginal objects, as defined under the NPW Act) and declared Aboriginal places (as defined under the NPW Act) in NSW.

A search of AHIMS was conducted on 24 September 2018 to identify registered (known) Aboriginal sites or declared Aboriginal places within or adjacent to the study area (Client Service ID 372375). The search results are attached as Appendix D.

The AHIMS Web Service database search was conducted within the following coordinates (GDA, Zone 56):

<table>
<thead>
<tr>
<th>Eastings</th>
<th>Northings</th>
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<tbody>
<tr>
<td>292100</td>
<td>6223100</td>
</tr>
<tr>
<td>295400</td>
<td>6226700</td>
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</tbody>
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Buffer: 0 metres (the search coordinates included an extensive buffer around the study area).

The AHIMS search results showed:

| 39 | Aboriginal sites are recorded in or near the above location |
| 0  | Aboriginal places have been declared in or near the above location |

The AHIMS search results showed:

The distribution of registered Aboriginal sites within these coordinates is shown in Figure 5. The frequencies of site features (site 'types') within the AHIMS database search area are shown in Table 1.

Table 1. Frequency of site types from OEH AHIMS database search

<table>
<thead>
<tr>
<th>Site Context</th>
<th>Site Feature</th>
<th>Frequency</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Artefact</td>
<td>9</td>
<td>56.25</td>
</tr>
<tr>
<td></td>
<td>Artefact; Modified Tree (Carved or Scarred)</td>
<td>1</td>
<td>6.25</td>
</tr>
<tr>
<td></td>
<td>Artefact; Potential Archaeological Deposit (PAD)</td>
<td>2</td>
<td>12.50</td>
</tr>
<tr>
<td></td>
<td>Potential Archaeological Deposit (PAD)</td>
<td>4</td>
<td>25.00</td>
</tr>
</tbody>
</table>

Total 16 100

Other heritage registers and databases

Other sources of information including heritage registers and lists were also searched for known Aboriginal heritage in the vicinity of the study area. These included:

- Campbelltown Local Environmental Plan 2015
- Roads and Maritime s. 170 Heritage and Conservation Register
- State Heritage Register and State Heritage Inventory
- Commonwealth Heritage List
- National Heritage List
- Australian Heritage Places Inventory
- Register of the National Estate (non-statutory list).

No Aboriginal heritage items or places were listed on these registers within or in the vicinity of the study area. The north eastern portion of the study area overlaps 'Sugarloaf Farm homestead group and rural landscape setting', an item listed on the Campbelltown LEP 2015 (Item 01389) and the NSW State Heritage Register (Item 01389). Item is listed for historical (non-Aboriginal) heritage.
Figure 5. AHIMS search results
3.2 Previous archaeological assessments in the vicinity of the study area

Previous archaeological investigations have been undertaken within the study area and in the vicinity for various stages of land releases, proposed residential developments and associated infrastructure projects. These have ranged from initial archaeological survey through to test excavation. The pertinent studies are discussed below.

Menangle Park

An Aboriginal heritage assessment was undertaken during the early planning stages of the Menangle Park Urban Release Area by HLA-Envirosciences in 2004. The Menangle Park Urban Release Area (MPURA) encompassed approximately 950 hectares and included the current study area. The assessment consisted of a review of background information including previous archaeological surveys and test excavations within the assessment area, an assessment of landscape and environmental context and a field survey of the area. Background research identified ten previously recorded Aboriginal archaeological sites within the area, all open artefact scatters and isolated finds, and one potential scarred tree. Sites had identified during previous surveys undertaken by Brayshaw & McDonald (1990), Dibden (2002a, 2002b, 2003a, 2003b) and subsequent test excavations by Edgar & Corkill (1991).

The HLA Envirosciences survey recorded a total of 12 new sites, with artefacts also identified at six of the ten previously known site locations within the wider assessment area. All newly recorded sites were open context artefact scatters or isolated finds and were recorded in a variety of landform contexts including open depression, flat, lower, mid and upper slopes and on ridgelines and crests. Artefacts comprised a range of raw materials but the majority were of silcrete (64.4%), followed by fine grained siliceous material, quartz, chert and quartzite. Artefact types included cores, retouched flakes (including one backed artefact) and unmodified flaking debitage. The highest number of stone artefacts (n=40) were identified at site MPRP 2 (AHIMS 52-2-3909) which was located on a flat landform at the junction of two unnamed creeks approximately 1.3 kilometres north west of the current study area.

The assessment developed an archaeological sensitivity model of MPURA which designated zones of nil, moderate and high sensitivity based on landform context and the presence of known sites, potential for undetected surface material and potential for subsurface deposits. The majority of current study area was mapped within moderate sensitivity while the western portion of the study area adjacent to Howes Creek was mapped within an area of high sensitivity and the Hume Motorway was mapped within a zone of nil sensitivity (HLA Envirosciences 2004: Figure 9). Areas of PAD were also described within the wider rezoning area, based on low levels of apparent landscape disturbance. One area of PAD encompassed the western portion of the current study area.

Additional assessment was subsequently undertaken by Jo McDonald Cultural Heritage Management (JMCHM) in 2004. The new study aimed to expand on the sensitivity mapping previously undertaken by HLA Envirosciences by including an assessment of land use disturbance. Disturbance mapping was undertaken for the entirety of the area, which was divided into three zones: high, moderate or low disturbance areas. The majority of the area (65%) was considered to have suffered moderate disturbance. The land use mapping was reinterpreted for archaeological sensitivity, with low disturbance areas considered to have high archaeological potential and vice versa. The current study area was assessed as displaying moderate sensitivity with small areas of high sensitivity associated with Howes Creek. The Hume Motorway corridor was assessed as being highly disturbed lands with low/no sensitivity.

The next stage of investigation was undertaken by Niche Environment and Heritage in 2013 (Niche 2013a), who prepared an Aboriginal Heritage Impact Assessment as part of the rezoning process. A portion of the Menangle Park Urban Release Area on the western side of the Hume Motorway was divided into a number of Precincts which were assessed individually for their Aboriginal heritage. The portion of the current study area on the western side of the Hume Motorway falls within the southern portion of Precinct 100 and the northern portion of Precinct 300. The assessment included a review of previous studies and development of a predictive model, which considered that “the most likely areas to contain Aboriginal archaeological deposits within the MPURA are areas of low disturbance within 200m of water […] on flat land and on slopes between 1 and 11.1 degrees… Where this land coincides with the Theresa Park soil landscape there is a higher likelihood for that area to contain contextualised Aboriginal archaeological sites of significant density which in turn increases the likelihood for those Aboriginal archaeological sites to be of moderate to high scientific archaeological significance” (Niche 2013a:20-21). Specific to Precinct 100 and Precinct 300, it was considered that higher site density/frequency could be expected in areas of Theresa Park soils than in Blacktown soils, and that landforms associated with Howes Creek had previously been demonstrated to contain subsurface deposits. The elevated landforms near the creek were considered to have high potential for subsurface deposits. Based on the presence of previously recorded AHIMS sites and areas of archaeological potential within the area, it was recommended that an AHIP be sought for the development of the Precincts. A test excavation and an Aboriginal Cultural Heritage Assessment Report (CHAR) were also recommended.

A CHAR and test excavation were subsequently undertaken by Niche in late 2013 (Niche 2013b, 2013c). The CHAR assessment area comprised 238 hectares of lands owned by UrbanGrowth NSW and included the portion of the current study area west of the Hume Motorway. Part of the assessment process included correcting erroneous site locations registered on AHIMS and submitting site card updates, as well as registering previously recorded (but not registered) archaeological sites within the assessment area.
Archaeological sensitivity mapping was reviewed and the assessment area divided into zones of good, moderate and low potential as per JMCHM 2010. Test excavation was conducted to sample landforms within Zone 1 (good potential) and Zone 2 (moderate potential) landscapes. A total of 103 test pits (measuring 50 x 50 centimetres) were excavated across six transects within the MPURA area. Excavated depths ranged from 10 centimetres to 145 centimetres with a variety of soil profiles described. A total of 100 artefacts were recovered, mostly from Transects 2 and 3 and five artefacts from a single pit on Transect 7. Transects 1, 6 and 8 contained no artefacts. Overall artefact densities ranged from 0 to 15/0.25m² (extrapolated to 60/m³). No artefacts were recovered further than 350 metres from a permanent or temporary source of water and no artefacts were recovered from pits placed on slopes with a gradient greater than 4 degrees (Niche 2013b:54). Notable finds included a grinding dish and top stone with ochre residue.

Transect 7 ran approximately north-east to south-west across the flat and slope landforms on the northern side of Howes Creek. The transect was partially within the western portion of the current study area. Transect 7 consisted of eight test pits which were characterised by brown silty topsoil overlying yellowish brown silty clay to clay. A total of five silcrete artefacts were recovered from the closest test pit to Howes Creek (Test Pit 701 A). The artefacts comprised one broken tool, one complete flake and three broken flakes. An additional pit was excavated immediately adjacent to Test Pit 701 A; however, no additional artefacts were recovered.

Transect 2 ran approximately north-south from the crest landform occupied by the house Lot down towards Howes Creek approximately 100 metres south of the current study area. Three squares excavated on the ridge and upper slope (210, 211 and 212) contained one artefact each, while higher density was identified at 207a and 207b at the juncture of the alluvial flat and slope immediately above a drainage depression (n=1 and n=5 respectively). Soil profiles along the bottom of the slope demonstrated an alluvial influence, with brown silty sand topsoil overlying a dark reddish brown sandy soil with occasional pieces of decomposing sandstone. The dark reddish brown sand transitioned to a yellowish reddish brown sandy soil with a high percentage of yellow decomposing sandstone and an increasing percentage of clay. Along the ridge and upper slope, profiles were comparable to those described at Transect 1, being shallow clayey silty topsoils with gravels overlying a clay B horizon (Niche 2013b:62). Square 209 on the lower slope displayed a deeper A horizon (possible colluvial influence) and was excavated to a depth of 95 centimetres. Areas along Howes Creek were considered to display profiles consistent with underlying Tertiary High Level Alluvium (Tal).

Based on higher artefact densities and deeper (and potentially older) profiles described for pits excavated within the Tal landscape, these areas were considered to display greater archaeological potential and sensitivity than those excavated on the shale hillslopes. Overall, the alluvial terraces and terrace/slope interface were considered to be the most sensitive landforms. A revised archaeological sensitivity zone plan was prepared using the findings of the test excavation and an artefact density analysis. The entirety of the area was divided into five archaeological zones, with Zones 1 and 5 analogous to JMCHM 2010 zones of high and low potential, and Zones 2, 3 and 4 representing a more nuanced division of the moderate potential areas. Areas of cultural significance were also mapped as a separate zone. Based on the accompanying mapping, the portion of the current study area assessed displays a mixture of Zones 1, 3 and 4. Zone 1 was defined as ‘high potential for surface and continuous subsurface archaeology’ and within the current study area was located in immediate proximity to the Howes Creek and in the vicinity of its junction with an unnamed tributary. Zone 3 (‘moderate potential for surface and discontinuous subsurface archaeology’) encompasses the gentle slopes. Zone 4 (‘low potential for intact archaeology with infrequent, discontinuous subsurface archaeology’) was mapped across the higher gradient slopes at a greater distance from the watercourses. The current study area did not contain any identified areas of cultural sensitivity.

Significance assessment was undertaken for identified archaeological sites and sensitivity zones within the MPURA (Niche 2013c). Zones 1 and 2 were considered to display high research potential and high scientific significance. Zone 3 was considered to display moderate research potential and significance, while Zone 4 areas were assessed as being of low potential and significance. It was recommended that an AHIP be sought for the whole of the development, with provision for salvage excavation at identified high artefact density areas within Zones 1 and 2 and surface collection of recorded sites located within Zone 3 areas. Preparation of an Aboriginal Heritage Management Plan was also recommended to assist with the ongoing management of the MPURA’s cultural values.
3.3 Spring Farm Parkway: Stage 1 and 2 – PACHCI 2 Aboriginal heritage assessment

An Aboriginal archaeological survey report (PACHCI Stage 2) was prepared as part of the Review of Environmental Factors (REF) for Stages 1 and 2 of the Spring Farm Parkway proposal (Artefact 2017a). In addition, an addendum assessment was completed for portions of Stage 1 which had been inaccessible during the original assessment (Artefact 2017b). The assessments comprised archaeological survey in addition to desktop review of previous archaeological investigations and the environmental context.

The desktop review of previous investigations showed that archaeological sites in the region generally occurred as surface artefact scatters and isolated artefacts which were concentrated on prominent ridgelines or adjacent to the Nepean River. Lower frequencies of culturally modified trees and areas of potential archaeological deposit (PAD) had also been recorded. The desktop review noted that the assessment area was located within a landscape with varying levels of natural and human disturbance including ploughing, the construction of dams and natural process such as erosion and fluvial activity.

The desktop review identified seven previously registered Aboriginal archaeological sites outside of the current study area and within the Stage 2 assessment area. The sites consisted of five low density surface artefact scatters and two isolated artefacts which had been identified on creek bank, crest and slope landforms in the vicinity of drainage lines. The artefacts were predominantly made from silcrete with smaller quantities of quartz and chert also recorded. The artefact assemblage comprised flakes and flaked fragments with one scraper also identified.

The archaeological survey was undertaken with representatives from the Tharawal Local Aboriginal Land Council. Ground surface visibility was generally low within the survey area due to dense grass cover. Visible surface disturbance was most extensive within road corridors and Main Southern Railway easement while instances of localised disturbance were associated with land clearance, tracks and the construction of dams or utilities.

The survey identified five areas of potential archaeological deposit (Spring Farm PAD-01 to Spring Farm PAD-05) and revisited the locations of previously recorded Aboriginal archaeological sites within the combined Stage 1 and Stage 2 assessment area. Within the current study area, the assessment identified three areas of potential archaeological deposit: Spring Farm PAD-03, Spring Farm PAD-04 and Spring Farm PAD-05 (Figure 6).

Spring Farm PAD-03 and Spring Farm PAD-04 were identified as areas of potential archaeological deposit (PAD) situated on sloping landforms adjacent to an unnamed tributary of Howes Creek. Spring Farm PAD 5 was an area of potential archaeological deposit (PAD) located within an area of regrowth eucalypts on a terrace landform adjacent to a second order tributary of Howes Creek. The three areas of PAD had limited visible disturbance and were assessed as having moderate potential due to the similarity between the PAD areas and other sites recorded in the region.

No archaeological potential was identified within the remaining portions of the current study area. The assessment recommended a program of archaeological test excavation at the three areas of potential archaeological deposit within the current study area to determine the nature, extent and archaeological significance of each area of PAD.

Subsequent to the completion of the PACHCI Stage 2 heritage assessment, the project area was modified to encompass design refinements and site compound areas. KNC undertook a survey and assessment of several areas of the new project area that were outside of the PACHCI Stage 2 assessment area. No additional Aboriginal archaeological sites or areas of archaeological potential were identified within these areas. The areas were located on slopes or low lying areas that were unlikely to retain subsurface archaeological deposits.
Figure 6. Areas of potential archaeological deposit identified by PACHCI Stage 2 assessment within the current study area
4 Archaeological Test Excavation

Previous investigation undertaken as part of the PACHCI Stage 2 assessment identified three areas of PAD (Spring Farm PAD-03, Spring Farm PAD-04 and Spring Farm PAD-05) within the current study area. The PACHCI Stage 2 assessment recommended a program of archaeological test excavation at the three areas of PAD to obtain further information in regards to the nature and significance of the Aboriginal cultural heritage resource and how it may be affected by the proposal.

An archaeological test excavation program was undertaken by KNC and field representatives of registered Aboriginal parties in July 2018 as recommended by the PACHCI Stage 2 assessment and in accordance with the OEH Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales. The purpose of the test excavation program was to collect information about the nature and extent of subsurface Aboriginal objects through excavation of a sample of the identified areas of potential archaeological deposit at Spring Farm PAD-03, Spring Farm PAD-04 and Spring Farm PAD-05.

Aims, methodology and results of the test excavation program are presented below.

4.1 Aims

The primary aim of the test program was to determine if intact archaeological deposits were extant and to assess the nature and extent of these deposits. Test excavation focused on defining the boundary of any subsurface archaeological deposit in relation to artefact distribution and disturbance from land use practices or natural processes.

This information was sought to assist in interpreting the archaeological landscape that remains in the study area and aid management of the archaeological resource. The sampling area was restricted to ensure an adequate sample without having significant impact on the archaeological value of the identified PAD areas.

4.2 Methodology

Field methodology was developed and carried out in accordance with the Roads and Maritime PACHCI and OEH Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales. The test excavation program was specifically designed to target questions of artefact survivability through assessing the intactness of the deposit.

The test excavation program was undertaken at Spring Farm PAD-03, Spring Farm PAD-04 and Spring Farm PAD-05. At each test excavation area, a site datum was recorded and test excavation units were placed along regularly spaced transects. In accordance with the Code of Practice, each test excavation unit measured 50 x 50 centimetres and squares were evenly distributed to sample the extent of each area within the study area. The coordinate of the north-west corner for each excavation unit was recorded using a handheld GPS receiver in GDA94 Zone 56. The test units were then given the name ‘TS’ for Test Square, followed by an arbitrary unique identifying number (e.g. TS 1, TS 2, TS 3).

Following OEH guidelines, the first excavation unit was excavated in 5 centimetre spits onto a culturally sterile deposit. Based on the results of the first excavation square, subsequent squares were excavated in 10 centimetre spits until culturally sterile soils were reached. The information from each test excavation square, including a detailed deposit description and unit depths, was recorded by the excavators onto standardised excavation unit recording sheets. At the end of the excavation program, all squares were photographed and soil section profiles were drawn.

All excavation was undertaken using hand tools. All excavated material was placed in buckets and dry sieved on site using a combination of nested 5 millimetre and 2.5 millimetre wire mesh screens. Artefacts retrieved from the excavation were retained for further investigation. All test squares were backfilled with the original soil at the completion of the excavation. The excavation took place between 23 and 27 July 2018.
Figure 7. Archaeological test square locations and artefact density at Spring Farm PAD-03 and Spring Farm PAD-04
4.3 Spring Farm PAD-03

The Spring Farm PAD-03 test excavation area was located within Lot 8 DP249530, approximately 240 metres west of the Hume Motorway corridor and 470 metres east of Fitzpatrick Street. The test excavation area was situated on a gently south sloping landform bound by a steep south sloping spurline to the north and an unnamed tributary of Howes Creek to the south (Plate 1).

A total of 17, 50 x 50 centimetre test squares (TS 1-14 and TS 46-48) were excavated within the proposed impact area at Spring Farm PAD-03. The test squares within the Spring Farm PAD-03 test excavation area were positioned at 20 metre intervals along two east to west oriented transects and two north west to south east oriented transects (Figure 7). An additional test square (TS 11) was excavated within the low lying flat adjacent to an unnamed tributary of Howes Creek (Plate 2).

Vegetation within the test excavation area comprised of low pasture grasses with isolated trees and a concentration of trees adjacent to the unnamed creek. Visible surface disturbance was low and limited to past tree clearance.

4.3.1 Soils and disturbance

Sediment profiles were characterised by silty loam overlying basal clay which varied in depth across the test excavation area. The test squares excavated on the slope in the eastern portion of the area were characterised by moderate to deep deposits with visible iron-manganese nodules clustering within the interface between the silty loam and basal clay (Figure 8). The test square excavated within the low lying area adjacent to the unnamed creek (TS 11) was characterised by a deep deposit of silty loam overlying basal clay (Figure 10). The remaining test squares were characterised by shallow to moderately deep silty loam overlying basal clay with infrequent iron-manganese nodules (Figures 9 and 11). Bioturbation was evident within the test excavation squares with fine root systems present throughout the area. Small fragmented pieces of charcoal were dispersed throughout the test excavation squares with no obvious burning event. Examples of the soil profiles are described below.

I. 0-5cm: Pale brown silty loam, dry, loose. Frequent fine root systems. Clear boundary to:
II. 5-25cm: Pale brown clayey silty, compact. Infrequent fine root systems. Gravels < 1cm 5%. Infrequent charcoal flecking <1cm <1%. Diffused boundary to:
III. 25cm-base: Orange brown silty clay, compact. Infrequent fine root systems throughout. Gravels and Fe/Mn nodules <1cm 40%.
IV. Base: Orange brown clay, compact.

Figure 8. TS 1 north section and soil profile description
I. 0-2cm: Pale brown silty loam, dry, loose. Frequent fine root systems. Clear boundary to:

II. 2-10cm Pale brown silty loam, moderately compact. Infrequent fine root systems. Gravels and Fe/Mn nodules <1cm 5%. Diffused boundary to:

III. 10-18cm: Mid brown silty loam, compacted. Infrequent fine root systems. Gravels and Fe/Mn nodules <1cm 5%. Clear boundary to:

IV. 18cm-base: Orange brown clay, moderately compacted. Infrequent fine root systems.

Figure 9. TS 7 north section and soil profile description

I. 0-3cm: Pale brown silty loam, dry, loose. Frequent fine root systems. Clear boundary to:

II. 3-45cm: Mid brown silty loam, moderately compact. Infrequent fine root systems. Clear boundary to:

III. 45cm-base: Orange brown clay, moderately compacted. Infrequent fine root systems.

Figure 10. TS 11 north section and soil profile description

I. 0-2cm: Pale brown silty loam, dry, loose. Frequent fine root systems. Clear boundary to:

II. 2-16cm: Mid brown silty loam, moderately compact. Infrequent fine root systems throughout. Gravels and Fe/Mn nodules <1cm increasing with depth to 20%.

III. 16cm-base: Orange brown clay. Infrequent fine root systems.

Figure 11. TS 12 north section and soil profile description

4.3.2 Artefact distribution and lithics

A total of four artefacts were recovered from four of the 17 test squares excavated at Spring Farm PAD-03 giving a mean artefact density across the test excavation area of 0.24 artefacts/test square. Extrapolated to square metres, the test area displayed a mean artefact density of 0.96/m². Artefact distribution across the tested area was characterised by localised very low density in the four squares with artefacts and the absence of artefacts across the remaining test squares. The artefacts were recovered from the top 20 centimetres of the deposit.

The artefacts recovered from Spring Farm PAD-03 during the test excavation program were predominantly made from silcrete with one (ID 4) made from quartz. Artefacts were predominantly small in size with three artefacts measuring between 10-19 millimetres in size while one artefact (ID 1) was between 30-34 millimetres in size.

The artefacts consisted of three flakes and one medial flake fragment. Two artefacts (IDs 1 and 2) exhibited pot lidding and crazing on their dorsal surfaces.
4.3.3 Discussion

The Spring Farm PAD-03 test excavation program recovered four artefacts from four of the 17 test squares excavated. The spatial distribution of artefacts was characterised by disconnected squares of low density artefact concentrations. The absence of spatial concentrations of artefacts across adjacent test squares and lack of conjoining artefacts indicates that the area was not a focal point for the creation of stone artefacts and that the site had been disturbed by past land use practices or natural processes. The results reflect the previous test excavation program undertaken in the western portion of the site which also found a low density artefact concentration within a single test pit while the remaining seven excavated pits, including one adjacent to the find spot did not contain artefacts. Due to the presence of artefacts at the site, it was reclassified/renamed Spring Farm Parkway AFT 1.

The soil profiles within the excavated test squares indicate that the area had been variably affected by subsurface disturbance which had resulted in the occurrence of relatively stable deposits with the formation of iron-manganese nodules within test squares excavated on the slope in the eastern portion of the area. The deposit within the remaining test squares indicates that deposit had not remained stable enough for the formation of iron-manganese nodules concentrations and was deflated in the west while, in the case of TS 11, the deposit had been affected by fluvial activity associated with the unnamed creek. The low artefact density, limited range of artefact types and dispersed spatial distribution of artefacts indicate a low potential to retrieve additional archaeological information from the site.
4.4 Spring Farm PAD-04

The Spring Farm PAD-04 test excavation area was located within Lot 8 DP249530 and Lot 11 DP584016, approximately 90 metres west of the Hume Motorway corridor and 650 metres east of Fitzpatrick Street. The test excavation area was situated on a gently west sloping landform which overlooked the junction of two unnamed tributaries of Howes Creek.

A total of 21, 50 x 50 centimetre test squares (TS 15-28 and TS 42-45) were excavated within the proposed impact area at Spring Farm PAD-03. The test squares were positioned at 20 metre intervals along five east to west oriented transects (Figure 7).

Plate 7. Spring Farm PAD-04 facing west towards a tributary of Howes Creek

Vegetation within the test excavation area comprised of exotic grasses and clusters of native trees. Visible surface disturbance was low and limited to past tree clearance and the construction of a fence.

4.4.1 Soils and disturbance

Sediment profiles were variable across the test area with the deposit within test squares in the south of the study area characterised by silty loam overlying basal clay with visible iron-manganese nodules clustering along the interface between the silty loam and basal clay. The test squares in the northern portion of the study area were characterised by silty loam overlying silty clay loam and basal clay. The depth of deposit varied across the tested area with moderately deep deposits within the southern portion (Plate 14) while test squares were generally shallower in the north portion of the test area (Plates 13 and 15). Bioturbation was evident within the test excavation squares with fine root systems present throughout the area. Small fragmented pieces of charcoal were dispersed throughout the test excavation squares with no obvious burning event. Examples of the soil profiles are described below.

I. 0-6cm: Pale brown silty loam, dry, friable. Frequent fine root systems throughout. Clear boundary to:
II. 6-12cm: Mid grey brown silty loam, compact. Infrequent fine root systems throughout. Infrequent charcoal flecking <1cm 1%. Diffused boundary to:
III. 12-20cm: Dark brown silty clay loam, compact. Infrequent fine root systems throughout. Infrequent fine root systems. Infrequent charcoal flecking <1cm 1%. Clear boundary to:
IV. 20cm-base: Mid brown clay, compact. Infrequent fine root systems.

Figure 12. TS 15 north section and soil profile description
I. 0-2cm: Pale brown silty loam, dry, friable. Frequent fine root systems throughout. Clear boundary to:
II. 2-8cm: Mid grey brown silty loam, compact. Infrequent fine root systems throughout. Clear boundary to:
III. 8cm-base: Mid brown clay, compact. Infrequent fine root systems.

Figure 13. TS 22 west section and soil profile description

I. 0-5cm: Pale brown silty loam, dry, friable. Frequent fine root systems throughout. Clear boundary to:
II. 5-18cm: Pale grey brown silty loam. Infrequent fine root systems throughout. Infrequent charcoal flecking <1cm 1%. Diffused boundary to:
III. 18-22cm: Pale grey brown silty clay loam, compact. Infrequent fine root systems throughout. Gravels and Fe/Mn nodules <1cm 30%. Diffused boundary to:
IV. 22cm-base: Mid brown clay, compact.

Figure 14. TS 26 south section and soil profile description

I. 0-2cm: Pale brown silty loam, dry, friable. Frequent fine root systems throughout. Clear boundary to:
II. 2-10cm: Pale brown silty loam, compacted. Infrequent fine root systems throughout. Diffused boundary to:
III. 10-19cm: Dark brown silty clay loam. Infrequent fine root systems throughout. Clear boundary to:
IV. 19cm-base: Mid brown clay, compact. Infrequent fine root systems

Figure 15. TS 44 north section and soil profile description

4.4.2 Artefact distribution and lithics
A total of two artefacts were recovered from two of the 21 test squares excavated at Spring Farm PAD-04, giving a mean artefact density across the test excavation area of 0.10 artefacts/test square. Extrapolated to square metres, the test area displayed a mean artefact density of 0.4/m². Artefact distribution within the Spring Farm PAD-04 test excavation area was characterised by individual artefacts within TS 15 and TS 19 and the absence of artefacts across the remaining test squares. The artefacts were recovered from the top 20 centimetres of the deposit.

The artefacts recovered from Spring Farm PAD-04 during the test excavation program consisted of a quartz proximal flake fragment (ID 5) and a silcrete angular flake fragment (ID 6). The artefacts were small in size and measured between 15-19 millimetres in size. The quartz proximal flake fragment retained rounded cortex on the dorsal side. The silcrete angular fragment exhibited crazing and pot lidding.
Plate 8. Quartz proximal flake fragment (ID 5) from TS 15

Plate 9. Silcrete angular fragment (ID 6) from TS 19

4.4.3 Discussion

The test excavation programs at Spring Farm PAD-04 recovered two artefacts from two of the 21 test squares excavated. The spatial distribution of artefact across the tested area was characterised by isolated artefacts which were dispersed and without spatial focus. The range of material recovered and absence of localised concentrations of artefacts indicates that the site was not the focus of past stone artefact creation and that the site may have been affected by subsurface disturbance. Due to the presence of artefacts at the site, it was reclassified/renamed Spring Farm Parkway AFT 2.

The soil profiles within the excavated test squares indicate that the area had been variably affected by subsurface disturbance which had resulted in the occurrence of relatively stable deposits with the formation of iron-manganese nodules within test squares excavated on the slope in the southern portion of the area. The deposit within the remaining test squares indicates that deposit has not remained stable enough for the formation of iron-manganese nodules concentrations and had been affected by natural processes or modern land use practices. The very low artefact density, limited range of artefact types and dispersed spatial distribution of artefacts indicate a low potential to retrieve additional archaeological information from the site.
Figure 16. Archaeological test square locations and artefact density at Spring Farm PAD-05
4.5 **Spring Farm PAD-05**

The Spring Farm PAD-05 test excavation area was located adjacent to the Hume Motorway corridor within Lot 11 DP249530 and approximately 160 metres west of Menangle Road. The test excavation area was situated on a gently west sloping landform adjacent to an unnamed tributary of Howes Creek to the south.

A total of 10, 50 x 50 centimetre test squares (TS 32-41) were excavated within the proposed impact area at Spring Farm PAD-05. The test squares within the Spring Farm PAD-05 test excavation area were positioned at 20 metre intervals along two north to south oriented transects and two north-west to south-east oriented transects (Figure 7). An additional test square (TS 41) was excavated within a cleared area adjacent to the dense vegetation within the riparian corridor.

![Plate 10. Spring Farm PAD-05 facing south with TS 36 in foreground](image)

Vegetation within the test excavation area comprised clusters of regrowth trees with areas of patchy grass and plant detritus. Visible surface disturbance was low and limited to past tree clearance and the construction of fencing.

4.5.1 **Soils and disturbance**

Sediment profiles were generally homogenous across the test excavation area and were characterised by a shallow deposit of silty loam overlying basal clay. Bioturbation was evident within the test excavation squares with fine root systems present throughout the area. Small fragmented pieces of charcoal were dispersed throughout the test excavation squares with no obvious burning event. Examples of the soil profiles are described below.

![Figure 17. TS 32 south section and soil profile description](image)

I. 0-4cm: Mid grey brown silty loam, dry, friable. Frequent fine root systems. Clear boundary to:

II. 4-8cm: Mid grey brown silty loam, compact. Infrequent fine root systems throughout. Diffused boundary to:

III. 8-15cm: Mid brown silty clay loam, compact. Infrequent fine root systems throughout. Orange clay nodules < 5cm 5%. Infrequent charcoal flecking <1cm 1%. Clear boundary to:

IV. 15cm-base: Reddish brown clay, compact.
I. 0-2cm: Mid grey brown silty loam, dry, friable. Frequent fine root system. Clear boundary to:
II. 2-17cm: Mid grey brown silty loam, compact. Infrequent fine root systems throughout. Occasional orange clay nodules. Diffused boundary to:
III. 17cm-base: Reddish brown clay, compact. Infrequent fine root systems.

Figure 18. TS 34 south section and soil profile description

I. 0-2cm: Mid grey brown sily loam, dry, friable. Frequent fine root systems. Clear boundary to:
II. 2-7cm: Light grey brown silty loam, compact. Infrequent fine root system. Infrequent charcoal flecking <1cm 1%. Occasional orange clay nodules. Clear boundary to:
III. 7cm-base: Reddish brown clay, compact.

Figure 19. TS 36 east section and soil profile description

I. 0-3cm: Mid grey brown silty loam, dry, friable. Frequent fine root systems. Clear boundary to:
II. 3-10cm: Pale grey brown silty loam, compact. Infrequent fine root systems. Iron-manganese nodules < 1cm <5%. Infrequent charcoal flecking <1cm 1%. Diffuse boundary to:
III. 10cm-base: Orange brown silty clay , compact. Clay content increasing with depth. Infrequent fine root systems throughout. Iron-manganese nodules < 1cm <5%.

Figure 20. TS 41 north section and soil profile description

4.5.2 Artefact distribution and lithics
The test excavation program at Spring Farm PAD-05 recovered one artefact from TS 34 while the remaining nine test squares did not contain artefacts. TS 34 was located in the middle to the western most transect and the artefact was recovered from a depth between 10 and 20 centimetres below the ground surface. The artefact was a silcrete distal fragment that was between 20 and 24 millimetres in size. The artefact exhibited crazing and pot lidding on the dorsal surface and retained below 30% cortex.
4.5.3 Discussion

The Spring Farm PAD-04 test excavation program recovered one artefact from TS 34 while no artefacts were excavated from the remaining nine test squares. The artefact was identified within the upper 20 centimetres of the deposit. Due to the presence of an artefact at the site, it was reclassified/renamed Spring Farm Parkway IF 1.

The soil profiles within the excavated test squares were characterised by a shallow deposit of silty loam with low density of iron-manganese nodules indicating that the deposit had not remained stable and may have been affected by natural processes or past land use practices. The very low artefact density is indicative of an isolated event and indicates a low potential to retrieve additional archaeological information from the site.
5 Consultation Process

5.1 Aboriginal stakeholder consultation

Roads and Maritime is committed to effective consultation with Aboriginal communities regarding Roads and Maritime activities and their potential for impact on Aboriginal cultural heritage. The Roads and Maritime PACHCI was developed to provide a consistent means of effective consultation with Aboriginal communities regarding activities which may impact on Aboriginal cultural heritage and a consistent assessment process for Roads and Maritime activities across NSW.

The aim of consultation is to integrate cultural and archaeological knowledge and ensure registered Aboriginal parties have information to make decisions on Aboriginal cultural heritage. For the preparation of this CHAR, consultation with Aboriginal people has been undertaken in accordance with the OEH Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010 (OEH 2010) and the requirements of Clause 80C of the National Parks and Wildlife Regulation 2009.

Roads and Maritime advertised in local media (Appendix A) and contacted potential Aboriginal stakeholders identified from government agency notification responses. Roads and Maritime invited Aboriginal people who hold knowledge relevant to determining the cultural heritage significance of Aboriginal objects and Aboriginal places in the area in which the proposed activity is to occur to register an interest in a process of community consultation. Investigations for the Spring Farm Parkway have included consultation with the 27 Aboriginal community groups and individuals as listed in Table 2 below.

Table 2. Registered Aboriginal parties

<table>
<thead>
<tr>
<th>Registered Aboriginal party</th>
<th>Representative and/or Contact Person</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tharawal Local Aboriginal Land Council</td>
<td>Rebecca Jarvis</td>
</tr>
<tr>
<td>Badu</td>
<td>Karia Bond</td>
</tr>
<tr>
<td>Biamanga</td>
<td>CEO</td>
</tr>
<tr>
<td>Butucarbin</td>
<td>Jennifer Beale</td>
</tr>
<tr>
<td>Cubbitch Barta Native Title Claimants</td>
<td>Glenda Chalker</td>
</tr>
<tr>
<td>Cullendulla</td>
<td>CEO</td>
</tr>
<tr>
<td>Darren Duncan</td>
<td>Darren Duncan</td>
</tr>
<tr>
<td>Darug Custodian Aboriginal Corporation</td>
<td>Justine Coplin</td>
</tr>
<tr>
<td>Darug Land Observations Pty Ltd</td>
<td>Jamie Workman and Uncle Gordon Workman</td>
</tr>
<tr>
<td>Dharug</td>
<td>Mitchell McCourt</td>
</tr>
<tr>
<td>Didge Ngunawal Clan</td>
<td>Paul Boyd</td>
</tr>
<tr>
<td>Duncan Folk Consultancy</td>
<td>Duncan Falk</td>
</tr>
<tr>
<td>Eora</td>
<td>Kahu Brennan</td>
</tr>
<tr>
<td>Gangangarra</td>
<td>Kim Carriage</td>
</tr>
<tr>
<td>Goobah</td>
<td>Basil Smith</td>
</tr>
<tr>
<td>Kamilaroi-Yankuntjatjara Working Group</td>
<td>Phillip Khan</td>
</tr>
<tr>
<td>Kawul Cultural Services</td>
<td>Vicki Slater</td>
</tr>
<tr>
<td>Muragadi Heritage Indigenous Corporation</td>
<td>Jesse Carroll – Johnson</td>
</tr>
<tr>
<td>Murra Bidgee Mullangari</td>
<td>Ryan Johnson</td>
</tr>
<tr>
<td>Murramarang</td>
<td>CEO</td>
</tr>
<tr>
<td>Nundagurri</td>
<td>Thomas Tighe</td>
</tr>
<tr>
<td>Shaun Carroll</td>
<td>Shaun Carroll</td>
</tr>
<tr>
<td>Thoorga Nura</td>
<td>John Carriage</td>
</tr>
<tr>
<td>Waarlan Group</td>
<td>Phil Boney</td>
</tr>
</tbody>
</table>
Registered Aboriginal party | Representative and/or Contact Person
--- | ---
Walbunja | Hika Tekowhai
Warragil Cultural Services | Aaron Slater
Registered Aboriginal Stakeholders [details withheld]* | Registered Aboriginal Stakeholders [details withheld]*

*An additional Aboriginal stakeholder has registered for the proposal but has chosen to withhold their details in accordance with item 4.1.5 of the Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010 (OEH 2010a).

The formal consultation process has included:

- Advertising for registered Aboriginal parties (Appendix A);
- Government agency notification letters;
- Notification of closing date for registration;
- Provision of proposed assessment methodology allowing 28 day review (letters dated 1/05/2018);
- An Aboriginal Focus Group (AFG) meeting held on 8 May 2018 to discuss archaeological assessment methodology;
- Ongoing compilation of registrants list, through continuing to register individuals and groups for consultation on the proposal;
- Provision of draft CHAR for review allowing a minimum 28 day review (letters dated 10/10/2018);
- Ongoing consultation with the local Aboriginal community.

5.2 Stakeholder responses to presentation of information about the proposed project

Formal responses to the presentation of information about the proposed project were received from Duncan Folk Consultancy (DFC) and Kamilaroi-Yankuntjatjara Working Group (KYWG). Comments and information received from stakeholders is attached in full in Appendix B and summarised below.

DFC advised that “the nearby Nepean River contains many important and culturally sensitive sites including shelters containing rock art, stone quarries for tool making e.g. stone axe heads, murder and massacre sites of local Aboriginal people” (via email dated 7/05/2018). DFC recommended that the area “should be treated with the utmost respect and care” (via email dated 7/05/2018).

KYWG advised that the area is highly significant to past and present Aboriginal people, especially along the flood plains of the Nepean where campsites and burials may be present due to the sand (letter dated 2/05/2018).

5.3 Review of draft CHAR

The draft CHAR was provided to registered Aboriginal stakeholders for review and comment on 10/10/2018. All registered Aboriginal stakeholders were provided a 28 day period for review (closure of comment period on 7 November 2018). Comments and information received from stakeholders during this period are attached in full in Appendix B and summarised below.

5.4 Stakeholder responses to draft CHAR

Formal responses to the draft CHAR were received from Darug Custodian Aboriginal Corporation (DCAC), DFC, Darug Land Observations Pty Ltd (DLO), Cubbitch Barta Native Title Claimants (CBNC) and an additional Aboriginal stakeholder that had registered for the proposal but had chosen to withhold their details in accordance with item 4.1.5 of the Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010 (OEH 2010a).

DCAC supported the recommendations of the report (via email 22/10/2018). DCAC stated that “his area is significant to the Darug people due to the evidence of continued occupation, within close proximity to this project site there is a complex of significant sites” (via email 22/10/2018) and advised that “Darug sites are all connected, our country has a complex of sites that hold our heritage and past history, evidence of the Darug lifestyle and occupation are all across our country, due to the rapid development of Sydney many of our sites have been destroyed, our sites are thousands of years old and within the short period of time that Australia has been developed pre contact our sites have disappeared” (via email 22/10/2018).

DFC agreed with the findings of the report and that there was no need for a salvage excavation to be conducted (via email dated 17/10/2018).
DLO supported the report and believed that recovered artefacts should be reburied on Country (the study area) (via email dated 1/11/2018). It is KNC’s position that the long term management of recovered Aboriginal objects will comply with Requirement 26 “Stone artefact deposition and storage” in the Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW. Recovered objects will be lodged with the Australian Museum in the first instance.

CBNC requested further information in regards to the test excavation program and report (letter dated 23/10/2018). CBNC stated that the tested area should have included the space between PAD 3 and PAD 4 through to the end of the proposed impact area as they considered it to be the same landform. CBNC also asked why the area on the western side of the Hume Motorway was not tested. The area between PAD 3 and PAD 4 was tested as shown on Figure 7. The test excavation program found that the area comprised dispersed low density artefact scatters that had been variably affected by subsurface disturbance. The remaining portion of the impact area within the same landform and the area on the western side of the Hume Motorway were assessed as lacking favourable topography for the preservation of subsurface archaeological deposits and having the potential for similar or higher levels of subsurface disturbance due to the construction of an embankment for the Hume Motorway and an access track.

CBNC asked “how is the larger part of PAD 3, being protected from [sic] construction of the road, if it was never tested?” (letter dated 23/10/2018). The test excavation program was restricted to the portion of the identified PAD areas within the impact area of the project as the areas outside would not be impacted by this project. The test excavation program focused on the portions of the areas of potential archaeological deposit which were most likely to contain subsurface deposits that, in the case of PAD 3, comprised the lower slope and adjacent flat. The remaining portion of the PAD within the study area was located on a relatively steep slope where the preservation intact subsurface deposits were highly unlikely.

CBNC asked about the sections of the proposed road beyond the current study area and noted that they “found it very frustrating dealing with this piece meal situation and keeping up with what is going on” (letter dated 23/10/2018).

CBNC stated that they believe that there should have been more testing and that there seemed to be a minimalist approach for projects with large impact areas. The overall study area was assessed during the PACHCI Stage 2 assessment which determined that the tested areas had potential for archaeological deposits based on previous archaeological investigations in the area and low levels of visible disturbance. No archaeological potential was identified within the remaining portions of the current study area.

CBNC stated that “in regards to inter-generational equity, this project is only the beginning of a much larger scale destruction of Aboriginal sites in the Menangle Park area. There will be nothing left when this massive development takes place, over the coming years” (letter dated 23/10/2018). As discussed in Section 3, several archaeological investigations have been undertaken at Menangle Park for proposed redevelopment and the archaeological potential of the sites within the current study area in relation to the wider Menangle Park area can be determined. As discussed in Section 9.1 the Aboriginal archaeological sites within the study area exhibit minimal to no information and offer no significant value as conservation items. Impact to the sites results in a neutral change to the cumulative index. The overall impact to Aboriginal archaeological sites within the wider Menangle Park area is being considered as part of the proposed redevelopment.

An additional Aboriginal stakeholder that had registered for the proposal but had chosen to withhold their details stated that they had no issues with the project (via email dated 22/10/2018)
6 Summary and Analysis of Background Information

Analysis of the background information presented in sections 2, 3 and 4 allows an assessment of the cultural heritage values within the proposal area to be made. Combining data from historical/ethnographic sources, Aboriginal community consultation, landscape evaluation and archaeological context provides an insight into how the landscape around the proposal area was used and what sort of events took place in the past. This section draws together a variety of information to bring further understanding to the cultural landscape of the proposal area.

The study area and surrounding region are known to have been important to and extensively used by past Aboriginal people. Early colonial interest in the area led to interactions between the British and the local Aboriginal people relatively soon after the arrival of Europeans to Australia. Aboriginal people’s use of the wider Cumberland Plain is well-documented in historic accounts and members of the contemporary Aboriginal community continue to experience connection with the area through cultural and family associations.

Archaeological investigations within the region have revealed physical traces of a range of Aboriginal land use activities which have survived in the form of archaeological sites. Recorded site types in the vicinity include open artefact scatters (camp sites), isolated artefacts and a scarred tree. Archaeological surveys and excavations within the MPURA have demonstrated a varied archaeological landscape within the local area. The preservation of intact archaeological deposit in the vicinity of Howes Creek (and its tributaries) is strongly affected by environmental factors such as proximity to flood zones, landform, slope stability and historical or modern land use disturbances.

An archaeological test excavation confirmed the presence of minimal subsurface archaeological deposit at the three areas of potential archaeological deposit: Spring Farm Parkway AFT 1 (formerly Spring Farm PAD-03), Spring Farm Parkway AFT 2 (formerly Spring Farm PAD-04) and Spring Farm Parkway IF 1 (formerly Spring Farm PAD-05). The artefacts recovered from the sites indicate that the sites were not the focal points for the creation of stone artefacts and that the artefacts represented isolated events which had been disturbed by natural processes or past land use practices. The subsurface deposit at the three sites exhibited low-no archaeological potential.

6.1 Summary of known Aboriginal sites within the proposal area

Review of background information, Aboriginal community consultation and archaeological assessment has resulted in the identification of three Aboriginal archaeological sites of Aboriginal archaeological value containing Aboriginal objects within the study area (Table 3). The locations of these sites are shown on Figure 21.

Table 3. Identified Aboriginal archaeological sites within the proposal area

<table>
<thead>
<tr>
<th>Site Name</th>
<th>AHIMS ID</th>
<th>Site Feature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spring Farm Parkway AFT 1</td>
<td>tbc</td>
<td>Artefact</td>
</tr>
<tr>
<td>Spring Farm Parkway AFT 2</td>
<td>tbc</td>
<td>Artefact</td>
</tr>
<tr>
<td>Spring Farm Parkway IF 1</td>
<td>tbc</td>
<td>Artefact</td>
</tr>
</tbody>
</table>
6.2 Aboriginal sites within the proposal area

Site name: Spring Farm Parkway AFT 1
AHIMS site ID: tbc

Site Spring Farm Parkway AFT 1 was an artefact scatter situated on a gently south sloping landform bound by a steep south sloping spurline to the north and an unnamed tributary of Howes Creek to the south. The site was located within Lot 8 DP249530, approximately 240 metres west of the Hume Motorway corridor and 470 metres east of Fitzpatrick Street. The site was initially identified as an area of archaeological potential (Spring Farm PAD-03) during the PACHCI Stage 2 survey.

An archaeological test excavation was undertaken in the western portion of the site by Niche in late 2013 (see Section 3.2). The program excavated eight test pits and five artefacts were recovered within the test pit closest to Howes Creek. The artefacts comprised one broken tool, one complete flake and three broken flakes. An additional pit was excavated immediately adjacent to Test Pit 701 A; however, no additional artefacts were recovered.

A subsequent archaeological test excavation was undertaken in the eastern portion of the site by KNC in July 2018 (see Section 4). The program excavated 17 test squares within the proposed impact area. A total of four artefacts were recovered from four of the 17 test squares excavated. The artefacts consisted of three flakes and one medial flake fragment which were predominantly made from silcrete while one flake made from quartz. Artefacts were predominantly small in size with three artefacts measuring between 10-19 millimetres in size and one silcrete flake measured was between 30-34 millimetres in size.

The spatial distribution of artefacts was characterised by disconnected squares of low density artefact concentrations. The absence of spatial concentrations of artefacts across adjacent test squares and lack of conjoining artefacts indicates that the area was not a focal point for the creation of stone artefacts and that the site had been disturbed by past land use practices or natural processes. The low artefact density, limited range of artefact types and dispersed spatial distribution of artefacts indicate a low potential to retrieve additional archaeological information from the site.

Site name: Spring Farm Parkway AFT 2
AHIMS site ID: tbc

Site Spring Farm Parkway AFT 2 was an artefact scatter situated on a gently west sloping landform which overlooked the junction of two unnamed tributaries of Howes Creek. The site was located within Lot 8 DP249530 and Lot 11 DPS84016, approximately 90 metres west of the Hume Motorway corridor and 650 metres east of Fitzpatrick Street. The site was initially identified as an area of archaeological potential (Spring Farm PAD-04) during the PACHCI Stage 2 survey.

An archaeological test excavation was undertaken at the site by KNC in July 2018 (see Section 3.2). The program excavated 21 test squares within the proposed impact area. A total of two artefacts were recovered from two of the 21 test squares excavated. The artefacts consisted of a quartz proximal flake fragment and a silcrete angular flake fragment. The artefacts were small in size and measured between 15-19 millimetres in size.

The spatial distribution of artefact across the tested area was characterised by isolated artefacts which were dispersed and without spatial focus. The range of material recovered and absence of localised concentrations of artefacts indicates that the site was not the focus of past stone artefact creation and that the site may have been affected by subsurface disturbance. The very low artefact density, limited range of artefact types and dispersed spatial distribution of artefacts indicate a low potential to retrieve additional archaeological information from the site.

Site name: Spring Farm Parkway IF 1
AHIMS site ID: tbc

Site Spring Farm Parkway IF 1 was an isolated artefact which was situated on a gently west sloping landform adjacent to an unnamed tributary of Howes Creek to the south. The site was located adjacent to the Hume Motorway corridor within Lot 11 DP249530 and approximately 160 metres west of Menangle Road. The site was initially identified as an area of archaeological potential (Spring Farm PAD-05) during the PACHCI Stage 2 survey.

An archaeological test excavation was undertaken at the site by KNC in July 2018 (see Section 3.2). The program excavated 10 test squares within the proposed impact area. The test excavation program at Spring Farm PAD-05 recovered one artefact from the 10 test squares excavated. The artefact was located within TS 34 which was located in the middle to the western most transect from a depth between 10 and 20 centimetres below the ground surface. The artefact was a silcrete distal fragment that was between 20 and 24 millimetres in size. The very low artefact density is indicative of an isolated event and indicates a low potential to retrieve additional archaeological information from the site.
Figure 21. Identified Aboriginal archaeological sites within the study area
7 Cultural Heritage Values and Statement of Significance

7.1 Significance Assessment Criteria

One of the primary steps in the process of cultural heritage management is the assessment of significance. Not all sites are equally significant and not all are worthy of equal consideration and management (Sullivan and Bowdler 1984; Pearson and Sullivan 1995:7). The determination of significance can be a difficult process as the social and scientific context within which these decisions are made is subject to change (Sullivan and Bowdler 1984). This does not lessen the value of the heritage approach, but enriches both the process and the long term outcomes for future generations as the nature of what is conserved and why, also changes over time.

The assessment of significance is a key step in the process of impact assessment for a proposed activity as the significance or value of an object, site or place will be reflected in resultant recommendations for conservation, management or mitigation.

The Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales (OEH 2010a) requires significance assessment according to criteria established in the Australia ICOMOS Burra Charter, 1999 (Australia ICOMOS 1999). The Burra Charter and its accompanying guidelines are considered best practice standard for cultural heritage management, specifically conservation, in Australia. Guidelines to the Burra Charter set out four criteria for the assessment of cultural significance:

- Aesthetic value - relates to the sense of the beauty of a place, object, site or item
- Historic value - relates to the association of a place, object, site or item with historical events, people, activities or periods
- Scientific value - scientific (or research) value relates to the importance of the data available for a place, object, site or item, based on its rarity, quality or representativeness, as well as on the degree to which the place (object, site or item) may contribute further substantial information
- Social value - relates to the qualities for which a place, object, site or item has become a focus of spiritual, political, national or other cultural sentiment to a group of people. In accordance with the OEH Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW, the social or cultural value of a place (object, site or item) may be related to spiritual, traditional, historical or contemporary associations. According to OEH, “social or cultural value can only be identified though consultation with Aboriginal people” (OEH 2011:8).

There are three locations of recorded Aboriginal cultural heritage values within the study area. The significance assessment for the identified archaeological sites has focussed on the social/cultural, historic, scientific and aesthetic significance of Aboriginal heritage values as identified in The Burra Charter.

Social Values

This area of assessment concerns the value/s of a place, feature or site to a particular community group, in this case the local Aboriginal community. Aspects of social significance are relevant to sites, objects and landscapes that are important or have become important to the local Aboriginal community. This importance involves both traditional links with specific areas as well as an overall concern by Aboriginal people for sites generally and their continued protection. Aboriginal cultural significance may include social, spiritual, historic and archaeological values.

It has been identified during the consultation process that the local area has cultural heritage value (social value) to the local Aboriginal community.

Regarding Aboriginal sites identified within the study area, no specific cultural or social values expressed by these sites have been identified to date.

Historic Values

Historical research did not identify any information regarding specific historical significance of identified Aboriginal archaeological sites within the current study area. No specific historical significance for the sites within the study area provided by the registered Aboriginal stakeholders.
**Scientific Values**

Scientific values have been assessed for the identified Aboriginal archaeological sites in the proposal area. These values have been developed based on significance criteria of research potential (including integrity/condition, complexity and archaeological potential), representativeness and rarity. Identified archaeological sites in the study area displayed low-no scientific significance.

Sites of low significance are those that do not offer archaeological research potential and are unlikely to provide any further scientifically valuable information.

**Aesthetic Values**

Aesthetic values are often closely related to the social values of a site or broader cultural landscape. Aspects may include scenic sights, smells and sounds, architectural fabric and creative aspects of a place.

The study area has no specific associated aesthetic values listed by registered Aboriginal community groups. Archaeologically, the study area does not contain these values.
7.2 Statements of Significance

The proposal area contains three identified Aboriginal archaeological sites as defined under the National Parks and Wildlife Act 1974. The three identified Aboriginal archaeological sites within the study area are:

- Spring Farm Parkway AFT 1
- Spring Farm Parkway AFT 2
- Spring Farm Parkway IF 1

Based on the values assessment, the following levels of significance were ascribed to the three sites within the study area:

**Spring Farm Parkway AFT 1**
Site Spring Farm Parkway AFT 1 represents a commonly occurring type of site in the region, consisting of an open artefact scatter of low density on a slope landform. The artefacts are typical of the region in terms of type and raw material. The test excavation program at site Spring Farm Parkway AFT 1 demonstrated that the site was not a focal point for the creation of stone artefacts and that the artefacts represented isolated events which had been disturbed by natural processes or past land use practices. It is unlikely that further investigation could contribute to our understanding of Aboriginal landscape use in the region. Based on the intactness, representativeness and research potential of the site, Spring Farm Parkway AFT 1 is determined to have low archaeological significance.

**Spring Farm Parkway AFT 2**
Site Spring Farm Parkway AFT 2 represents a commonly occurring type of site in the region, consisting of an open artefact scatter of very low density on a slope landform at the junction of two minor creeks. The artefacts are typical of the region in terms of type and raw material. The test excavation program at site Spring Farm Parkway AFT 2 demonstrated that the site was not a focal point for the creation of stone artefacts and that the artefacts represented isolated events which had been disturbed by natural processes or past land use practices. It is unlikely that further investigation could contribute to our understanding of Aboriginal landscape use in the region. Based on the intactness, representativeness and research potential of the site, Spring Farm Parkway AFT 2 is determined to have low archaeological significance.

**Spring Farm Parkway IF 1**
Site Spring Farm Parkway IF 1 represents a commonly occurring type of site in the region, consisting of an isolated artefact on a slope landform. The artefact is typical of the region in terms of type and raw material. The test excavation program at site Spring Farm Parkway IF 1 demonstrated that the site was not a focal point for the creation of stone artefacts and that the artefact represented an isolated event. The site had been disturbed by natural processes or past land use practices and it is unlikely that further investigation could contribute to our understanding of Aboriginal landscape use in the region. Based on the intactness, representativeness and research potential of the site, Spring Farm Parkway IF 1 is determined to have low archaeological significance.
8 The Proposed Activity and Impact Assessment

Roads and Maritime propose to build the Spring Farm Parkway to link the Camden Bypass, the Hume Motorway and Menangle Road, Menangle Park. The proposed Spring Farm Parkway proposal is split into two stages to support housing development and better connectivity for the region.

The proposed works for Stage 1 of the Spring Farm Parkway proposal involves the construction of a 2.5 kilometre road which would connect the Menangle Park development area to the Hume Motorway and Menangle Road. The Stage 1 proposal includes an interchange with the Hume Motorway with north facing ramps and provision for future south facing ramps.

The study area encompasses both the construction and operational footprints allowing for space to construct the road, local road alterations and temporary ancillary facilities.

The entirety of the study area would be impacted by construction and associated work. In total three Aboriginal archaeological sites would be impacted by the proposal. The proposed impact to sites identified within the study area is detailed in Table 4 and shown in Figure 22.

Table 4. Proposed impact to Aboriginal archaeological sites within the study area

<table>
<thead>
<tr>
<th>Site Name</th>
<th>AHIMS ID</th>
<th>Description</th>
<th>Significance</th>
<th>Type / Degree of Harm</th>
<th>Consequence of Harm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spring Farm Parkway AFT 1</td>
<td>tbc</td>
<td>Fragmentary, low density artefact scatter located on a slope landform</td>
<td>Low</td>
<td>Direct / Total</td>
<td>Total loss of value</td>
</tr>
<tr>
<td>Spring Farm Parkway AFT 2</td>
<td>tbc</td>
<td>Fragmentary, low density artefact scatter located context on a slope landform</td>
<td>Low</td>
<td>Direct / Total</td>
<td>Total loss of value</td>
</tr>
<tr>
<td>Spring Farm Parkway IF 1</td>
<td>tbc</td>
<td>Low isolated artefact located on a slope landform</td>
<td>Low</td>
<td>Direct / Total</td>
<td>Total loss of value</td>
</tr>
</tbody>
</table>
Figure 22. Study area (impact area) and Aboriginal heritage
9 Mitigating Harm

9.1 Ecologically Sustainable Development Principles

The assessment applied the principles of Ecologically Sustainable Development (ESD) to the current proposal. The principles of Ecologically Sustainable Development are defined in Section 6 of the NSW Protection of the Environment Administration Act 1991. The ESD principles relevant to Aboriginal cultural heritage within the proposal area are: the Precautionary Principle and the Principle of Inter-Generational Equity. The application of these principles in relation to the current proposal is discussed below.

The Precautionary Principle
The Precautionary Principle states “that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation”.

The identified Aboriginal archaeological sites have been considered by Roads and Maritime in relation to the proposed road construction and associated activities. A larger area was surveyed as part of the PACHCI Stage 2 assessment in order to provide options for Aboriginal archaeological site avoidance where possible. While conservation is the best approach when considering Aboriginal heritage, the avoidance of Aboriginal archaeological sites within the study area was not possible due to the requirements of the proposal and limited area in which it could occur.

The Aboriginal sites located within the study area have been impacted by past land use activities and natural processes which would further impact the sites. Scientific confidence has been achieved through archaeological investigations which have included survey and test excavation (Sections 3 and 4). Aboriginal cultural heritage value confidence has been achieved through consultation with Aboriginal stakeholders (Section 5). As detailed in Sections 6 and 7, the assessment has determined that the study area contains Aboriginal archaeological sites with low significance.

The Principle of Inter-Generational Equity
The Principle of Inter-Generational Equity states “that the present generation should ensure that the health, diversity and productivity of the environment are maintained or enhanced for the benefit of future generations”.

The archaeological sites located within the proposal area were evaluated in relation to intergenerational equity and in particular, the cumulative impact of the proposal on the Aboriginal heritage of the region. The archaeological sites within the study area exhibit minimal to no information and offer no significant value as conservation items. Impact to the sites results in a neutral change to the cumulative index.
9.2 Mitigation Measures

Suitable recommendations for the identified impact to the sites has been developed based on ESD, environmental context and condition, background research and consultation with stakeholders. The proposal area contains low significance sites.

Sites Spring Farm Parkway AFT 1, Spring Farm Parkway AFT 2 and Spring Farm Parkway IF 1 are considered to display low significance based on their scientific value and potential to inform on Aboriginal landscape use along Howes Creek.

An AHIP is required for impacts to land and identified sites/objects prior to the commencement of pre-construction or construction activities associated with the proposal that would affect the sites. Measures for mitigating harm to the sites are outlined in Table 5 below.

Table 5. Mitigation measures for impacted Aboriginal sites

<table>
<thead>
<tr>
<th>Site Name</th>
<th>AHIMS number</th>
<th>Mitigating Harm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spring Farm Parkway AFT 1</td>
<td>tbc</td>
<td>AHIP required prior to commencement of work affecting the site.</td>
</tr>
<tr>
<td>Spring Farm Parkway AFT 2</td>
<td>tbc</td>
<td>AHIP required prior to commencement of work affecting the site.</td>
</tr>
<tr>
<td>Spring Farm Parkway IF 1</td>
<td>tbc</td>
<td>AHIP required prior to commencement of work affecting the site.</td>
</tr>
</tbody>
</table>
10 Summary and Recommendations

A total of three Aboriginal sites are situated within the study area. An AHIP would be sought for Aboriginal objects within the boundaries of the study area, incorporating archaeological sites listed in Table 6.

AHIP

An application for an AHIP should be made under section 90A of the National Parks and Wildlife Act 1974 for the three Aboriginal archaeological sites. No current AHIPs or planned future AHIPs exist within the area which is the subject of this application.

An AHIP would be sought for the land and associated objects within the boundaries of the study area (Figure 23). The AHIP would also be sought for the specified Aboriginal sites and objects contained within the sites listed in Table 6.

Table 6. Known archaeological sites requiring AHIP and degree of harm

<table>
<thead>
<tr>
<th>Site Name</th>
<th>AHIMS Number</th>
<th>Degree of Harm</th>
<th>Consequence of Harm</th>
<th>Significance of Harm</th>
<th>Mitigation</th>
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<td>Spring Farm Parkway AFT 1</td>
<td>tbc</td>
<td>Total</td>
<td>Total loss of value</td>
<td>Low</td>
<td>Disturbed no salvage warranted</td>
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<td>Total loss of value</td>
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Figure 23. AHIP application area boundary
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<th>Point ID</th>
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<th>Point ID</th>
<th>Easting</th>
<th>Northing</th>
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## Glossary of Terms

**Aboriginal Object**
(as defined in the NPW Act)

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

**Aboriginal Place**
(as defined in the NPW Act)

A place declared under s.84 of the NPW Act that, in the opinion of the Minister, is or was of special significance to Aboriginal culture.

**Anvil**

An object used as a stable base for producing stone artefacts. This will have percussion pitting from the impact of reducing an anvil rested core.

**Artefact**

Any object that has been physically modified by humans or that is unmodified but is out of its natural context and considered to have been brought to the location by humans (a manuport).

**Attribute**

A physical characteristic of an artefact

**Backed Artefact**

A tool made from a flake or flake fragment, with steep blunting retouch along one or opposite margin after the flake was removed from the core. Includes geometric microliths of various shapes and asymmetric Bondi points.

**Backed Broken**

Fragments of backed or partly backed flakes. Breakage often occurred during manufacture.

**Backing Debitage**

Small retouching flakes produced from the backing process using an anvil rested technique along its thick margin. May have bidirectional scars or a small distal cone from rebounding off an anvil.

**Bipolar Core**

A core reduced using the bipolar technique, being placed on an anvil and struck with a hammer stone.

**Bipolar Flake**

A flake with proximal and distal crushing produced by bipolar flaking technique. These may have a flattened ventral surface/bulb of percussion. Some flakes may only have crushing/step fractures at proximal end, having been removed before reaching the base of the core.

**Bondi Point**

An asymmetrical backed artefact which is widest at the proximal end and pointed at the distal end. The length of a Bondi point is generally over twice the artefact width.

**Bulb of Percussion**

An attribute on the ventral surface of a flake during the detachment of the flake from a core by the movement of force from a blow applied to a single point. The bulb of percussion is characteristically a bulge which occurs just below the point of force application.

**Bulbar (Éraillure) Scar**

A scar on the ventral surface of a flake which sometimes occurs during the removal of the flake from a core by the force of percussion.

**Chert**

A fine rock of sedimentary origin, made up mostly of microcrystalline quartz, but sometimes with a chalcedony or opal component. Chalcedony is a microporous mass of silica. Includes banded varieties.

**Cobble**

An edge rounded stone more than 6.4 centimeters in size. e.g. core blank, hatchet blank, or hammer stone.

**Colour**

Recorded with particular reference to silcrete to determine if artefacts were heat altered material versus unheated stone.

**Conchoidal**

Exhibiting the characteristics of direct percussion such as a bulb of percussion or ripple marks

**Cone-Split Broken Flake**

A flake broken longitudinally through its point of force application (pfa) /cone. Retains some of the striking platform and point of impact. These are recorded as left or right half of the flake when viewing itsventral surface CSBF/Left, or CSBF/Right.

**Conjoin**

Two or more stone artefacts which are part of a knapping event that can be refitted to each other.

**Core**

Any stone used as a nucleus or blank for removing flakes large enough for use as implements. These must have negative flakes scars, although large retouched flakes used as cores may still retain a remnant ventral surface. Subsequent use as a core must intercept the old ventral surface. A core may be made on a cobbble, pebble, flake, broken flake, flake fragment, heat shatter or naturally fragmented rock.

**Core Flaking Pattern**

The pattern of negative flake scars on cores, used to determine stone reduction strategies. Sometimes a core may have evidence of more than one flaking pattern. These include:
- Unifacial – scars show that useable flakes have been removed one edge at a time in one direction. Sometimes reduction continued in this way after the core was rotated. Flakes should have a flat unmodified platform.
- Bifacial – scars show that larger potentially useable flakes were struck off both opposing faces of an edge. Core edges often appear ‘wavy’ when viewed in plan.
- Asymmetric alternating – tiny preparation flakes are first removed off the core platform, then larger useable flakes struck off the opposing face. The preparation scars can be seen on flakes with faceted platforms, and are sometimes still present on abandoned cores or core fragments.
- Bipolar – small negative step scars or crushing at opposing ends of a core, from it being rested on an anvil and struck with a hammer stone. There may also be a tiny distal cone on flakes, from the force rebounding off the anvil.

<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Core Fragment</td>
<td>Broken off a core, and still retaining technological attributes such as negative flake scars or core platform.</td>
</tr>
<tr>
<td>Core Tool</td>
<td>A core that also has evidence of tool use on its margins or ridges such as striations, edge rounding or polish.</td>
</tr>
<tr>
<td>Cortex</td>
<td>The natural outer weathering rind or surface of rock. This may be remnant on the dorsal surfaces of an artifact, and is recorded as a percentage of the dorsal surface area.</td>
</tr>
<tr>
<td>Crazing</td>
<td>The surface of a heat affected rock which resembles cracked ceramic.</td>
</tr>
<tr>
<td>Crenate Fracture (CF)</td>
<td>Debitage with crenate fracture. This could be from heat shatter but may be from chemical weathering, particularly in chert or tuff artefacts.</td>
</tr>
<tr>
<td>Culturally Modified Tree</td>
<td>A tree that, before or concurrent with (or both) the occupation of the area in which the tree is located by persons of non-Aboriginal extraction, has been scarred, carved or modified by an Aboriginal person by:</td>
</tr>
<tr>
<td></td>
<td>• The deliberate removal, by traditional methods, of bark or wood from the tree, or</td>
</tr>
<tr>
<td></td>
<td>• The deliberate modification, by traditional methods, of the wood of the tree.</td>
</tr>
<tr>
<td>Debitage</td>
<td>Material from the stone knapping process with no signs of subsequent modification.</td>
</tr>
<tr>
<td>Distal End</td>
<td>The termination of a flake opposite the bulb of percussion or point of applied force.</td>
</tr>
<tr>
<td>Distal Flake Fragment</td>
<td>A fragment of a flake that has been broken but distal termination (also termed distal fragment or distal flake). It does not have a distal termination.</td>
</tr>
<tr>
<td>Dorsal</td>
<td>The outside or back of a flake when removed from a core. The dorsal surface may have negative flake scars from previous flake removals and/or cortex.</td>
</tr>
<tr>
<td>Fine Grained Siliceous</td>
<td>Fine grained siliceous rocks which could not be positively identified without detailed mineralogical investigation.</td>
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<tr>
<td>(FGS)</td>
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<tr>
<td>Flake</td>
<td>A stone artefact that has been removed from a core. A flake has a proximal striking platform, point of force application (pfa), bulb of percussion and distal termination. Also may have a bulbar (éraillure) scar, ripple marks and fracture lines</td>
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<tr>
<td>Flaked Piece</td>
<td>An artefact that has evidence of flaking but no characteristics of a flake, broken flake, flake fragment, retouched flake or core can be discerned. Also referred to as an angular fragment.</td>
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<tr>
<td>Geometric Microlith</td>
<td>A type of backed artefact which is symmetrical in shape. They are often made from flakes with backing along truncated proximal and or distal ends.</td>
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<tr>
<td>Grinding Grooves</td>
<td>Oval shaped indentations on rock surfaces, such as sandstone outcrops which occurred as the result of the shaping and sharpening of ground stone artefacts.</td>
</tr>
<tr>
<td>Grindstone</td>
<td>A portable stone with linear striations and/or polish which shows that it has ground. Often made from fine grained sandstone or quartzite. May retain evidence of multipurpose use such as grinding of seeds, ochre.</td>
</tr>
<tr>
<td>Ground Stone Artefact</td>
<td>A stone artefact with an edge or surface that had been modified by grinding on another piece of stone. See Grindstone and Hatchet</td>
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<tr>
<td>Hammer stone</td>
<td>A stone used to strike a core for removal of flakes. Often spherical pebbles or cobbles with evidence of percussion pitting or spall scars on ends or margins.</td>
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<td>Hatchet</td>
<td>A ground edged hatchet head or fragment. Should have evidence of intentional grinding e.g. linear striations/polish from shaping or resharpening the cutting edge. Hatchets were multipurpose tools and may also have evidence of hammer percussion or anvil use.</td>
</tr>
<tr>
<td>Heat Shatter (HS)</td>
<td>Debitage caused by heat shatter. May have evidence of pot lidding from excessive heat</td>
</tr>
<tr>
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</table>
stress and/or irregular heat fractured surfaces.

Hornfels
A medium to fine grained metamorphic rock. Includes a variety known as spotted pelitic hornfels with tiny dark clasts or grains.

Igneous
A range of rocks of mixed mineral composition formed after cooling of molten subterranean materials. Occur as intrusions into older rocks such as dykes, diatremes, or spread onto the land surface from volcanic activity. Includes varieties such as basalt, dolerite.

Knapping Floor
An area where a core was flaked/knapped to produce flakes and tools.

Length
A measurement of the distance between the platform and the termination of a flake.

Lustre
A subjective record of lustre of stone artefact, also relating to heat treatment.

Manuport
An unmodified piece of stone out of natural context and considered to have been brought to the site by humans.

Medial Flake Fragment
A fragment of the mid-section of a flake with no platform or termination.

Medium Grained
A medium grained Siliceous rock of unknown type.

Midden
Also called shell midden. An area with the remains of edible shellfish which were discarded as the result of human procurement/consumption. May include fish and animal bones, stone artefacts and/or charcoal.

Mortar
A large base stone for grinding/pounding.

Modification/Activity Type
Refers to the activity associated with the lithic item e.g. debitage or waste from stone flaking, used as a hammer, anvil, core, bipolar core, retouched artefact, backed artefact.

Pebble
An edge rounded stone less than 6.4 centimetres in size. May have been used as core or small hammer stone.

Petrified Wood
Also called silicified or fossilized wood. Formed when trees were fossilized and their structure replaced by silica. Wood structure and growth rings are still visible as ‘bands’ within this material.

Platform Type
Records the type of platform on whole flakes or proximal flake fragments for information on flaking patterns and reduction strategies. These include:

- Plain – platform is smooth flat surface. Unifacial flaking or unifacial with core rotation.
- Rridged – platform has ridge from previous flake removal across core. Unifacial rotated or symmetric alternating (bifacial) flaking.
- Scarred – platform has one or more flake scars. Symmetric alternating (bifacial) flaking or asymmetric alternating flaking. May indicate platform preparation.
- Faceted – platform has multiple tiny flake scars struck from the dorsal. Indicates careful platform preparation. Asymmetric alternating flaking.
- Focal – small platform less than twice the area of ring crack.
- Crushed - platform has been crushed from force of flake removal but the rest of the flake is otherwise intact. The platform may have multiple step fractures. Bipolar or unifacial.
- Indeterminate – platform is flawed, irregular, or partly collapsed with the remainder of the flake intact.

Potential Archaeological Deposit (PAD)
An area where no surface archaeological remains are present that has been assessed as having the potential to contain subsurface archaeological deposits on the basis of indicators which may include landform, distance to water and visible surface disturbance.

Proximal End
The striking end of a flake opposite the distal end or termination.

Proximal Flake Fragment (Prox Frag)
A fragment of a flake that has been broken but retains its proximal striking platform (also termed proximal fragment or proximal flake). It does not have a distal termination.

Quality
A record of the flaking quality of the stone. This is a subjective measurement based on how well the material flakes and the presence of flaws. Poor quality material may have large grains or internal flaws which may inhibit controlled reduction of the material. Certain fine grained material lacking in flaws or inclusions may have been preferred for its good flaking properties and selected for particular tasks or implement types e.g. precision cutting/slicing.

Quartz
A hexagonal crystalline form of silicon dioxide (SiO2). May occur as clear, white or coloured from mineral impurities. Can occur as single crystals, veins or geodes. Often has
internal fractures or flaws.

**Quartzite**
Sandstone that had been metamorphosed by volcanic activity or recemented with silica in solution.

**Raw Material**
The type of stone out of which the artefacts have been made. See Chert, Silcrete and Quartz

**Reduction Type**
Refers to the technological aspects of reducing stone. For definitions on fracture mechanics and flake characteristics refer to work by Cotterell and Kamminga (1987) and Holdaway and Stern (2004). For non-debitage items it is used to describe the form of that item before it was modified or fractured e.g. a large flake may have been reflaked and used as a core to produce further useable flakes.

**Retouched Artefact**
A stone artefact with negative flake scars along its margins from intentional retouch after it was removed from the core. More recent scars show that the flakes removed were too small to have been used as tools. It could not always be determined whether these were intended for use as tools or were for core preparation.

**Shape**
Recorded for whole flakes and includes the following:
- Wider than long (W>L)
- Longer than wide (L>W)
- Length equals width (L=W)
- Elongate - length more than twice the width.

**Silcrete**
An indurated rock comprised of quartz grains cemented in a siliceous matrix.

**Silicified Tuff**
Also variously termed indurated mudstone, tuff or ryolitic tuff. A fine grained rock of volcanic ash or other fine sediments metamorphosed and consolidated with silica. Sometimes distinguished from chert by having a lack of lustre (Corkill 1999:45), although heat treatment may result in lustrous flaked surfaces (Flenniken & White 1983:43).

**Site**
An area where Aboriginal objects have been identified.

**Size**
The maximum or longest dimension of each item was recorded, and entered as individual size classes of 5 millimetres (0-4mm, 5-9mm, 10-14mm, 15-19mm etc.).

**Termination**
Records the type of termination on whole flakes or distal flake fragments. Termination variation depends on the amount of force used, nature of the raw material and core morphology. These include:
- Feather – A distal end which has a gradual thinning towards the termination
- Hinge – A rounded termination
- Plunging – A distal end containing the bottom surface of the core it was removed from
- Step – A squared off termination

**Thickness**
A measurement of the distance between the dorsal and ventral faces of a flake at point where length and width measurements meet.

**Tool**
A stone artefact which has been modified into a formal type or used (expedient tool).

**Usewear**
An artefact with evidence of use such as striations, rounding or tiny edge fracture scars

**Ventral Surface**
The face of a flake which can be joined back to the core the flake was removed from. The ventral surface of a flake may exhibit the bulb of percussion, the ringcrack, ripple marks or fissures

**Weight**
Weight for each artefact was recorded using an electronic balance to the nearest 0.1g.

**Width**
A measurement at right angles to the length measurement of a flake, at the midpoint of the length
References


Niche Environment and Heritage (Niche), 2013a. *Aboriginal Heritage Impact Assessment - DA04 (Precinct 100, 200, 300, 400 & supporting infrastructure)*. Report prepared for UrbanGrowth NSW.


Sherwin, L. and G. Holmes (Eds), 1986. Geology of the Wollongong and Port Hacking 1:100,000 Sheets 9029, 9129. NSW Geology Survey, Sydney NSW.


Appendix A  Advertisement for registration of interest

Appeared in:
Appendix B  Aboriginal Stakeholder Comments
Appendix C  Aboriginal Focus Group Meeting Minutes
Appendix D  AHIMS Search Results
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Report generated by AHIMS Web Services on 24/09/2013 for Benjamin Anderson for the following areas at Datum: ODA, Zone: 56, Eastings: 292100 - 292500, Northings: 6223100 - 6226700. with a Buffer of 0 meters. Additional Info: Archaeological Assessment Number of Aboriginal sites and Aboriginal objects found is 39.

This information is not guaranteed to be free from errors, the Office of Environment and Heritage (NSW) and its employees disclaim liability for any loss or damage caused as a result of any reliance on the information contained in this report.
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Report generated by AHIMS Web Service on 2019/03/02 for Benjamin Anderson for the following areas at Datum: GDA, Zone: 56, Eastings: 292100 - 295500, Northings: 622300 - 622600, with a buffer of 0.00 meters. Additional Info: Archaelogical Assessment, Number of Aboriginal sites and Aboriginal objects found is 39.

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### AHIMS Web Services (AWS)

**Extensive search - Site list report**

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