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Glenfield Planned Precinct

Aboriginal Cultural Heritage Assessment

Prepared for the Department of Planning, Industry and Environment

November 2020

Final draft prior to Aboriginal stakeholder review

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Executive Summary

The Department of Planning and Environment (DPE), now the Department of Planning, Industry and Environment (DPIE), is undertaking precinct planning for the proposed rezoning and future development of the Glenfield Planned Precinct (the study area), which lies on the Glenfield to Macarthur Urban Renewal Corridor. As part of this process, DPIE has commissioned Extent Heritage Pty Ltd (Extent) to prepare an Aboriginal Cultural Heritage Assessment Report (ACHAR) for the precinct.

The ACHAR was initiated to assist DPIE in the precinct planning process, to identify Aboriginal cultural heritage opportunities and constraints across the precinct, and to maximise conservation outcomes. It provides information on the location, distribution and significance of Aboriginal objects; the likely harm to objects by the proposed development; and recommendations for their management. It must be emphasised that the level of on-site investigation was limited, and that further work will be required as development progresses in the precinct.

Key Findings

- Ten Aboriginal archaeological sites have been documented within the study area, three of which have previously been completely or partially impacted as a result of development undertaken prior to the current investigation. The identified sites consist of artefact scatters, isolated Aboriginal objects, an area of potential archaeological deposit, a culturally modified tree, and a tree of cultural value.

- Additional archaeological sites are likely to be present within the study area. The corridors along the Georges River and Bunbury Curran Creek have been identified as areas of high sensitivity, as these landforms are likely to have formed foci for long-term and/or repeated Aboriginal occupation in the past.

- Documentary ethnographic research indicates there is some potential for the presence of post-Contact Aboriginal occupation of the former Throsby estate, which once encompassed a portion of the study area. The nature and location of evidence of post-Contact Aboriginal occupation is, however, very difficult to predict without sub-surface investigation.

- Most of the identified Aboriginal sites within the study area are considered to be of low scientific significance, as only limited information can be derived from these sites. The area of potential archaeological deposit (PAD) along the Georges River corridor is of high scientific significance, as it has greater research potential, and has been demonstrated to be of deep antiquity in other areas. The single verified culturally modified tree is of high cultural value, and another tree is considered to have cultural value.

- While the ILP and rezoning would not in itself cause direct impact, the subsequent development will likely result in impacts to two Aboriginal sites (GPP IF1 and GPP IF7), though the ILP design allows for the other sites to be conserved..

- Recommendations have been made to ensure appropriate investigation and assessment is undertaken to ensure Aboriginal heritage is managed, conserved and/or impact is mitigated in the future.

Potential Aboriginal Heritage Impact

Based on the Indicative Layout Plan (ILP), developments are likely to result in the following impacts on the identified Aboriginal archaeological and cultural heritage resources:

- The ILP provides for the protection of the culturally modified tree, although the tree will be located immediately adjacent to medium rise residential (3-6 storey) structure(s). A protective buffer will separate the tree from development risk, but particular care will need to be taken to prevent vandalism or other damage risk not associated with development works.

- The ILP provides for the full conservation of one tree of cultural value, one potential archaeological deposit (PAD) and two isolated Aboriginal objects. All of these will be located within areas of open space, local park or riparian corridor.

- The ILP design provides for the conservation of the remainder of one low-density artefact scatter, which was partially impacted prior to this study. This site will be located within an area of open space and/or local park.

- Impacts to the locations of two isolated Aboriginal objects. It would be best that these artefacts are collection by Aboriginal stakeholders and relocated and/or reburied in locations that will not be impacted by development (see recommendations).

- There are various levels of impacts to other Aboriginal sites as well as impacts to previously unidentified Aboriginal archaeological sites considered likely to be present in the precinct.

Some potential for Aboriginal heritage conservation has been identified within the constraints of the ILP, including significant areas in close proximity to the Georges River and Bunbury Curran Creek. Further investigation, consultation and planning is required to maximise conservation potential.

Recommendations

- Following an arboriculturist review of a number of culturally modified trees, a single tree, GPP MT 2, was identified as an Aboriginal site. Given the rarity of such sites in southwest Sydney, this site along with a suitable buffer of not less than 20 metres should be protected and conserved in the ILP.

- Along with the ANZAC memorial forest, a range of exotic and endemic tree species were observed throughout the Hurlstone Agricultural School grounds, and were identified as species Aboriginal people were known to use in the past. With the exception of GPP MT5 and Horne Park (Eco Logical Australia, 2016), none were specifically identified as of cultural value. However, following the ILP, consideration of re-use, re-planting and/or interpretation of the site's current tree species within the

broader development is recommended. This could form part of the wider interpretive outputs recommended below.

- When AHIPs are eventually applied for in order to permit development at the locations of GPP IF1 and GPP IF7, the conditions of the AHIPs should be structure in a way that would allow the collection of these artefacts and the relocation and/or reburial of the artefacts elsewhere in areas that will not be impacted by development.

- The findings and information in this report, along with a simplified heritage constraints map presented by lot/property, should be provided to Campbelltown City Council, DPIE and Heritage NSW in digital spatial format. This would ensure the Consent authorities involved in future environmental assessments across the study area under Part 4 or 5 of the *Environmental Planning and Assessment Act 1979* are aware of the potential cultural heritage implications of any given project.

- Regardless of the outcomes of the ILP and/or Development Control Plan (DCP) process, Aboriginal objects, sites and places as shown in **Figure 22** - **Figure 27** are protected under the *National Parks and Wildlife Act 1974*, and any proposal for activities in these areas should ensure appropriate Aboriginal heritage assessment is undertaken in accordance with Heritage NSW guidelines prior to any ground disturbance.

- Consultation with the Registered Aboriginal Parties should be maintained during the remainder of the rezoning process. Please note that should consultation lapse due to a discontinuation of communications for more than six months, the consultation process may no longer be in compliance with Heritage NSW's policies and may need to be restarted.

- An Aboriginal Heritage Interpretation Strategy (HIS) and Aboriginal Heritage Interpretation Plan (HIP) should be developed in consultation with the Registered Aboriginal Parties to incorporate the promotion, celebration and/or commemoration of the Aboriginal cultural values and importance of the study area in future development. This may include naming conventions, cultural heritage walks, signage and/or artworks, etc. These documents should be incorporated into the DCP and/or provided to the Consent Authorities for inclusion in Development Approval conditions, to ensure implementation is undertaken in an holistic approach across the Precinct.

Enacted recommendations

- The following was a recommendation made in earlier drafts of this report that has now been implemented in the latest Development Control Plans. It is included here for reasons of full disclosure.

    - The Development Control Plans (DCP) or equivalent produced from the ILP process must ensure appropriate Aboriginal heritage management requirements are included. These must include, but not be limited to:

- In areas of known Aboriginal sites, and areas of moderate and high Aboriginal sensitivity (**Figure 22** - **Figure 27**): an Aboriginal Cultural Heritage Assessment Report (ACHAR) must be undertaken in accordance with Heritage NSW guidelines prior to a Development Application (or equivalent) being approved.

- In areas of low Aboriginal sensitivity (**Figure 22** - **Figure 27**): an Aboriginal Due Diligence Assessment must be undertaken in accordance with Heritage NSW guidelines prior to a Development Application (or equivalent) being approved.

- In areas of very low to nil Aboriginal sensitivity (**Figure 22** - **Figure 27**): no further Aboriginal heritage assessment is required prior to a Development Application (or equivalent) being approved.

PLEASE NOTE: While pre-exhibition consultation has been undertaken on previous iterations of the ILP, the current version of the draft report has not yet been reviewed by Registered Aboriginal Parties (RAPs). Prior to finalisation, the report requires a 28-day period of RAP review, in accordance with *Aboriginal Cultural Heritage Requirements for Proponents* (DECCW 2010).

Contents

1. Introduction

1.1 Project Description

The Department of Planning and Environment (DPE), now the Department of Planning, Industry and Environment (DPIE), is undertaking precinct planning for the proposed rezoning and future development of the Glenfield Planned Precinct (**Figure 1**, henceforth referred to as the 'study area'), a precinct along the Glenfield to Macarthur Urban Renewal Corridor. As part of the initial environmental assessment process, DPIE commissioned a European (historical) Heritage Impact Statement (HIS), which identified places of potential Aboriginal heritage value within the study area (City Plan Heritage 2018).

Subsequently, Extent Heritage Pty Ltd (Extent) was engaged to provide advice regarding the overall Aboriginal heritage management requirements for precinct planning purposes (Extent Heritage 2018a). The Extent report found that there are a number of recorded Aboriginal archaeological sites within the precinct, as well as the potential for significant Aboriginal archaeological deposits to be present in proximity to the Georges River. It was recommended that an Aboriginal Cultural Heritage Assessment (ACHAR) be undertaken to identify Aboriginal cultural heritage opportunities and constraints across the precinct and to maximise conservation outcomes. As a result, Extent has been commissioned by DPIE to prepare the recommended ACHAR (this document) to assist in the precinct planning process.

The principle objectives of the report are to:

- identify Aboriginal cultural heritage objects, sites and cultural values areas within the study area;
- identify prospective conservation areas based on their Aboriginal cultural heritage values;
- consult with Aboriginal stakeholder communities; and
- provide the basis for the supporting documentation for the required approvals under the *National Parks and Wildlife Act 1974*.

This report has been developed in accordance with heritage guidelines and procedures prepared by Heritage NSW, previously the Office of Environment and Heritage (OEH) and the Department of Environment, Climate Change and Water (DECCW). These guidelines and procedures are: the *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (OEH 2011); *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (DECCW 2010); and the *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW 2010).

1.2 Legislative Context

There are several Commonwealth and State Acts (and associated regulations) that manage and protect Aboriginal cultural heritage. These are summarised in **Table 1** and **Appendix A**.

Table 1. Summary of legislative context for the project.

Legislation	Description	Relevant to study area?	Details
Commonwealth			
Environment Protection and Biodiversity Conservation Act 1999	Recognises sites with universal value on the World Heritage List (WHL). Protects Indigenous heritage places with outstanding heritage value to the nation on the National Heritage List (NHL), and significant heritage value on the Commonwealth Heritage List (CHL).	No	There are no Indigenous heritage places within the study area listed on the WHL, NHL or CHL.
Native Title Act 1993	Administers rights and interests over lands and waters by Aboriginal people. Provides for negotiation and registration of Indigenous Land Use Agreements (ILUAs). Often used in NSW to identify relevant stakeholders for consultation.	No	The entire study area is, or has previously been, freehold land and cannot be subjected to a claim under this Act. A search of the National Native Title Register, Register of Native Title Claims, and Register of Indigenous Land Use Agreements online was undertaken on 30.08.18, and found that the study area is not affected by any registered or confirmed Native Title Claims.
Aboriginal and Torres Strait Islander Heritage Protection Act 1984	Preserves and protects areas and objects of particular significance to Aboriginal people that are under threat from injury or desecration.	No	There are no areas or objects within the study area subject to a Declaration under the Act.
State (NSW)			
Environmental Planning and Assessment Act 1979	Requires environmental impacts, including Aboriginal heritage, to be considered in land use planning. Provides for the development of environmental planning instruments, including State Environmental Planning Policies and Local Environmental Plans.	Yes	The study area comprises the Glenfield Planned Precinct, a precinct of the Glenfield to Macarthur Urban Renewal Corridor, within the Campbelltown LGA. Once finalised, the precinct plan will be accompanied by a list of Directions to Campbelltown City Council under Section 9.1 of the EP&A Act (formerly Section 117 Directions). With respect to Aboriginal heritage, these directions would contain provisions that facilitate the conservation of Aboriginal objects or Aboriginal places protected under the *National Parks and Wildlife Act 1974*, as well as any areas, objects, places or

Legislation	Description	Relevant to study area?	Details
			landscapes identified as being of heritage significance to Aboriginal culture and people.
National Parks and Wildlife Act 1974	Provides blanket protection for all Aboriginal objects and declared Aboriginal places. Includes process and mechanisms for development where Aboriginal objects are present, or where Aboriginal Places are proposed for harm.	Yes	An AHIP must be obtained from the Chief Executive of Heritage NSW under Section 90 of the Act where harm to an Aboriginal object or Aboriginal Place cannot be avoided.
Aboriginal Land Rights Act 1983	Establishes Local Aboriginal Land Councils (LALCs). Allows transfer of ownership of vacant crown land to a Local Aboriginal Land Council. The Registrar, *Aboriginal Land Rights Act 1983, registers Aboriginal land claims and maintains* the Register of Aboriginal Owners. Often used in NSW to identify relevant stakeholders for consultation.	No	The entire study area is, or has previously been, freehold land and cannot be subjected to a claim under this Act. A search of the Register of Aboriginal Owners was made on 19.09.2018 and found no Registered Owners.
Environmental Planning Instruments			
Campbelltown Local Environmental Plan (LEP) 2015	Conserves archaeological sites, Aboriginal objects and Aboriginal places of heritage significance.	Yes	Development consent is required for subdividing, excavating, developing and disturbing land on which an Aboriginal object is located, is within an Aboriginal place of heritage significance, or on land that contains an archaeological site. Within the study area, there are no items or places of Aboriginal heritage significance listed within Schedule 5 of the Campbelltown LEP.

1.3 Study area

The study area comprises approximately 6 km^2 (597.96 ha) within the City of Campbelltown Local Government Area, and is defined as the 'Glenfield Planned Precinct'. The precinct is within the Parish of Minto, County of Cumberland, and falls within the Tharawal Local Aboriginal Land Council administrative boundaries.

The study area is one of seven precincts in the Glenfield to Macarthur Urban Renewal Corridor being progressively released and rezoned for urban development. The boundaries of the Glenfield Planned Precinct are defined by Glenfield Road to the north, Georges River to the east, Bunbury Curran Creek to the south, and the Hume Highway and Campbelltown Road to the west. The precinct is bisected east-and-west into two portions by the Glenfield to Leppington railway. The majority of the eastern side of the precinct is characterised by low density housing, an aged care facility, a small shopping complex and neighbourhood centre. The western portion

comprises primarily Hurlstone Agricultural High School as well as three other schools, low density housing to the north and Government land to the south.

1.3.1 Proposed Development

The proposed Indicative Layout Plan (ILP) (**Figure 24** and **Figure 25**) incorporates a range of uses, including low, medium and high density residential development, local schools and sports facilities, employment centres and neighbourhood centres, and other local infrastructure, including an electrical substation. Rezoning the land within the study area will not result in any ground surface disturbance, but the eventual developments will result in direct impacts to the ground surface. These impacts would occur through the development of major urban infrastructure, such as piling for high-rise structures, basement parking, underground ground services and infrastructure, cutting, levelling and fill works for the creation of mixed use lots, detention basins and general landscaping works. There may also be potential for indirect impacts to the ground surface during the redevelopment phase from vehicular movement, storage of materials and ancillary construction-related facilities.

Further details on the development are provided in **Section 9.1**.

1.4 Limitations

This report is based on existing, publicly available environmental and archaeological reports about the study area. The background research did not include any independent verification of the results and interpretations of externally sourced existing reports. Information from the Aboriginal Heritage Information Management System (AHIMS) database was obtained from Heritage NSW. Information in the assessment reflects the scope and the accuracy of the AHIMS site data, which in some instances is limited.

While the investigation included a field survey of a limited portion of the study area, it was not able to access all parts of the study area, nor were sub-surface excavations undertaken. The distribution of cultural material within the study area is therefore based on a combination of regional modelling together with input from the sub-sampled surface investigation. As a result it is considered likely that there is the definite potential for additional Aboriginal objects/sites/deposits in the study area beyond those identified in this report. The recommendations address this by emphasising the need for additional investigations.

This report provides an assessment of the Aboriginal archaeological resource of the study area but does not include an assessment of built heritage and historical archaeology. It cannot be used as supporting documentation for any applications to Heritage NSW, under the *Heritage Act 1977*.

EXTENT
HERITAGE ADVISORS

Glenfield Planned Precinct

Study area

Drawn by: Tom Sapienza
Checked by: Madeline Shanahan
Date: 26 October 2020
Projection: GDA 1994 MGA Zone 56
Data sources: Extent, GA, Nearmap, NSW DFSS, OSM

0 250 500 750 1,000
Metres

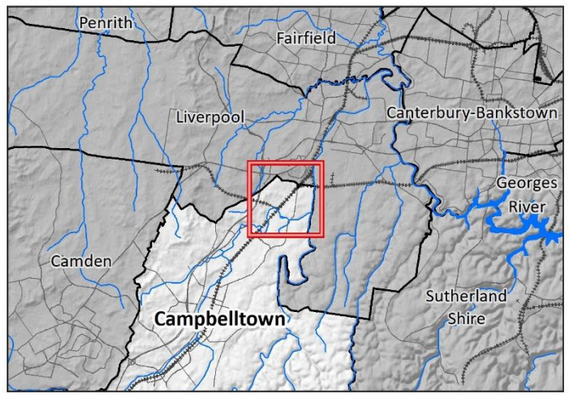


Figure 1. The Glenfield Planned Precinct study area.

2. Aboriginal Consultation

2.1 The Process

Aboriginal consultation for this project has been undertaken in accordance with procedures set out in the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (DECCW 2010). These guidelines identify a staged process of consultation, which includes:

Stage 1: Notification of project proposal and registration of interest

- Pre-Notification: Identification of the Aboriginal parties through contacting various government agencies.
- Notification: Contacting Aboriginal community organisations identified in the Pre-Notification phase to determine their interest (if any) in the project. This includes the placement of an advertisement in local print media seeking expressions of interest from Aboriginal community members.

Stage 2: Presentation of information about the proposed project

- Presentation of Project Information: Briefing registered Aboriginal parties (RAPs) about the project proposal and scope of the Aboriginal Cultural Heritage Assessment Report (ACHAR). This is usually undertaken through written correspondence and/or an on-site visit, and may undergo several iterations through the project lifetime as the nature of the assessment changes (e.g., field survey may lead to a requirement for test excavations).

Stage 3: Gathering information about cultural significance

- Seeking cultural information: Collection of information identifying any known Aboriginal objects of cultural value or places of cultural significance in the study area.
- Consultation protocols: Identification of any protocols that the RAPs would like adopted during the information gathering process, including how sensitive information will be managed.
- Potential impacts and mitigation measures: Discussion of potential impacts to heritage and appropriate mitigation options prior to developing the ACHAR. This is often undertaken onsite at the end of any field program and/or as part of the overall report review phase.

Stage 4: Review of draft Aboriginal cultural heritage assessment report

- Review of draft report: Review of the draft ACHAR by the RAPs, to provide comments on the overall findings, assessment of cultural significance and recommendations for management of Aboriginal heritage within the study area.

The consultation process for this project has two aims. Firstly, it is designed to comply with the Heritage NSW consultation procedures to obtain input on Extent's proposed assessment methodology and comment on the assessment report and management recommendations. Secondly, to identify – through consultation with knowledge holders – cultural places and values that may be affected by the proposed future development of the study area.

2.2 This Project

Two phases of Aboriginal community consultation have been undertaken for this project. The first phase, undertaken in March 2018, comprised preliminary consultation with the Tharawal Local Aboriginal Land Council (LALC) and Cubbitch Barta Native Title Claimants Aboriginal Corporation (CBNTC), as part of a preliminary constraints and opportunities assessment (Extent 2018a).

Two areas of potential Aboriginal cultural value had been identified within the grounds of Hurlstone Agricultural High School (HAHS) during an earlier heritage assessment (City Plan Heritage 2018:80), and representatives of the LALC and CBNTC were invited to attend a site meeting and field survey to inspect and discuss these two areas. The areas of cultural value were reported to be a stand of trees and a potential culturally modified (scarred) tree. The tree stand may have been associated with a potential former Aboriginal meeting place (Eco Logical 2016), and/or may have been used as a source of traditional medicine. It was concluded that the two areas were unlikely to have Aboriginal cultural significance, based on two primary data points:

- Neither of the Aboriginal community representatives had any knowledge of the two areas, despite both groups having been involved in cultural resource management in the region for a considerable time; and
- An arborist present during the inspection considered the trees in question to be typically too young for cultural modification (practices which largely ended in the 19th Century), and/or in some instances were non-endemic to the region, suggestive of quite recent planting (and again therefore unlikely to reflect cultural practices undertaken in general more than a century earlier).

The second stage of Aboriginal community consultation comprised formal Aboriginal community consultation in accordance with the Heritage NSW *Consultation Requirements for Proponents 2010* (**Section 2.1**), and at present time (October 2010) is still ongoing. A complete log of actions and correspondence to date is included in **Appendix B** and summarised in **Table 2**.

Overall, the formal consultation process identified 58 potential Aboriginal stakeholders (**Appendix B**) and 25 of these registered an interest in the project (**Appendix B**). A survey methodology document was distributed to the 25 Registered Aboriginal Parties (RAPs) for their comment and review between 3-31 October 2018. Sixteen responded in support of the proposed survey methodology, and five participated in the field survey (**Appendix B**). Several additional organisations were invited to participate in the field survey, but the volume of work in the Sydney Basin at the time ultimately made it impractical for them to attend.

Table 2. Summary of Aboriginal consultation undertaken to date for the project.

Consultation Stage	Description	Date Initiated	Date Completed	Details
1	Pre-Notification	2018-08-30	2018-09-11	Further correspondence and information in **Appendix B**.
2	Notification (including advertisement in the *Macarthur Advertiser*)	2018-09-11	2018-09-26	Further correspondence and information in **Appendix B**. Newspaper advertisements presented in **Appendix B**.
3	Presentation of Information about the proposed project Gathering information about cultural significance	2018-10-03	2018-10-31	Further correspondence and information in **Appendix B**.
	Field Investigation	2019-02-07	2019-02-12	Five RAPs participated in the survey between 7-12 February 2019. Further details are provided in **Section 6** and **Appendix B** below.
4	Review of draft report, including impacts and mitigation options	TBC	TBC	Feedback to be integrated into the report where relevant. Further details will be provided in **Appendix B**.

2.3 Aboriginal Stakeholder Feedback

The draft ACHAR will be distributed for a period of 28 days for review and comment by the RAPs (see **Table 2**). A follow-up reminder of the finalisation of the report will be sent to all RAPs one week prior to the end of the report review period.

Where relevant, any feedback received from the RAPs in relation to the project will be integrated into the report. A summary of comments received to date includes the following:

- Cubbitch Barta Native Title Claimants (CBNTC) provided information regarding previous assessments of the study area. Specifically, CBNTC recalled that Archaeological Management and Consulting Group (AMAC and SAS 2018) had recently undertaken archaeological test excavation of the Glenfield Special School site in the study area. CBNTC recalled that no artefacts were recovered.
- CBNTC also recalled excavations undertaken for the railway line (AMBS 2014), and by Mary Dallas along Bunbury Curran Creek (Dallas 1989; 2000).
- CBNTC also recalled the presence of a scarred tree along the electrical transmission line easement, in the north-western part of the precinct.

- RAPs expressed a range of associations with the study area, including descent from Traditional Owners and historical connections to the locality.
- Several of the RAPs have various levels of experience in archaeology, and cultural heritage management more broadly, and see this as part of their involvement in cultural maintenance and protection, and in caring for Country.
- The project was identified as an opportunity for Aboriginal community members to learn more about their heritage and about heritage management.
- Significant site types such as rock carvings and scarred trees should be preserved where possible, while any artefacts should be returned to Country.
- In general, a preference was expressed for involvement in any fieldwork.

3. Existing Environment

3.1 Key Findings

- The study area is located in the Cumberland Basin, and is characterised by undulating to rolling low hills on Wianamatta Group shales, interspersed with flat to gently sloping alluvial plains with occasional terraces or levees.
- Three separate soil landscapes occur within the study area. South Creek soils occur on the Georges River and Bunbury Curran Creek floodplains and are typically deep, with sandy or loamy topsoils up to 650 mm in depth and overlying clay or bedrock. Luddenham and Blacktown soils occur elsewhere in areas of undulating topography and are typically shallow, with thin loamy topsoils overlying clay.
- The study area is bounded by the Georges River and Bunbury Curran Creek, both of which were key resources for Aboriginal people in the past. However, significant landscape modification of a part of Bunbury Curran Creek has occurred within the study area, and its contemporary alignment does not reflect its original course.
- Originally, the study area would have been dominated by open-forest and open-woodland dry sclerophyll forest communities, but most of the area is now urbanised and cleared, with evidence of exotic species and new regrowth in HAHS. However, riparian corridors along the Georges River and Bunbury Curran Creek appear to have remained undeveloped since European occupation, and there is some potential for old-growth native vegetation along these corridors.
- An analysis of past land use indicates that the majority of the western portion of the study area, and small patches of the eastern portion of the study area, have been subject to limited historical disturbance. Moderate disturbances have occurred more recently from the construction of housing estates to the east of the railway line, and to the north of HAHS. Significant ground surface disturbance has occurred for the realignment of a small part of Bunbury Curran Creek, for the construction of the Main Southern Railway Line, and for the construction of the South West Rail Link and its associated compounds and site storage areas.

3.2 Geology, Topography and Soils

The study area is located within the Cumberland Plain, an extensive low-lying plain within the Sydney Basin. It is underlain by Wianamatta Group Ashfield and Bringelly Shales, which consist mostly of shale and laminite, with calcareous claystone, lithic sandstone, and rare coal; also with Quaternary alluvium comprising fine-grained sand, silt and clay along stream channels (**Figure 2**; Bannerman and Hazelton 1990:35, 92; AMBS 2008:11). Both the Georges River and Bunbury Curran Creek corridors contain evidence of Quaternary deposits and are of Pleistocene and Holocene age, and both also have high potential to provide natural and anthropogenic information (AHMS 2012:45).

The local topography is characterised by undulating to rolling low hills, interspersed with flat to gently sloping alluvial plains with occasional terraces or levees (Bannerman and Hazelton 1990:35, 92; OEH [eSPADE] 2016). The local relief is typically 10-30 m, with slopes ~5% and broad rounded crests and ridges. This type of landscape restricts a number of archaeological site types, such as rock shelter and rock engravings, which require sharp exposed sandstone relief not common in these areas. Conversely, surface artefact scatters and buried cultural material are likely to be more prevalent.

According to the Soil Conservation Service of NSW, three separate soil landscapes occur within the study area: Blacktown, South Creek and Luddenham (**Figure 3**). South Creek soils correspond with the Cumberland Plain's alluvial floodplains, and particularly those associated with Georges River and Bunbury Curran Creek, whilst Luddenham and Blacktown soils correspond with the remaining areas of undulating topography.

South Creek soils consist of deep, layered Quaternary sediments (typically 300-500 mm of friable to loose sandy loam, and 150 mm of clay loam; A horizon), overlying relict soils or bedrock (typically 700 mm of light-medium clay; B horizon). A horizon topsoils reach depths of 650 mm and contain significant sand and silt content, overlying hard-setting clay subsoils (B horizon). Soil profile sections sometimes reveal the deposition of bands or layers of alluvial material, which can be related to major flood events. Smaller flood events either remove – or remove and replace – surface materials (Bannerman and Hazelton 1990:93-94; OEH [ESPADE] 2016).

In contrast, both Luddenham and Blacktown soils are typically shallow. They comprise thin loamy topsoils (A horizon) over heavy clays (B horizon) and are usually <500 mm deep (Bannerman and Hazelton 1990:37, 81). The heavy clay unit is generally considered to pre-date the Aboriginal colonisation of Australia, and therefore only the upper A horizon has the potential to contain Aboriginal objects. The shallow nature of these A horizon deposits has implications for the potential for and survivability of Aboriginal objects, as even minor disturbance and/or de-vegetation will often result in the complete removal of the upper parts of the soil profile in which objects may occur. It is rare for these types of soils to contain deep, stratified or very old archaeological deposits.

3.3 Hydrology

The study area is located within the upper Georges River catchment system. The study area is bounded to the east by the Georges River and to the south by Bunbury Curran Creek. Also present within the study area are a series of smaller, unnamed tributaries of Bunbury Curran Creek and Glenfield Creek (**Figure 4**). These waterways run roughly northwest-southeast through the study area and form part of the Georges River watershed.

As well as providing fresh water for cooking and drinking, both the Georges River and Bunbury Curran Creek would have supported a diverse range of plant, riverine and animal resources. The presence of these major and minor waterways, being potential water and resource gathering sources for Aboriginal people in the past, indicates that Aboriginal sites may be present throughout the study area.

Historical maps of the study area demonstrate that considerable watercourse realignment and associated landscape modification has occurred throughout the course of the twentieth century (**Figure 4**). This is evident along Bunbury Curran Creek; at Kennett's Park, Seddon Park and the Macquarie Links Golf Course. Despite this modification, the original creek alignment is still discernible from existing vegetation and is reflected in contemporary cadastral boundaries.

3.4 Past Vegetation

Originally, the study area would have been dominated by open-forest and open-woodland dry sclerophyll forest communities, with slight variations in tree species composition based on the degree of inundation (Bannerman and Hazelton 1990; OEH [ESPADE] 2016). However, large parts of the broader region are now urbanised and cleared (Keith 2006:86). Such clearing impacts the integrity of archaeological deposits, and will have removed any trees modified by Aboriginal people in the past. Regionally, creek lines and associated riparian corridors contain dense bushland that may reflect pre-European vegetation and has higher potential to contain culturally modified trees.

Dominant tree species on floodplains would have included broad-leaved apple (*Angophora subvelutina*), cabbage gum (*Eucalyptus amplifolia*) and swamp oak (*Casuarina glauca*), with a shrubland of paperbarks (*Melaleuca* sp.) and tea trees (*Leptospermum* sp.) on more elevated streambanks (OEH [ESPADE] 2016). Elsewhere on rolling hills the dominant species were forest red gums (*E. tereticornis*), spotted gums (*Corymbia maculata*) and grey box (*E. moluccana*), with some ironbarks (*E. fibrosa* and *E. crebra*). Dominant shrub species would have included blackthorn (*Bursaria spinosa*), hickory wattle (*Acacia implexa*) and black wattle (*A. mearnsii*). Common ground cover species would have included speargrass (*Aristida vagans*), kangaroo grass (*Themeda australis*), knob sedge (*Carex inversa*) and weeping grass (*Microlaena stipodes*).

With respect to the study area, large portions of the precinct have been cleared of their native vegetation. However, riparian corridors of varying width (~50-250 m) along the Georges River and Bunbury Curran Creek appear to have remained undeveloped since European occupation, and despite regrowth there remains some potential for remnant native vegetation in these corridors.

In addition, small and isolated patches of vegetation occur along the South West Rail Link (SWRL) rail corridor adjacent to Bunbury Curran Creek, and in isolated stands along second and first order tributaries within Hurlstone Agricultural High School (HAHS) and the other school grounds, but the native status of these trees is presently unclear. Site inspection by an arborist in March 2018 identified the presence of regrowth eucalypts interplanted with exotic species within the HAHS Memorial Park and oval (Extent 2018a:7).

3.5 Land-use History

The historical post-contact use of the region surrounding the study area has been largely agrarian in nature. Development to the west of the Georges River commenced in the 1810s, when the land was taken up by settlers. Historical research suggests that the study area formed part of two major agricultural estates (Charles Throsby's 1,500 acre "Glenfield" estate and

James Meehan's 2,020 acre "Macquarie Fields" estate) as well as several other smaller allotments along the river of 80-150 acres (**Figure 5**). The region was accessed via a track leading from Liverpool to the Crossroads, which became known as the Great Southern Road, and eventually the Old Hume Highway (Roads and Maritime Services 2018:2).

Although both Throsby's "Glenfield" estate and Meehan's "Macquarie Fields" estate encompassed large portions of the study area, their respective homesteads were constructed on land not within the study area itself. Throsby's "Glenfield House" was on a ridge overlooking the Holsworthy fields at Casula, and Meehan's home (colloquially known as "Meehan's Castle") was on a hillcrest immediately south of the study area (Liston 2009:6). In the absence of detailed plans of either estate it is difficult to interpret how these properties were initially developed, however, there was likely some degree of initial vegetation clearance, followed by cultivation, dairying and/or grazing. By 1822, Meehan was reported to have a total of 2,750 acres, of which 500 had been cleared and were supporting 150 acres of wheat, 40 acres of maize, and 4 acres of orchards (Morris and Britton 2000:76; Wrigley 2001:9). The property was acquired by Samuel Terry following Meehan's death in 1831, and passed to Terry's daughter, Martha Foxlowe Hosking, in 1838. "Macquarie Fields House" was reportedly built at this time to replace Meehan's Castle (McGill et al. 1995). Both estates were retained by the Hosking and Throsby-Broughton families until their eventual subdivision (Liston 2009:12).

The construction of the Main Southern Railway Line extension from Liverpool to Campbelltown in 1858 represented the first major development within the study area. It comprised a single track, crossing Bunbury Curran Creek on a timber beam bridge (AMBS 2011:7). However, the Glenfield area was described as having only "a few scattered farms" at the time and as such, no platforms were built on the line in the area (McGill et al. 1995). The first platforms were opened at Glenfield and Macquarie Fields in 1869.

Duplication of the southern line in the 1880s and 1890s fuelled speculative development of land along the railway line. At Glenfield, the Hosking family landholdings to the east of the railway line were broken up into much smaller rural parcels, and streets and allotments were laid out in a regular grid and to a uniform street width (**Figure 6**). In many instances, this formal arrangement supplanted a pre-existing, irregular alignment of informal roads, paths and paddock fence lines, and it is likely to have been the case here at Glenfield. It was also at this time that the existing railway infrastructure was upgraded to service increased volumes of traffic on the railway line. The existing timber bridge over Bunbury Curran Creek was demolished and replaced with a brick arch bridge, which was completed in 1892 (AMBS 2011:8). Hosking family landholdings to the west of the railway line were conveyed as one large 1,800 acre property to members of the Ashcroft, Rea and Ross families between 1887 and 1914, before being eventually sold to the Education Department (City Plan Heritage 2018:53).

Throughout the early- to mid-twentieth century the development of Glenfield proceeded at a slow pace, and the landscape remained agrarian in nature. The Department of Agriculture opened Glenfield Experiment Farm (later known as the Veterinary Research Station) on land to the west of the railway in 1923. In 1926, Hurlstone Agricultural High School (HAHS) was moved from premises in Hurlstone Park to Glenfield, also to the west of the railway. In 1927, the Glenfield Special School opened on Quarter Sessions Road to provide education for children with special needs, and comprised a superintendent's home, dormitories and matron's quarters,

a kitchen and dining room and an isolation block. Historical topographic maps of the study area from 1929 and 1955 demonstrate the sporadic extent of development, which occurred along the railway line, at HAHS, and at the Veterinary Research Station (**Figure 7** and **Figure 8**). An aerial photograph of the study area in 1956 illustrates that the remaining land had been largely cleared and was divided amongst a patchwork of paddocks (**Figure 9**).

After the Second World War, NSW planning authorities selected Campbelltown as a future growth centre, which in turn fuelled speculative development in neighbouring suburbs. A series of new subdivisions were constructed in Glenfield in the 1950s and 1960s to the east of the railway line, and an electrical transmission line was installed along the northern HAHS boundary in 1963. West of the railway line, the Veterinary Research Station, Glenfield Special School and HAHS continued to operate. These progressively undertook a range of improvements that included the demolition of old or surplus buildings and the construction of additional facilities and amenities. An aerial photograph of the study area in 1970 illustrates the extent of the residential subdivision to the east of the railway line, which at this time had been clustered along Railway Parade. The remaining lots in Glenfield appear to have been large, but mostly cleared, rural lots (**Figure 10**).

Progressive residential subdivisions of these remaining rural lots east of the railway characterised the developments of the 1970s, 1980s and 1990s. This was accelerated by improved road and rail access to new estates. Also undertaken at this time was the realignment and canalisation of part of Bunbury Curran Creek in the vicinity of the railway crossing (**Figure 11**). This canalisation resulted in significant excavation works between Kennett and Seddon Park in the east, and the Macquarie Links Golf Course in the west. In 1990, the Veterinarian Research Station relocated to new premises in Menangle Park, and the land was acquired by the Department of Education and Training (DET). Shortly thereafter the DET demolished several Research Station buildings, including machinery sheds, animal and stock yards and shelters, concrete silos, a parasite laboratory, and an old fibre-cement cottage and toilet block. The remaining facilities were retained and used by the HAHS.

Since the 2000s, major developments in the study area have included the establishment of the Glenfield Road housing estate north of HAHS, and the construction of the South West Rail Link (SWRL), which began in 2011 and was completed in 2015. Construction of the SWRL caused considerable disturbance to large parts of the land in this area – not only from the construction of the line, which required significant excavation to pass below the Hume Motorway, but also from the use of the broader area as a site compound and materials storage area (**Figure 12**).

Based on the above information relating to historical land use, a map of existing disturbance is presented in **Figure 13**. An analysis of past land use indicates that the majority of the western portion of the study area, and small patches of the eastern portion of the study area, have been subjected to limited historical disturbance. Disturbances here have been constrained to vegetation clearance and some farming activities, which is likely to have caused some localised ground surface disturbance in the form of reworking of local soils, but not their complete removal. Moderate disturbances have occurred more recently from the construction of housing estates to the east of the railway line, and to the north of HAHS. These development activities are likely to have caused partial ground surface disturbance, resulting in the partial removal of local soils. Significant ground surface disturbance has occurred for the realignment of a small

part of Bunbury Curran Creek, for the construction of the Main Southern Railway Line, and for the construction of the South West Rail Link and its associated compounds and site storage areas. Disturbance in these areas is likely to have resulted in the complete removal of any vegetation and local soils, and with this, any cultural material that may have been present in these areas.

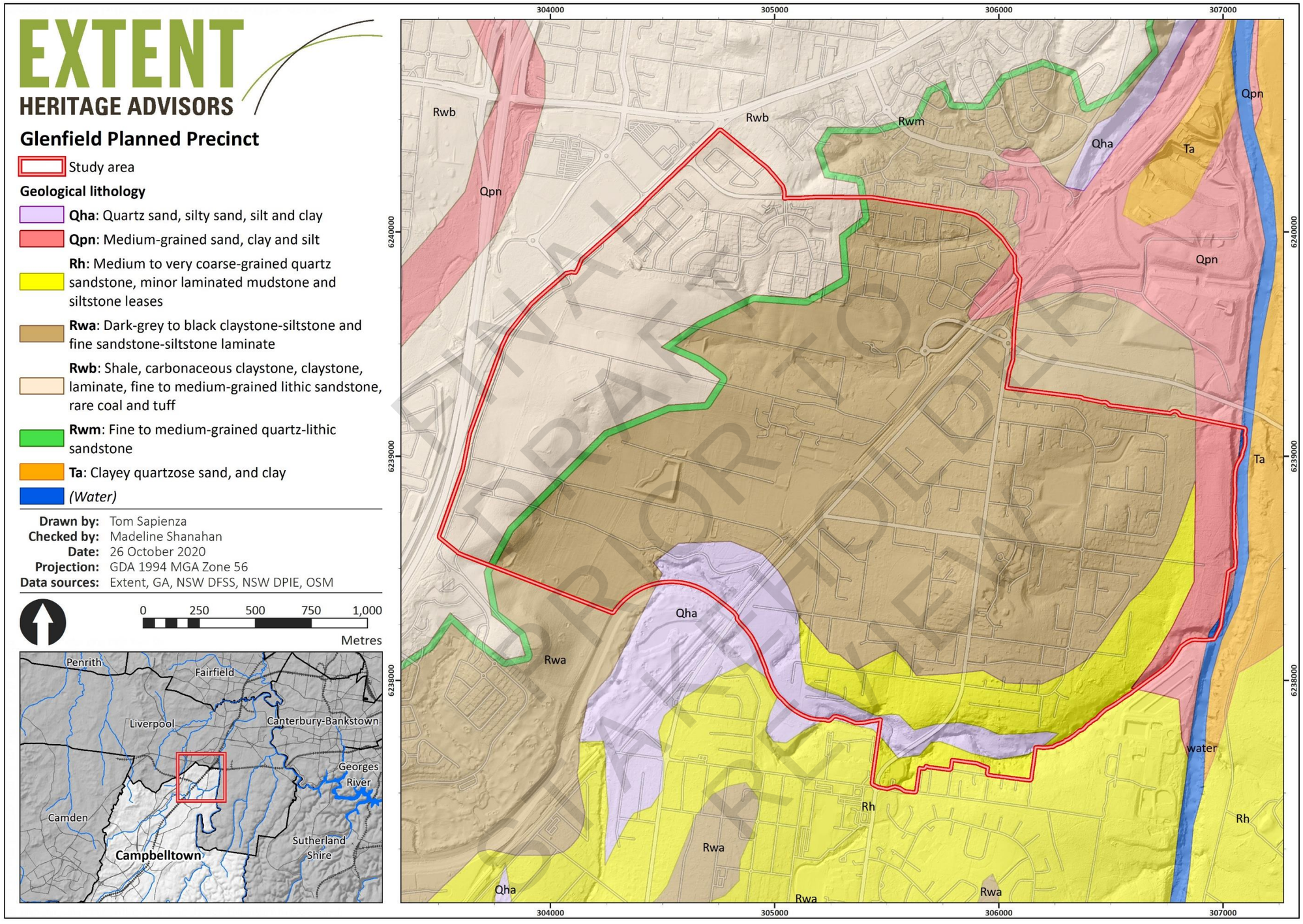


Figure 2. Local geology of the study area.

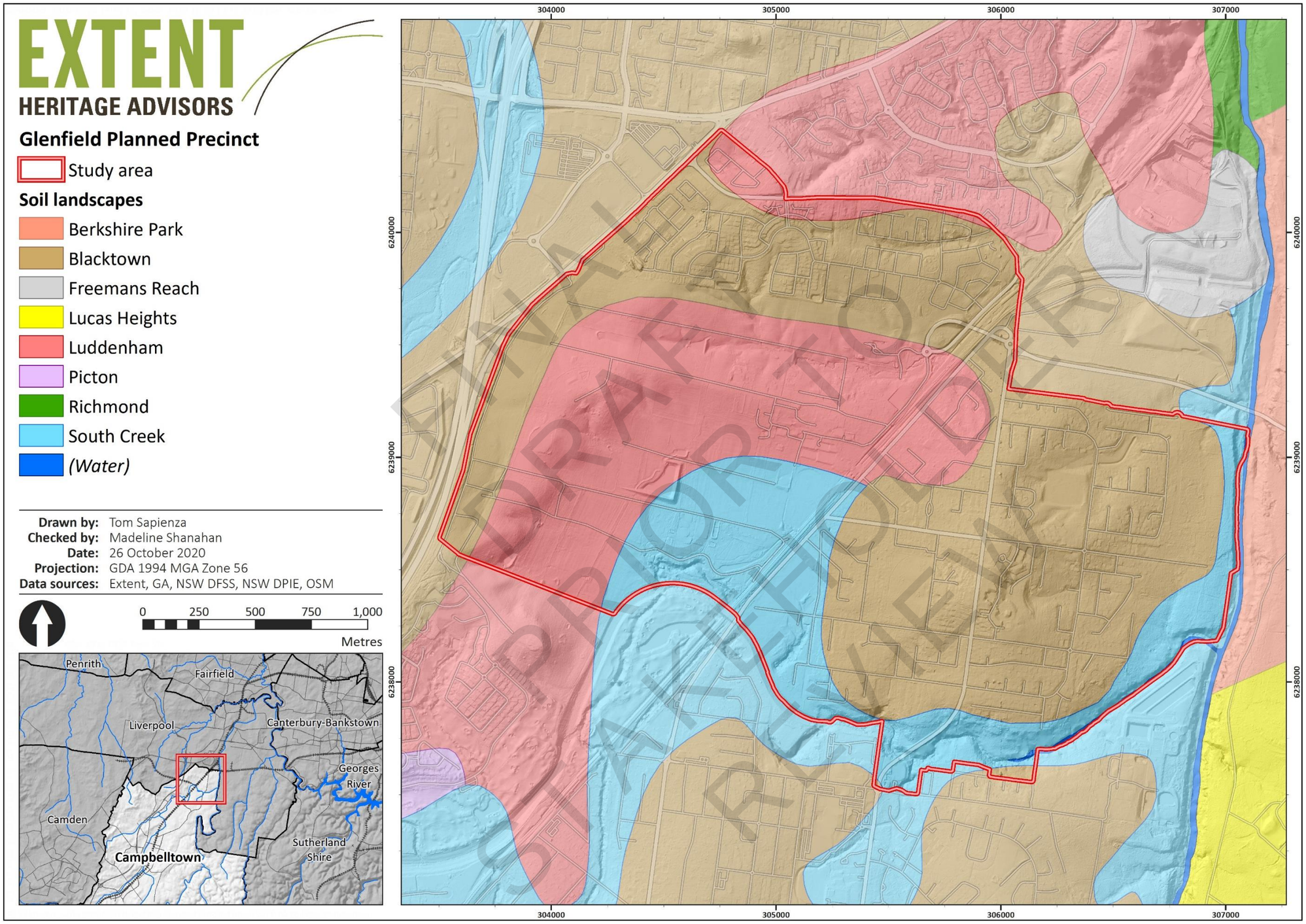


Figure 3. Soil landscapes of the study area.

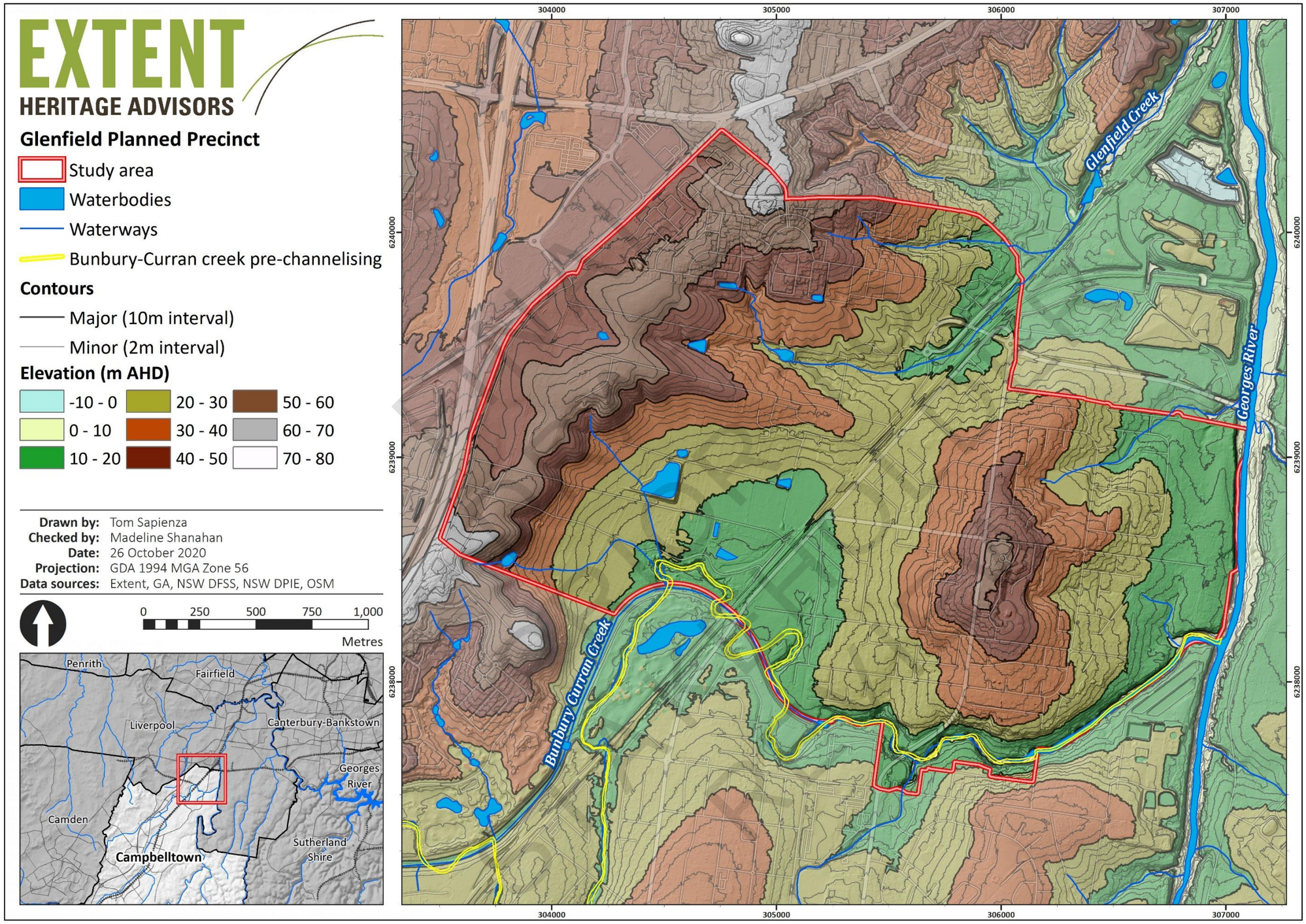


Figure 4. Topography and hydrology of the study area. The pre-canalisation alignment of Bunbury Curran Creek is indicated in yellow.

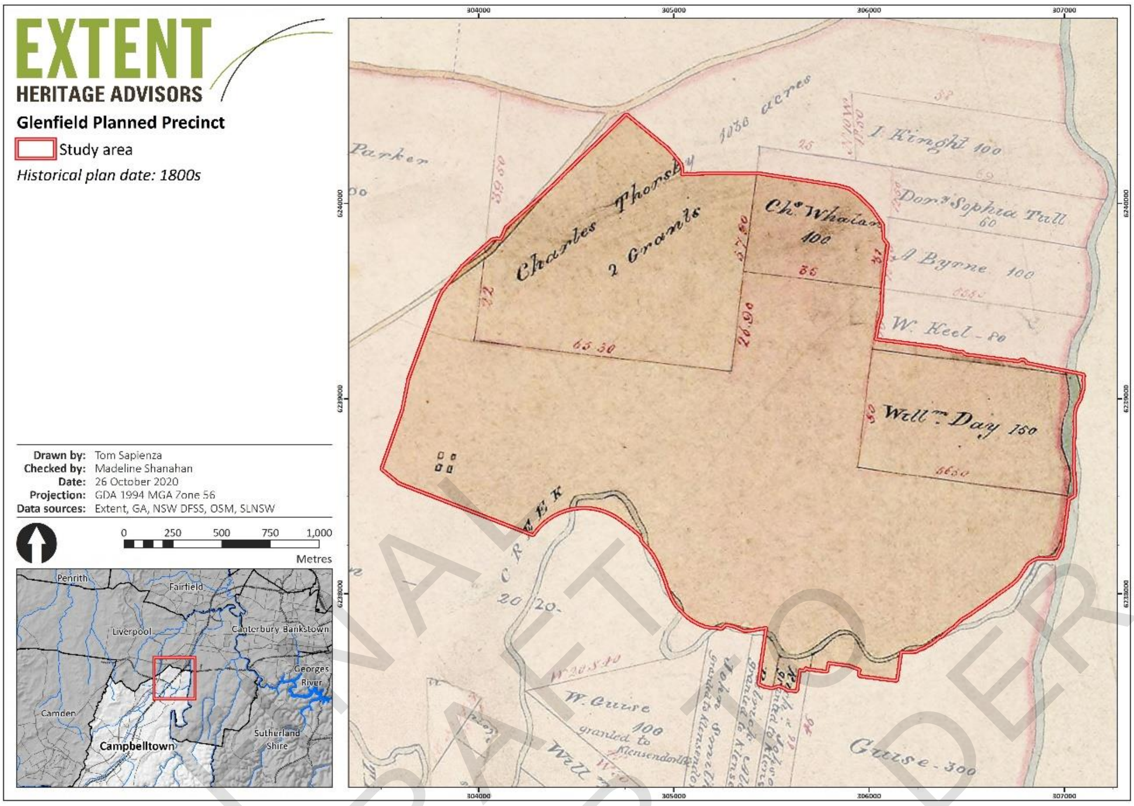


Figure 5. Undated Parish Map of Minto, showing early land grants within the study area.

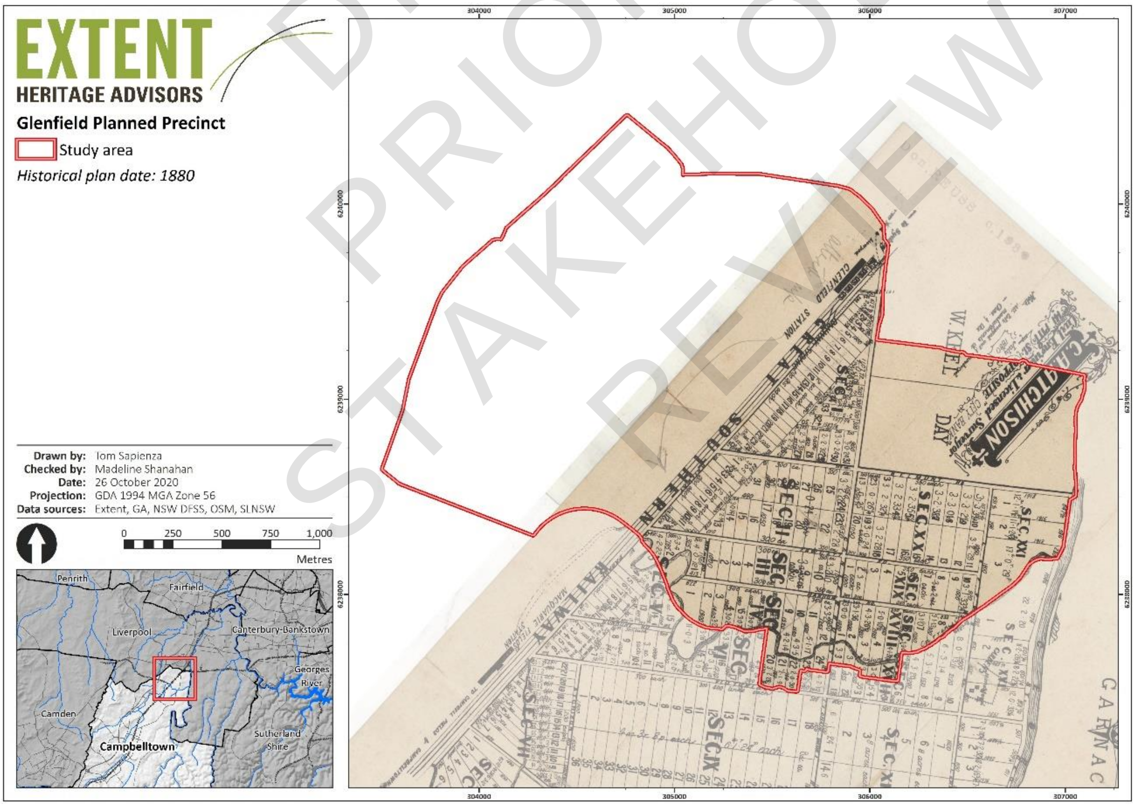


Figure 6. An advertisement for the Hosking's Estate subdivision sale, in 1880.

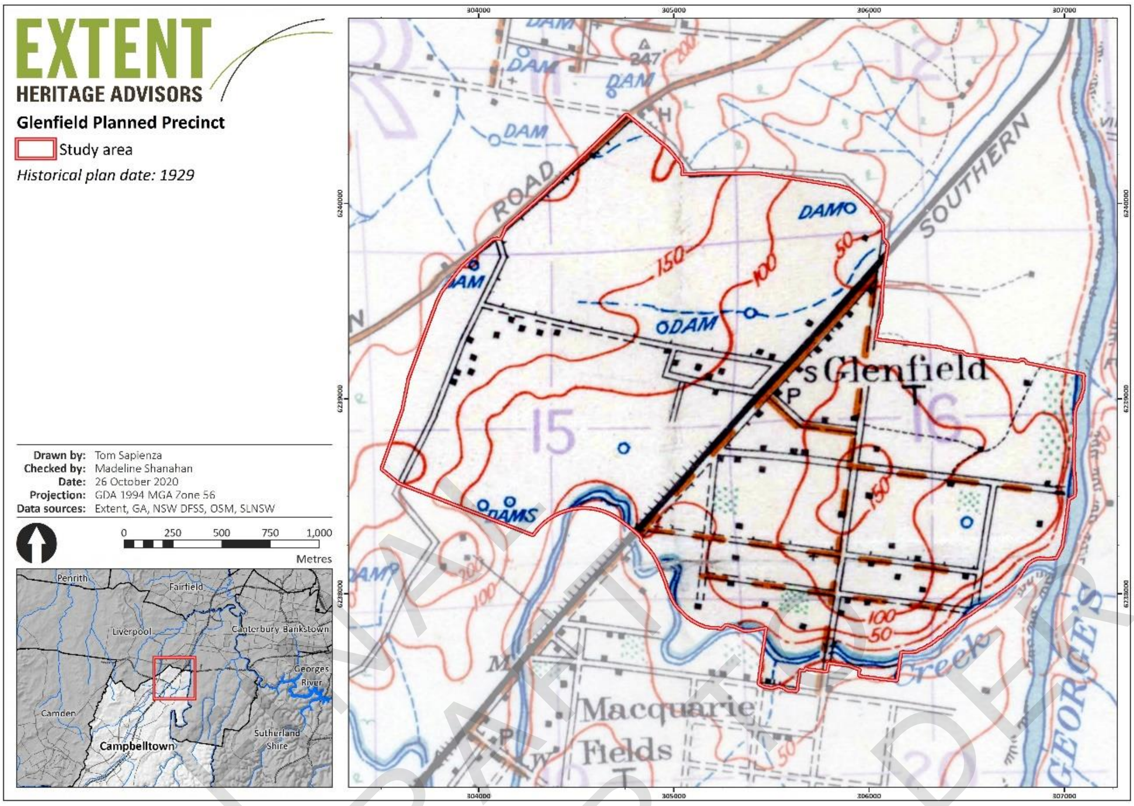


Figure 7. Topographic map of Glenfield in 1929.

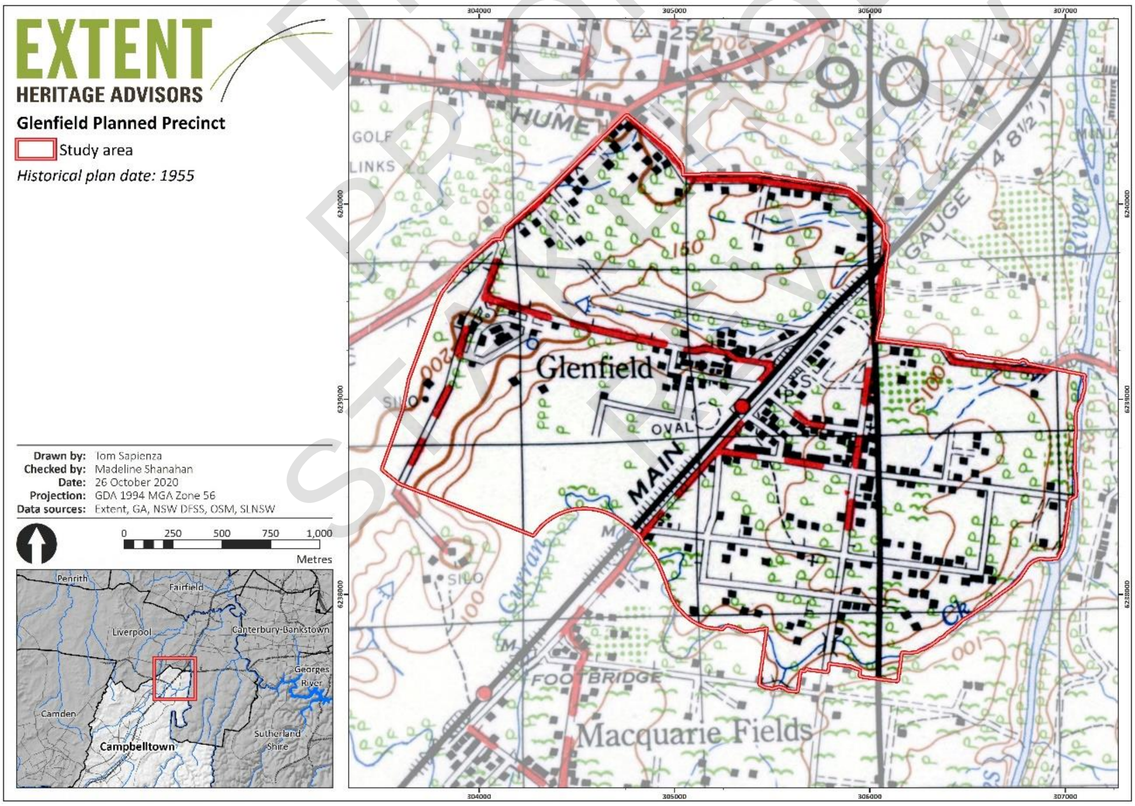


Figure 8. Topographic map of Glenfield in 1955.

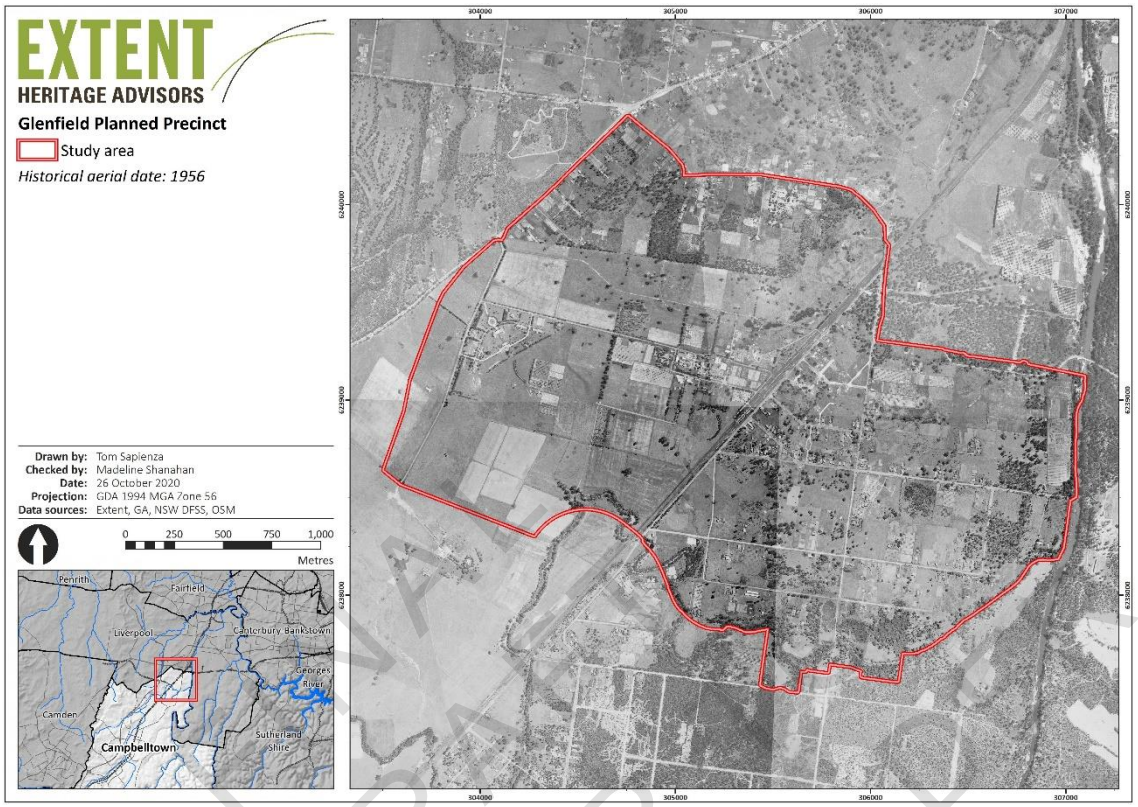


Figure 9. An aerial photograph of the study area in 1956.

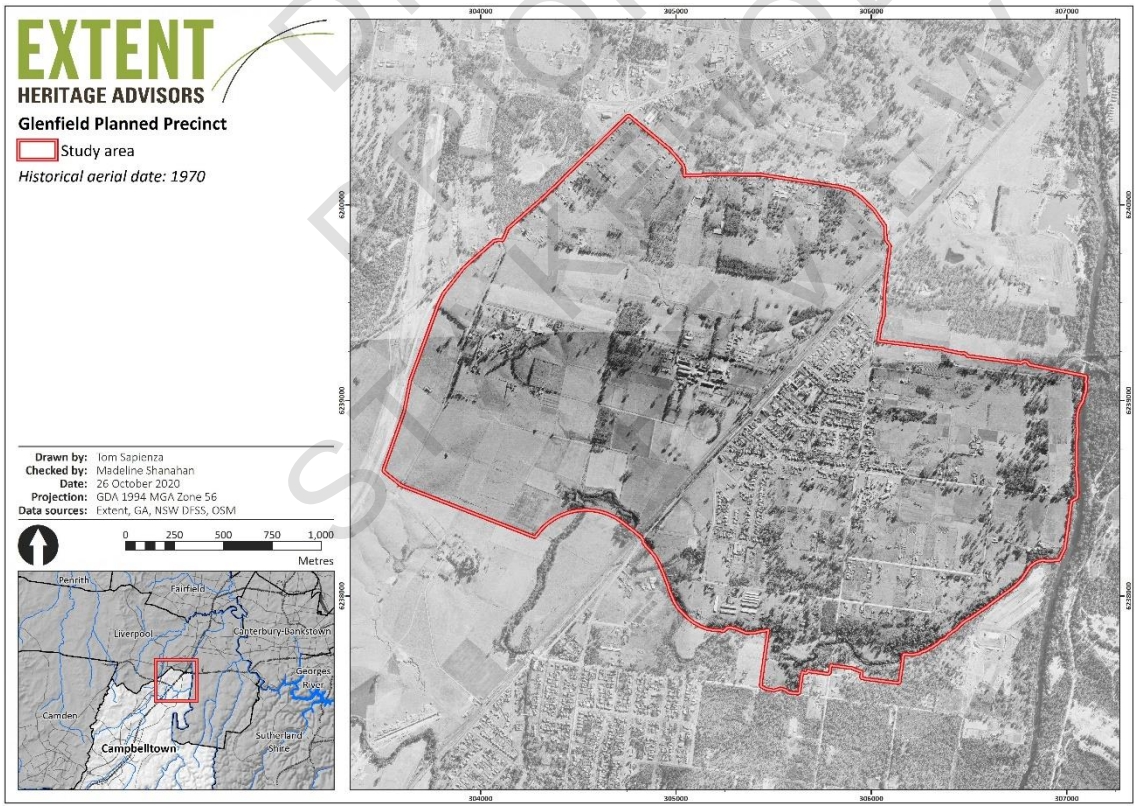


Figure 10. An aerial photograph of the study area in 1970.

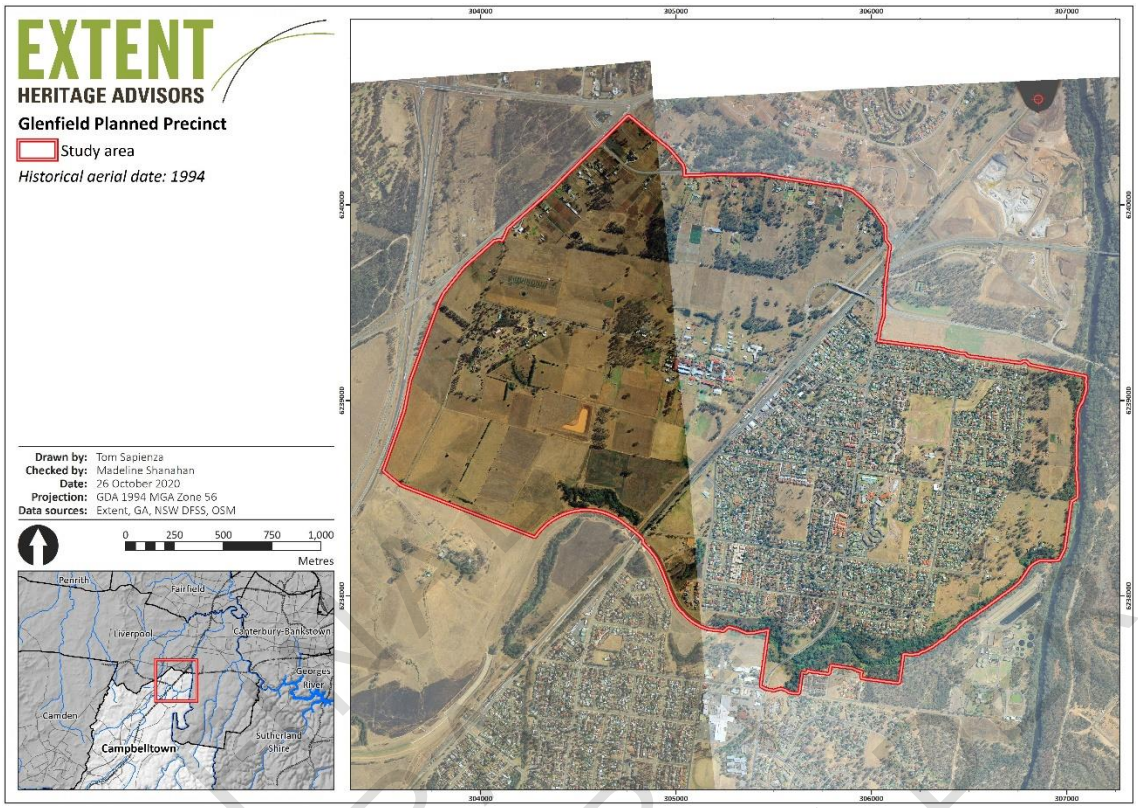


Figure 11. An aerial photograph of the study area in 1994.

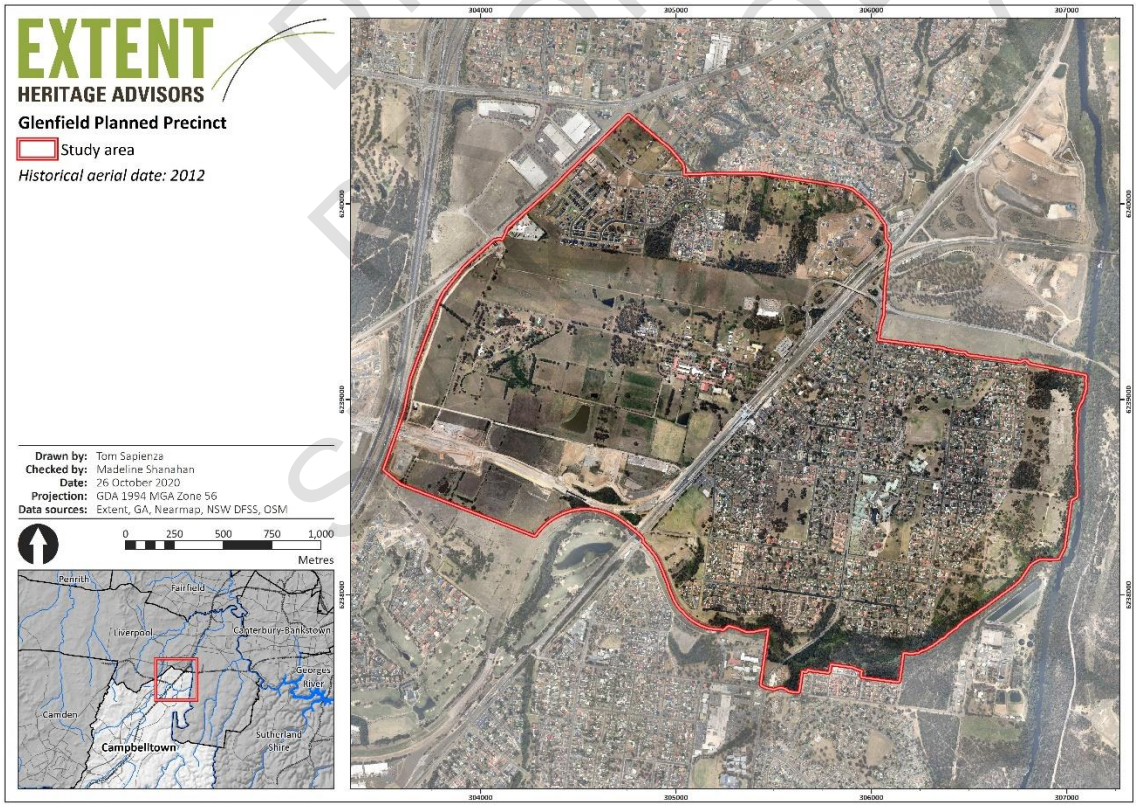


Figure 12. An aerial photograph of the study area in 2012.

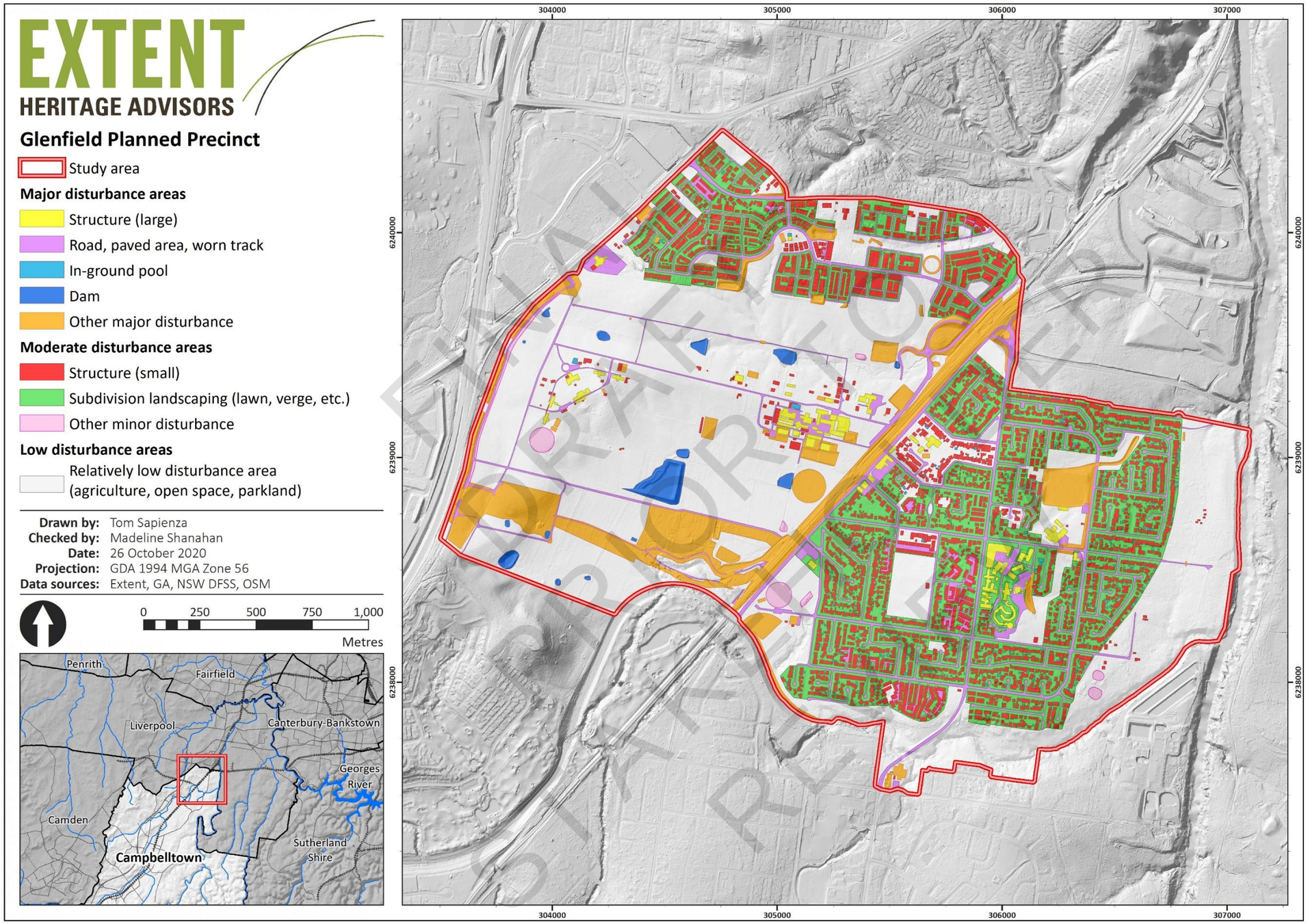


Figure 13. Map of historical disturbance based on an analysis of previous land use. Areas of high disturbance are associated with construction of the railway and realignment of Bunbury Curran Creek; areas of moderate disturbance are associated with residential estate and building construction; and areas of low disturbance are associated with minor development activities, including farming.

4. Ethnographic Record

4.1 Key Findings

- The study area extends through country that has been associated with the "freshwater" clans of the Tharawal language group.
- Local Tharawal families were recorded as having taken up refuge on Throsby's Glenfield estate during a period of heightened conflict in the broader Appin district, in 1816 CE.
- The continued presence of Aboriginal people in the broader district in the nineteenth century is also indicated by records of corroborees held at Camden Park and at Denham Court until at least the 1850s CE. There are also records of ceremony being held on the Denbigh property in ~1830 CE.

4.2 Regional Information

Over thirty separate Aboriginal groups populated the Sydney region in 1788, each with their own country, practices, diets, dress, and dialects. We now know of these groups as 'clans' and each identified with broader cultural-linguistic groups that were previously referred to as 'tribes': Darug, Darkinjung, Gundungarra, Tharawal, Guringai (Coastal Darug), Eora (Coastal Darug) and Awabakal (Attenbrow 2010:23, 32). Although a particular language may have been associated with a particular territory, social organisation was more complex, and involved regular interaction between clans and bands.

Gatherings were undertaken in order to trade, hunt, fight, feast, arrange marriages, conduct ceremonies, resolve disputes, and share information. The early ethnographic records from the region include details of a gathering of three clans on their way to Camden to learn a new song (Backhouse 1843:435), Burramattagal people venturing out to Manly to feast on a beached whale (Tench 1961:176), and groups of hunters near Carabeely cooperating on a large-scale kangaroo hunt (Barrallier 1897:751). There was often tension between neighbouring groups and the boundaries between territories were not lightly traversed (White 1790). On an expedition north-west of Parramatta, Watkin Tench records that his guides Colebee (Gadigal) and Ballederry (Burramattagal) quickly found themselves in 'country unknown' and they described those who lived there as 'bad'. When the party finally reached the Hawkesbury River, he surmised that 'Our natives had evidently never seen this river before' (Tench 1961:225-226).

The landscape was criss-crossed with Aboriginal paths, many of which later became roads. Missionary James Backhouse was amazed by the speed and sophistication of communication between clans; on 23 October 1835 he encountered Aboriginal people in Richmond who knew of his brief visit to Wellington, over three hundred kilometres away: 'Our persons, costume, and many other particulars, including our manner of communicating religious instruction, had been minutely described' (Backhouse 1843:339).

The same paths that wove these communities together rapidly spread smallpox throughout the region in 1789. The devastating outbreak forced major reorganisation amongst clan groups. When William Bradley sailed into Sydney in May 1789, he recorded the 'dreadful havock' that smallpox had wrought amongst Aboriginal communities: 'we did not see a Canoe or a Native the whole way coming up the Harbour & were told that scarce any had been seen lately except laying dead in & about their miserable habitations' (Bradley 1969). Traditional burial practices broke down and clans merged together as entire communities were taken by the disease (Hunter 1793:98-99). Bodies were found in caves and by streams, around the harbour and all along 'the path between Port Jackson & Broken Bay' (Bradley 1969). The impact of smallpox continued to ripple across the country, reducing communities in the Hunter 'from about 200, to 60' (Backhouse 1843:401).

The primary sources offer only glimpses of the ceremonial life of these Aboriginal communities. Europeans recorded some Aboriginal customs, such as the avulsed teeth and 'scarifications' of certain initiated men, and the kangaroo teeth necklaces and the missing little finger joints of 'mountaineer' and coastal women. But, due to the secrecy surrounding ceremonial events, there are serious limitations to even the most richly described accounts like the '*Yoo-long Erah-ba-diang*' initiation ceremonies Collins records at the head of Farm Cove and in the 'middle harbour' (Collins 1804:365-374); the contests and dances conducted on 'a clear spot between the town and the brick-field' (Collins 1804:236); and the operation performed by Yellomundee, a 'caradyee', on Colebee's wound on the banks of the Hawkesbury (Tench 1961:232).

Those clans that lived along the coast were saltwater people. They harvested shellfish from the shore; men fished from the shallows with long four-pronged spears, while the women fished in bark canoes using turban shell hooks and lines. The hunters' toolkit included clubs, boomerangs, womeras, spears tipped with shell, and, of course, fire. At times they stayed for several months in the one area: Joseph Banks (1998:246) records finding 'a small village consisting of about 6 or 8 houses' on the south shore of Botany Bay in April 1770, and in December 1790, Watkin Tench (1961:210) describes a similar 'little village (if five huts deserve the name)' on the north side of the bay. Botany Bay was a focal point of Aboriginal activity; it has the highest density of plotted ethnographic sources in the Sydney area.

The inland clans fished for mullet and eels in rich lagoons, but much of their food came from yams dug out from the riverbanks and worms known as 'cah-bro' extracted from river driftwood. Colebee and Ballederry called these people the 'climbers of trees' after their practice of skilfully ascending gums in pursuit of animals, cutting footholds in the trunks with a stone axe. More hunting traps were plotted in the area from Parramatta to Richmond than any other part of Sydney. These included 'bird decoys' full of feathers, hollowed-out trees, and a tapering chute at the foot of Richmond Hill 'between forty and fifty feet in length', constructed of earth, weeds, rushes, and brambles (Collins 1798).

Fire was a constant presence in early Sydney, from the 'moving lights' seen on the harbour at night (Banks 1998:243) to lone trees burning on the Cumberland Plain, 'the smoke issuing out of the top part as through a chimney' (White 1790:153). 'In all the country thro' which I have passed,' wrote Arthur Phillip in May 1788, 'I have seldom gone a quarter of a mile without seeing trees which appear to have been destroyed by fire' (Phillip 1914:31). The first Australians became known as the 'fire-makers' (Cox 1815). They used fire to open paths and to clean

country; to drive animals into the paths of hunters and then to cook the kill; to keep warm at night and to carry as a torch the next day; to treat wood, melt resin and crack stone for tools; to gather around and dance and share stories.

Mapping of ethnographic records gives us an insight into local burning regimes. On a hot dry day in September 1790, for example, David Collins observed Aboriginal people 'burning the grass on the north shore opposite to Sydney, in order to catch rats and other animals' (Hunter 1793). Almost exactly twelve months later, on 31 August 1791, they were again 'firing the country' in the same place on a hot day ahead of heavy rains. While Collins regarded this to be another 'remarkable coincidence', it suggests a connection to the land and an understanding of the seasons which the settlers could not fathom. This dismissive approach proved devastating during 1799 flood of the Hawkesbury. Settlers who ignored the flood warnings given by Aboriginal people were engulfed by a destructive torrent as the river 'swell'd to the height of fifty feet above its common level' (Collins 1804:488).

After contact, early Sydney remained, in the words of historian Grace Karskens, 'an Eora town' (Karskens 2009:351). Crowds of Aboriginal people would flow through the settlement at Sydney Cove, eating in the yard of Government House, sharing a table with the Governor himself, or gathering at Bennelong's hut. Large parties of convicts paid regular visits to an Aboriginal family in Woolloomooloo, 'where they danced and sung with apparent good humour' (Collins 1798:37). A short-lived fish trade sprang up in Parramatta, with Aboriginal people selling fresh bream and mullet for bread and salted meat (Collins 1798:165). Fierce warfare broke out on the Hawkesbury. And clans came 'not less than one Hundred Miles' to attend Governor Macquarie's 'Annual Meeting of the Natives' at Parramatta (Macquarie 1917:95). Combined, these events knit together a rich tapestry of Aboriginal activity around early Sydney.

4.3 The Study Area

The study area extends through country that has been associated with the Tharawal language. According to the anthropologist Norman Tindale, the Tharawal occupied a vast area of 1,200km^2, from the south side of Botany Bay and Port Hacking to the Shoalhaven River, and inland to Campbelltown and Camden (Tindale 2018 [1974]). However, it should be noted that Tindale's descriptions of tribal boundaries were based on linguistic evidence that was gathered between 1884 and 1969 CE, and on a conception of bounded territories that has since been questioned. Further research has indicated that traditional Tharawal land spanned from the south side of Botany Bay along the coast as far as the Shoalhaven River and Jervis Bay, from the coast to the Georges River and inland as possibly far west as Appin, Moss Vale and Camden (Attenbrow 2010:33).

Tharawal people were distinguished as 'fresh water', 'bitter water' or 'salt water' people depending on whether they inhabited the coastal regions, swamps or plateaus and inland river valleys of the broader Sydney region. According to the anthropologist and linguist RH Mathews, the Tharawal language had grammatical similarities with the neighbouring Darug, Gundungarra and Ngunnawal tribes, but differed slightly in vocabulary (Mathews 1901:140). Evidently, a shared language enabled the transmission of knowledge, customs, and lore as well as items and resources; and the Tharawal people travelled widely, visiting other clans at Prospect,

Parramatta and Windsor, Botany Bay and Broken Bay, Bathurst and Lake Bathurst (Liston 1988:49).

Shortly after the arrival of the First Fleet in Sydney Cove, two bulls and four cows went missing (Liston 1988:49-50). They ended up on land to the south of the Nepean River, in the area of Menangle and Camden. Once the herd was discovered by the Europeans in 1795, the area was named the Cowpastures, and the Aboriginal people of this area were referred to as the Cowpastures tribe, which may be equivalent to the Cobbiti Barta clan. A convict, John Warby, was stationed semi-permanently in the Campbelltown area from 1802 CE to care for the herd (Liston 1988: 50). Warby explored the surrounding area with the guidance of local Tharawal men. Tharawal people also guided Charles Throsby in the southern highlands from c1810 CE; and Hamilton Hume, in the Appin district from 1812 CE (Liston 1988:50; 2009:6).

Given the value of the cattle in the area to the European settlement, there was some concern that some would be killed by the local Aboriginal people. However, Governor King did not think that this was the case:

> *It has been supposed that several of those Cattle have been wilfully killed, which occasioned my proclamation of July 6th, 1803. However necessary it was to guard against those practices, Yet it does not appear that those Reports were well founded, nor do I think that more than one has been thus killed, and if more than one have Shared that fate their Number must be very limited.*
>
> *It has been reported that the Natives have killed some. This I doubt, as the Natives have always shewn the greatest fear on Meeting them, and climbed Trees till they left the place. Perhaps in course of Time this may be the Case. After tasting Beef they may endeavour to kill them.*
>
> *Native Dogs may do mischief among the Calves, as this seems to be the only Mischievous Animal in the Country that prowls after Stock, being very destructive to Sheep, and is equally bad, if not worse, among poultry.*
>
> *(King to Macarthur, 2 Nov 1805, HRA Ser 1 Vol.5)*

Aside from Warby, looking after the cattle, and exploring parties passing through, there were otherwise few Europeans in the region before 1810, and no reports of violence (Liston 1988:50). However, more intensive European occupation of the Minto, Airds and Appin districts took place in the following decade, and the impact on the local Aboriginal people was exacerbated by drought in 1814-16.

During these drought years, the neighbouring Gandangara people moved east towards the rivers within Tharawal country, and it appears that this was interpreted as threatening by the Europeans (Goodall & Cadzow 2009:52-53). Governor Macquarie initially urged forbearance among the Europeans, and asked the Cowpasture Aboriginal people to refrain from violence (Liston 1988:51). But as the conflict continued, in 1814 CE he ordered a party of 12 armed Europeans with four Aboriginal guides to apprehend five Aboriginal men, possibly Gandangara people, who he thought to be responsible for the death of two European children. The party

returned with no success, and in spring the Gandangara people moved back west. Gandangara people returned to the area in early 1816, and conflict broke out again (Liston 1988:51).

The conflict resulted in murders of both Aboriginal people and Europeans, but local relations were not clearly divided. During the period of most intense conflict, some Tharawal families were able to take refuge on Throsby's "Glenfield" estate (Goodall & Cadzow 2009:52). This included Gogy and Nighgingull with their families, Budbury (son of Pemulwuy), Young Bundle and others (Liston 1988:52). There is no further information regarding whether these families were sheltered within Throsby's home or outbuildings (in Casula), whether they chose to camp in proximity to the homestead or outbuildings, or whether they camped elsewhere on the estate in areas that were previously favoured locations. Throsby believed that the violence was the result of specific murders, and was not aggression against Europeans in general (Liston 1988:52).

In 1816 CE, Macquarie reported on the conflict, and on his plans to take action:

> *I am much Concerned to be under the Necessity of Reporting Murders and to Your Lordship that the Native Blacks of this Country, Inhabiting the distant Interior parts, have lately broke out in Open Hostility against the British Settlers residing on the Banks of the River Nepean near the Cow Pastures, and have Committed most daring Acts of Violence on their Persons and Depredations on their Property, in defending which no less than five White Men have been lately Killed by the Natives, who have not been known to Act in such a ferocious Sanguinary Manner for many Years past. ... With this view it is my Intention, as soon as I shall have Ascertained What Tribes Committed the late Murders and Depredations, to send a Strong Detachment of Troops to drive them to a Distance from the Settlements of the White Men, and to Endeavour to take some of them Prisoners in order to be punished for their late atrocious Conduct, so as to Strike them with Terror against Committing Similar Acts of Violence in future. Many of the Settlers have entirely Abandoned their Farms in Consequence of the late Alarming Outrages. In Order, however, to Induce them to return to their Farms, I have sent some small Parties of Troops as Guards of Protection for those Farms which are Most exposed to the Incursions of the Natives; but these have of late become so very Serious that Nothing Short of Some Signal and Severe Examples being made will prevent their frequent Recurrence. However painful, this Measure is Now become Absolutely Necessary. Unwilling hitherto to proceed to any Acts of Severity towards these People, and if possible to Conciliate and Keep on friendly Terms with them, I have forgiven or Overlooked Many of their Occasional Acts of Violence and Atrocity, exclusive of Numberless petty Thefts and Robberies Committed by them on the defenceless remote Settlers for the last three Years.*
>
> *(Macquarie to Bathurst, 18 March 1816, HRA, Ser 1 Vol.9)*

The raid ordered by Macquarie in 1816 CE resulted in the massacre of at least 14 men, women and children at Appin (Karskens 2009:225). Macquarie then forbade armed Aboriginal people from approaching within a mile of any town or farm, and for a group of no more than six

Aboriginals to remain on any farm (Karskens 2009:514). Karskens explains that this was equivalent to banishment, as Aboriginal men always carried spears and clubs, and family groups usually numbered more than six (Karskens 2009:514).

Following the 1816 CE conflicts, the Tharawal tended to remain to the south of the Nepean River in the Cowpastures (Liston 1988:55). In 1818 CE, an area of Macarthur's Camden estate, about 15km to the south of the study area, was marked out for the occupation of the local Aborigines (Liston 1988:55).

The continued presence of Aboriginal people in the district in the nineteenth century is indicated by records of corroborees held at Camden Park and at Denham Court, until at least the 1850s, usually when other Aboriginal people were passing through the district (Liston 1988:57). There are also records of ceremony being held on the Denbigh property in ~1830 CE, and Aboriginal people were also employed on the property.

Aboriginal people who stayed in the area in the mid to late-1800s tended to live on the fringes of white society, seeking employment on local farms in order to supplement their Government welfare allocations (Liston 1988:57). In 1883, Thornton recorded 18 Aboriginal people employed at Camden Park; 29 Aboriginal people fishing, hunting and gathering wild honey at Liverpool; and 2 Aboriginal people employed as farm labourers and domestic servants in Campbelltown (Thornton 1883:12-13).

From the late nineteenth century, efforts by the government to control Aboriginal people were substantially increased, and it became correspondingly difficult for local Aboriginal people to maintain a physical connection to their country. However, recent research has allowed an increased understanding of how Aboriginal people were able to maintain connections to country and varying degrees of social and economic independence from European society, even in the broader Sydney region (e.g., Goodall & Cadzow 2009). In addition, historical associations have also developed, as Aboriginal people have migrated through choice and force of circumstance.

5. Archaeological Record

5.1 Key Findings

- The majority of sites in the south-western Cumberland Plain are comprised of stone materials (artefact scatters and/or isolated finds), followed by potential archaeological deposits, grinding grooves and modified trees.
- Archaeological investigations in the region support the suggestion that past Aboriginal occupation of the south-western Cumberland Plain was focussed on higher-order watercourses. This is reflected in a higher likelihood of finding sites and higher artefact densities in these locations. However, there is a fair amount of variability in the exact criteria suggested; in particular, the distance from water, and the associated landforms that should be considered to have high potential.
- A riparian corridor width varying from ~100-300 m has been suggested, with some reports noting that areas near stream confluences are of particularly high sensitivity. In relation to landforms, the following have commonly been identified as having high potential for the presence of larger and/or higher density sites:
    - Creek flats, floodplains, alluvial terraces, and swamp margins.
    - Lower slopes and spurs leading into drainage lines.
    - Upper hill slopes and ridgelines, ridges with flat or gently sloping crests. These landforms have also been identified as having low potential
- Three artefact sites, comprising two artefact scatters (MFH 2 / #45-5-2495; SWRL 15 / #45-5-4253) and one isolated find (MLE 1 / #45-5-2744) have been registered within the study area on AHIMS. These sites are associated with lower slopes (MFH 2) and upper slopes/ridges/spurs overlooking Bunbury Curran Creek (SWRL 15 and MLE 1).

5.2 Regional Background

5.2.1 A History of Research in the Sydney Basin

One of the first investigations in the region was at Lapstone Creek, southwest of Emu Plains, in the foothills of the Blue Mountains (McCarthy 1948). Initially undated, this site was one of several used by McCarthy and others to differentiate the Bondaian and Eloueran artefact assemblages (e.g., Lampert 1966, 1971; McBryde 1966, 1974; Megaw 1965, 1968; Moore 1970, 1981). Radiocarbon ages suggesting a basal age of c.4 ka for the site were published in the late 1960s from archived samples of charcoal (McCarthy 1978; Polach et al. 1967). McCarthy (1978) also identified several ‘surface workshops’ along the banks of the river between Castlereagh and Emu Plains. These were large surface artefact scatters that were dominated by early reduction of pebbles derived from the Hawkesbury River. The sites were

dominated by uniface pebble blanks, edge-ground implements, and percussion stones, with minor representations of microliths, and were considered to be of late Holocene age.

In the 1970s Stockton and Holland (1974) undertook excavations at several rockshelters in the Blue Mountains (including Kings Tableland, Walls Cave, Lyrebird Dell and Springwood Creek), which demonstrated occupation of the region through the Last Glacial Maximum and terminal Pleistocene (25-10ka). Excavations revealed initial occupation of the Blue Mountain/Hawkesbury region by c.22 ka, with a Capertian assemblage dominating between c.12 to 6 ka and a Bondaian assemblage from c.3 ka and European arrival (and peaking after 600 years). The terms Capertian and Bondaian are explored further in the later sections of this report. However, in brief the 'Capertian' and 'Bondaian' were terms, coined in the 1940s, to characterise two different types of artefact assemblage. The Capertian is composed of amorphous pebble-tools dominated by silicified tuff and constrained to the Terminal Pleistocene, and the Bondaian generally composed of microliths and dominated by silcrete, and constrained to the late Holocene. A sterile phase was identified between the two assemblages at many of the Blue Mountain sites. As part of this work a disturbed rockshelter at Shaws Creek, K1, was excavated with preliminary findings indicating a potential for deep-time deposits in close proximity to the Hawkesbury River (Stockton 1973).

Subsequently, as part of his doctoral research, Kohen (1986; Kohen et al. 1984) undertook excavations of KII rockshelter, a more undisturbed site immediately east of K1. This excavation identified two main assemblages: a lower assemblage (within units 1-4/phases VI-IV) composed of amorphous core/flake tools and thick flakes, and an upper assemblage (within units 5-6/phases I-III) that included backed blades, geometric microliths, edge-ground hatchets and bipolar/scalar pieces (Kohen et al. 1984). The lower assemblage was dominated by chert (also referred to as silicified tuff), while the upper assemblage was dominated by igneous and metamorphic materials, as well as an increasing abundance of silcrete. Radiocarbon ages for the two assemblages indicated that the lower had a minimum age of 13 ka, while the upper was present in various guises from 4-1.2 ka. In contrast to Stockton (1973), Kohen saw no evidence of a hiatus between the two assemblages. With the exception of Cranebrook Terrace, the KII site currently provides the earliest evidence of occupation along the Hawkesbury River.

In the same study, Kohen (et al.1984) also referred to an open stratified site at Jamison Creek, Emu Plains, where two ages suggested an initial occupation from c.7 ka, with a proliferation of backed blades associated with a hearth date to c.3 ka. Thermo-luminescence (TL) dating of an open site at Regentville (RS 1), similarly found a focus of occupation between 5.2 ± 0.5 ka (W 1892) and a basal age 7.6 ± 0.8 ka (W 1893) (McDonald 1995).

The earliest date claimed for Aboriginal occupation in the region comes from Cranebrook Terrace, where five reportedly flaked pebbles identified as stone tools by Stockton were found within a gravel pit (Stockton and Holland 1974). Subsequent work by Nanson et al. (1987) demonstrated these gravels to be c.40 ka. If correct, these finds would be the oldest site on the Australian eastern coast. However, the artefactual status of the pebbles, their provenance (several were in an eroded context rather than *in situ*) and the association between the dates (which ranged from 10 to 42 ka) and the artefacts have been sources of controversy ever since. Mulvaney and Kamminga (1999) rejected these findings and despite extensive monitoring of

the Penrith gravel pits over the past 30 years no other comparable artefacts or evidence of early human occupation has come to light at those levels.

Excavations by Austral Archaeology Pty Ltd (2011) at the Windsor Museum site recovered an extensive artefact assemblage within a sand dune deposit dated to between 149 ka and 8.5 ka. Correlating these TL ages with the archaeology has proven to be difficult as the sediments are known to be bioturbated but it is very likely that the oldest artefacts are of late Pleistocene age.

As part of a salvage excavation for the Rouse Hill Infrastructure project, a basal layer of silicified tuff artefacts was recovered at RH/CC2, a stratified open site, and while undated, based on artefact typology, it was considered to be of a terminal Pleistocene age (JMCHM 2005a, 2005b). Consulting work on the western Cumberland Plain by Smith (1986) at Quakers Hill and McDonald et al. (1994) at Seconds Ponds Creek have recovered hearths and other features in association with extensive artefact scatters dated to the late Holocene. Further afield in tributaries of the Hawkesbury River, studies at Upper Mangrove Creek (Attenbrow 2004), Darling Mills SF 2 rockshelter (Attenbrow 1993) and MR/1 (Moore 1981) have all demonstrated terminal Pleistocene and early Holocene occupation.

Between 2008 and 2013, Archaeological and Heritage Management Solutions (AHMS) undertook archaeological investigations of a large sand body, PT 12 (#45-5-3198), in Pitt Town, northwest Sydney, in advance of development. PT 12 sand body is situated on the edge of a ridge line that follows the Hawkesbury River and associated tributaries. The most significant works consisted of a large salvage excavation totalling 100 m^2 in two locations on the sand body. These works recovered ~10,000 artefacts along with a large number of OSL ages. The findings of the study indicate that the sand body had formed >100ka, with occupation by Aboriginal people at ~36ka, and continuing through until 8ka (Williams et al., 2012, 2014). Currently, this represents the earliest evidence of permanent occupation of the Sydney region.

More recent work by AHMS on a large archaeological mitigation excavation program in advance of ~40 km of pipeline along several creeklines in northwest Sydney (AHMS 2015). This project involved 500 m^2 of open area excavation and recovered ~10,000 artefacts, along with an intense dating program. The findings all indicated that much of the Sydney Basin had only been colonised in the last few thousand years. It was hypothesised that earlier in the past, populations focussed on the main river systems and coast, only in-filling the intermediate region when demographic pressure reached a threshold in the last few thousand years. This provides further support for Attenbrow (2010) who considered that the vast majority of dated sites in the Sydney region are less than 5,000 years old (35 out of a total of 48 dated sites).

5.2.2 Spatial Patterns of Archaeology

Thousands of sites have been recorded for the Cumberland Plain on the Heritage NSW AHIMS database. The majority of these sites are artefact scatters (open camp sites or isolated finds), followed by potential archaeological deposits (PADs), grinding grooves and other site types. The absence of rockshelters with art or deposit for the western Sydney area may be accounted for by the geology of the area, which lacks sandstone escarpments and shelters. Other site types in western Sydney include stone quarries, non-human bone or organic material, shell, and water holes.

In a study of the regional archaeology of the Cumberland Plain, Kohen (1986) made a number of findings about site location patterns in the Sydney area. The study demonstrated that proximity to water was an important factor in site patterning. Kohen found that 65% of open artefact scatter sites were located within 100 m of permanent fresh water, and only 8 per cent of sites were found more than 500 m away from permanent fresh water. Kohen argued that open artefact scatters are larger, more complex and more densely clustered along permanent creek and river lines. In the same study, it was found that the most common raw materials for the manufacture of stone artefacts were silcrete (51%) and chert (34%), and that other raw materials often comprise quartz, basalt and quartzite.

Although the patterns described above have been generally supported by subsequent investigations, Kohen's study was limited by a reliance on surface evidence. Extensive excavation across the Cumberland Plain has since shown that areas with no surface evidence often contain sub-surface deposits buried beneath current ground surfaces, and particularly so in aggrading soil landscapes. In a 1997 study McDonald (JMCHM, 1997) found that:

- 17 out of 61 excavated sites had no surface artefacts before excavation.
- The ratio of surface material to excavated material was 1:25.

The character and composition of the excavated sites in McDonald's study could not be properly predicted on the basis of the surface evidence. It seems that surface evidence (or even the *absence of surface evidence*) does not necessarily indicate the potential, nature or density of sub-surface material.

McDonald's results clearly highlight the limitations of surface survey in identifying archaeological deposits in this landscape. The study also shows the importance of test excavation in establishing the nature and density of archaeological material on the Cumberland Plain.

McDonald has undertaken over 20 years of consulting archaeology in the Cumberland Plain, and, like Kohen, has developed a predictive model for the distribution of Aboriginal objects. In a recent publication, White and McDonald (2010:29) summarised this model as follows:

> *Topographic and stream order variables correlate with artefact density and distribution. High artefact density concentrations may have resulted from large number of artefact discard activities and/or from intensive stone flaking. Highest artefact densities occur on terraces and lower slopes associated with 4th and 2nd order streams, especially 50–100 metres from 4th order streams. Upper slopes have sparse discontinuous artefact distributions but artefacts are still found in these landscape settings.*

It must be noted, however, the on-site investigation in the southwest of the subregion have been significantly less than in the northwest. The limited studies that have been undertaken suggest that the models outlined above are generally robust, but there are differences. This is primarily for two main reasons: 1) there appear to be few raw material sources in the southwest. The sites containing tens of thousands of stone tools a few hundred metres from the Plumpton Ridge (a large silcrete outcrop) in the northwest for example, have no counterpart to the south, and based on existing evidence are unlikely to be present; and 2) the southwest is higher in the

creek catchment, making the geomorphology slightly more rugged and the creeks often stronger and more erosive, than the northwest. This results in archaeological sites being commonly lost in close association with the creekline, and more often found on mid, upper slopes and hill crests between 120-180 m from the creek's edge.

In 2009, ENSR Australia Pty Ltd (ENSR) undertook excavations at the Oran Park and Turner Road Land Release Precincts, approximately 15 km southwest of the study area, and found that:

> *… [the] archaeological landscape revealed by this investigation suggests that archaeological models derived from other regions or other areas should not be applied uncritically. There was no evidence for greater complexity (defined as intricacy) associated with confluences. There was no evidence of greater densities of archaeological material associated with higher order watercourses. Instead it appears that archaeological deposit in the south west [Cumberland Plain] is of relatively low density with occasional clusters in association with all areas of reliable water regardless of stream order. Future assessments in south west Sydney would benefit from paying greater attention to the investigation of areas within 300 m of all reliable watercourses (i.e., more than the conventional 50 m vicinity of watercourses) (ENSR 2009:66).*

More recently, a large-scale excavation of a series of pipelines along major creeklines by AHMS (2015) further contributed to McDonald's work. Key findings included:

- The archaeology of the Cumberland Plain is characterised by a cultural landscape consisting of foci of activity against background low density spread of Aboriginal objects found in all undisturbed locations, generally in the order of <6/m^2; and therefore it has been suggested that a 'site', or a place of specific Aboriginal cultural activity, is identified only when this threshold is exceeded. Areas of extensive occupation or repeated use contained densities >45/m^2 and frequently higher, with densities of >150/m^2 being not uncommon for the largest sites.

- While the works were constrained to the linear corridor of the pipeline, the testing program (frequently with resolution of 5 or 10 metre spacing of test pits) generally showed the length of high artefact densities (a priori sites). All of these results suggest that the linear length of high density sites is in the order of 10-20 m, and assuming a similar width, can be extrapolated to a 100-400 m^2 occupation area.

5.3 Local Information

Although when compared to the north-west of Sydney it appears that there is an apparent dearth of Aboriginal archaeological and cultural investigation in the south-western Cumberland Plain, there have been several archaeological investigations since the 1980s that have been undertaken in proximity to the study area or incorporated portions of the study area. Generally, these have comprised archaeological surveys and subsurface excavations undertaken as part of compliance-based archaeological investigations associated with urban development, though

some have been academic research or infrastructure upgrade projects. Key studies of relevance to the study area are illustrated in **Figure 18**.

In general, the results of the archaeological investigations undertaken to date tend to support the suggestion that past Aboriginal occupation of the south-western Cumberland Plain was focussed on higher-order watercourses. This is reflected in a higher likelihood of finding sites and higher artefact densities in these locations. Early studies by Koettig and Hughes for the East Hills-Glenfield Railway, and by Boot for a development at Wattle Grove, respectively, identified several artefact scatters overlooking Anzac Creek: AHIMS #45-5-0889, #45-5-0890, #45-5-0891, #45-5-0892, #45-5-0972, #45-5-2355, #45-5-2369 (Koettig & Hughes 1983; Boot 1990; 1992; 1993; 1994a; 1994b).

Mary Dallas undertook an assessment of a proposed housing subdivision in south Casula, approximately 2 km north of the study area (Mary Dallas 1988). Her study identified two artefact scatters and three culturally modified trees on a series of spurs overlooking Glenfield Creek (AHIMS #45-5-0720, #45-5-0721, #45-5-0722, #45-5-0723, #45-5-0724). Archaeological excavation of 149 test pits (1 m^2) along the South West Rail Link corridor recovered 2,969 artefacts, the majority of which were found on the margins of Kemps Creek (AMBS 2014:70). Testing here identified a "complex zone" of high density artefacts (in the order of 19/m^2) within 50 m of Kemps Creek; with low lithic densities (in the order of ≤3/m^2) and sparse lithic distribution along first and second order creeklines (AMBS 2014:57).

There is a fair amount of variability in the exact criteria suggested to demonstrate the likelihood of the presence of Aboriginal archaeological sites in relation to distances from water, and the landforms that should be considered to have high potential. A riparian corridor width varying from ~100-300 m has been suggested (ENSR 2009; AMBS 2011:28; 2014:57), with some reports noting that areas near stream confluences are of particularly high sensitivity (AHMS 2012). In relation to landforms, the following have variously been identified as having high potential for the presence of larger and/or higher density sites:

- Creek flats, floodplains, alluvial terraces, and swamp margins.
- Lower slopes and spurs leading into drainage lines.
- Upper hill slopes and ridgelines, ridges with flat or gently sloping crests. These landforms have also been identified as having low potential.

Variability in predictive modelling is likely to be at least in part the result of the developing understanding of the regional archaeology and the difference in preservation across study areas. However, it is also likely to reflect patterns of past Aboriginal occupation, which may have been influenced by the availability of resources that are today difficult to discern, and intangible and/or cultural factors. Therefore, while proximity to higher order watercourses and the presence of certain landforms can certainly be used as a guide to the potential presence of sites, it is the site-specific variability to these general rules that may provide a greater insight into past Aboriginal lives.

Within the alluvial contexts of the Georges River foreshore, previous investigation has demonstrated the archaeological significance and great antiquity of a deep sand body along the

riverbank (Extent Heritage 2018b) – an alluvial deposit that could, realistically, extend to within the study area. Recent archaeological salvage excavation of the Moorebank Intermodal Terminal (MIT) site, ~700 m northeast of the study area, demonstrated the presence of a significant artefact scatter in this locale (MA14). Two distinct phases of transient occupation during the last 22,000 years were identified, spanning from the Last Glacial Maximum (21±3ka) to the Late Holocene (<5ka). Georges River appears to have been a focus for occupation while climatic conditions were still turbulent, with an assemblage indicating exploitation of materials from local gravel beds, predominantly indurated mudstone/tuff/chert, but also containing basalt, quartzite and other rock types. Following the early occupation of the site, a second occupation phase appears to have taken place, which is represented and characterised by the use of silcrete raw materials and which includes backed artefacts. These findings are similar to other artefact assemblages in sand deposits found throughout the Sydney Basin (e.g., Parramatta, Pitt Town and Windsor).

Investigations within the Study Area

Of particular relevance to the study area are the results of archaeological excavations undertaken for the construction of the South West Rail Link (SWRL) (Australian Museum Business Services (AMBS) 2010; 2011; 2014), part of the Macquarie Fields House Estate (Dallas 1989; 2000), and the Glenfield School for Special Purposes (AMAC and SAS 2018); as well as archaeological surveys undertaken for the subdivision of the Macquarie Links Housing Estate (GML 2000), the development of the Glenfield Waste Disposal site (AHMS 2012), and the Hurlstone Agricultural High School (City Plan Heritage 2018; Extent Heritage 2018a).

Archaeological survey of the northern part of the Macquarie Fields House Estate by Mary Dallas in 1989 identified a low-density artefact scatter in the southern portion of the study area, MFH 2 (AHIMS #45-5-2495). This surface scatter and an associated area of Potential Archaeological Deposit (PAD) was identified on the southern bank of Bunbury Curran Creek, and was considered to represent Aboriginal occupation focused in this area (**Figure 14**, Dallas 1989). Subsequent test excavation of the site and PAD in 2000 found that the site comprised a low-density background scatter of stone artefacts, comprising artefact types that were common in the local region, and hence of low archaeological significance (Dallas 2000).

Archaeological survey for an access road for the Macquarie Links Housing Estate by GML Heritage (2000) identified an isolated stone artefact in the southwestern corner of the study area, MLE 1 (AHIMS #45-5-2744). This site was located on a grader track, on a prominent spur/ridgeline overlooking Bunbury Curran Creek (GML 2000).

Archaeological survey undertaken by AHMS for the Glenfield Waste Disposal site identified an artefact scatter, two isolated finds and an area of potential archaeological deposit within relatively undisturbed, partially vegetated land immediately north of the study area (AHMS 2012:9). The area of potential archaeological deposit (GWD2) is associated with a large undulating terrace feature (400 x 100 m) that encompasses a tributary and the edge of the Georges River, and which lies just outside of the study area boundary (**Figure 15**, AHMS 2012:67).

A comprehensive archaeological assessment of the proposed South West Rail Link (SWRL) corridor was undertaken by AMBS between 2008 and 2014 (AMBS 2008; 2010; 2011; 2014). Initial survey found five previously identified sites and ten newly recorded sites along the proposed SWRL alignment, and graded the alignment into areas of high, moderate and low archaeological sensitivity. Within the study area, this included an area of low archaeological sensitivity near Bunbury Curran Creek (and associated with MFH 2), and an area of moderate archaeological sensitivity extending upslope to a ridge between Quarter Sessions Road and the Hume Highway (AMBS 2010:65). With respect to the latter the sensitive area was given a higher grading due to its relatively undisturbed context and its elevated position between two reliable watercourses; and this sensitive area became the focus of targeted test (AMBS 2011) and salvage (AMBS 2014) excavation.

Archaeological excavations recovered 33 Aboriginal objects from 13 m^2 of excavation (**Figure 16**). Silcrete was the predominant raw material, with indurated mudstone/tuff/chert (IMTC) and quartz also present. The soil within these test pits generally consisted of brown to reddish brown topsoil, overlying red to orange clay at a depth of between 150-230 mm. AMBS considered that the area represented an "activity area at which multiple raw materials were flaked, and/or the location was visited on multiple occasions" (AMBS 2014:69-70). The area, comprising a low-density artefact scatter, was subsequently classified as SWRL Site 15/AAS1 (AHIMS #45-5-4253).

In 2018, brief archaeological and arboreal assessment of two areas of potential Aboriginal cultural heritage value was undertaken within the grounds of the Hurlstone Agricultural High School (HAHS), following their identification as potential scarred tree/Aboriginal meeting place sites in an earlier assessment (City Plan Heritage 2018, cited in Extent Heritage 2018a). Subsequent investigation found both sites were unlikely to have Aboriginal cultural significance, as local Aboriginal community representatives present had no knowledge of either site; and the trees in question were considered too young for cultural modification and/or were non-endemic to the region. Advice regarding the presence of a potential culturally modified tree within an electrical easement, along the northern edge of the HAHS, was provided but the CBNTC representative at this time, and was reiterated during consultation undertaken for the preliminary assessment (see **Section 2.3**).

More recently, an Aboriginal cultural heritage assessment with archaeological test excavation was undertaken in advance of the proposed redevelopment of the Glenfield School for Special Purposes (GSFSP) by Archaeological Management and Consulting Group and Streat Archaeological Services Pty Ltd (AMAC and SAS) (2018). Excavation of 29 0.25 m^2 test pits in the south eastern corner of the school identified truncated and reworked Luddenham soils (**Figure 17**). A_1 horizon topsoils were found to be largely absent and A_2 deposits were found to be redeposited and heavily disturbed, overlying mottled basal clay (B_2 horizon) to an average depth of 250 mm. No Aboriginal objects, deposits or features of cultural significance were identified; the report concluded that no further archaeological assessment was warranted and that works could proceed with caution (AMAC and SAS 2018:52).

Figure 14. Location of artefact scatter MFH 2 (AHIMS #45-5-2495, red circle) overlain with the proposed SWRL corridor (green) and compound areas (blue) (Source: Dallas 1989, cited in AMBS 2010:23).

Figure 15. Map of archaeological sites identified within the Glenfield Waste Disposal site, showing areas of significant disturbance (red). Potential archaeological deposit GWD 2 (grey), associated with an alluvial terrace on a tributary of the Georges River, is adjacent to the study area (source: AHMS 2012).

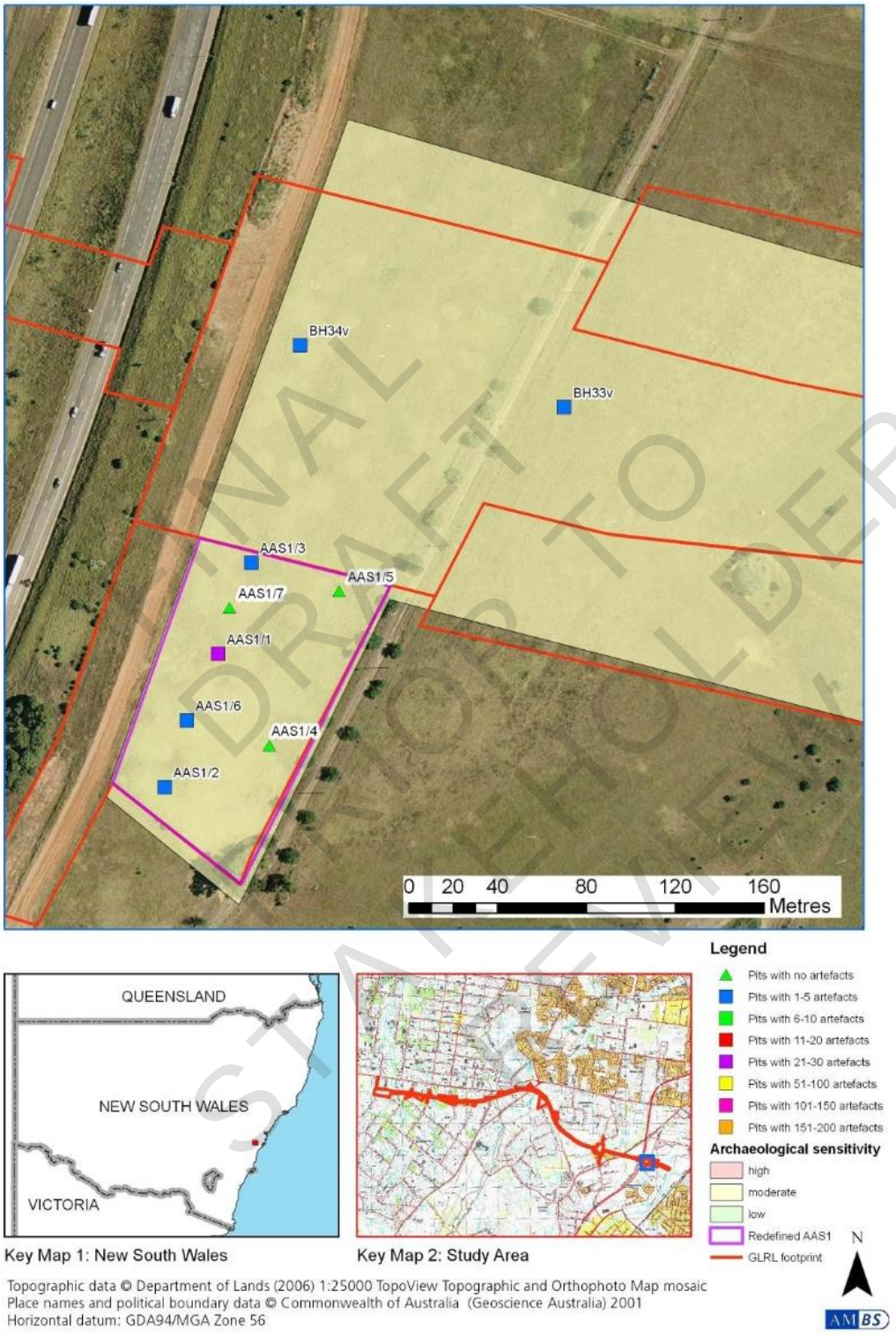


Figure 16. Locations of excavated test pits within SWRL Site 15/AAS1 (AHIMS #45-5-4253), comprising a low-density artefact scatter (Source: AHIMS #45-5-4253 site card).

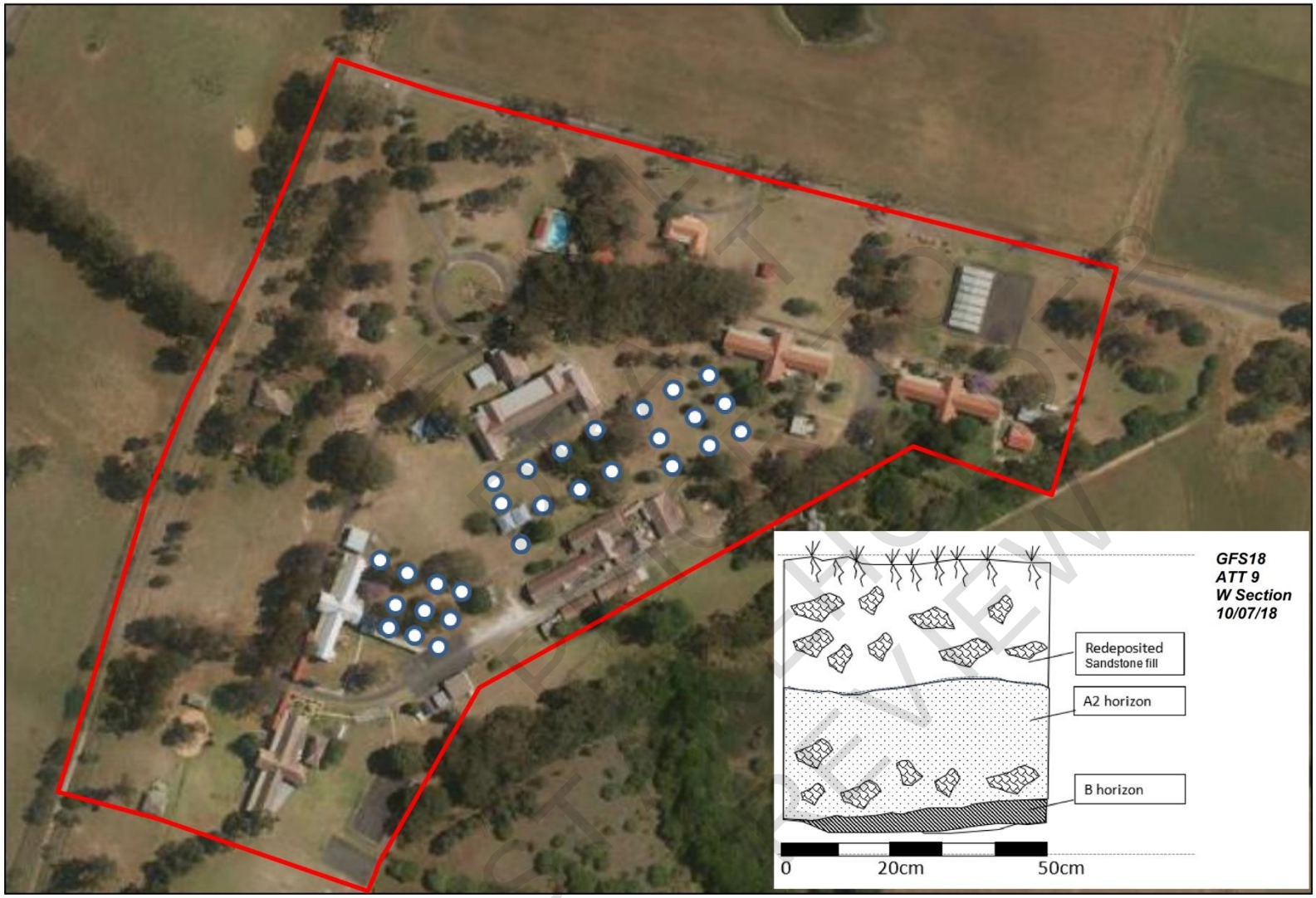


Figure 17. Test pit locations within GSFSP and (in inset) typical soil profile encountered during excavations (Source: AMAC and SAS 2018).

5.4 Aboriginal Heritage Information Management System Database

Heritage NSW maintains the Aboriginal Heritage Information Management System (AHIMS), a database of previously recorded Aboriginal objects and sites. AHIMS is not a comprehensive record of Aboriginal archaeological heritage in NSW but is based largely on the results of previous academic and cultural resource management projects. An extensive search of AHIMS was initially undertaken on 19 October 2018 (ID 377432); this was updated with by a search of AHIMS that was undertaken on 27 October 2020 (ID 545479). The search covered a 5 km^2 area centred on and encompassing the study area (**Figure 19**). Details are given in **Appendix C**.

The search resulted in the identification of 63 sites within the search area (

Table 3). Of these, one is listed as not being a site ("Glenfield S.T." #45-6-2428), leaving a total of 62 valid sites. Five of these ("EPSW 1" #45-5-3984, "CRO 1" #45-5-4245, "SWRL 15" #45-5-4253, "DD 3" #45-5-2457 and "DD4" #45-5-2458) are listed as a site status of "destroyed"[1].

A site can be described in terms of one or more of 20 site features that are specified by Heritage NSW. For the 63 sites in the search area, a total of 64 instances of four site features has been recorded. As is generally the case on the Cumberland Plain, the majority of the site types recorded (n=49) are artefact(s), which refers to lithic artefacts found either by themselves or in scatters on the ground surface. This reflects both the high use of lithic artefacts by the past Aboriginal populations of the area, and the relatively high survival rate of this durable material. Seven areas of potential archaeological deposit (PAD) have also been recorded, some in association with artefact sites, and reflect the possibility of past Aboriginal occupation of these locations based on a variety of factors, including their landform context and level of disturbance from prior historical development. Five modified trees and three rockshelter with art sites were also identified.

[1] Note that "destroyed" is a term of art used by Heritage NSW to describe one of the possible statuses of sites listed in the AHIMS database. Sites in AHIMS have one of four possible site statuses:

- Valid: the site has not been affected by developments or other impacts.
- Destroyed: the site has been impacted by developments or other occurrences (e.g., natural disasters) to the point that no portions of the original site remain *in situ*.
- Partially destroyed: the site has been impacted by developments or other occurrences, but some portion of the original site remains *in situ*.
- Not a site: subsequent investigations have determined that the listing is not an actual Aboriginal heritage site.

Note that a site status of "destroyed" is applied to a site in the situation when an artefact scatter or isolated find is collected by Aboriginal stakeholders and reburied in another location prior to development. In such a situation, the new location of the artefacts will be assigned a new AHIMS site number and given a site status of "valid", while the original site will be given a site status of "destroyed". Although all the artefacts from the original site may have protected from development and safely placed elsewhere, none of the artefacts are *in situ* any longer. Thus, while "destroyed" *can* refer to the physical destruction of Aboriginal heritage sites it can also refer to situations where the original context of the site or the site's contents has been altered to the extent that nothing remains any longer *in situ*.

Table 3. Aboriginal sites in the vicinity of the study area, summarised by site feature.

Site Feature	Number of instances	% of Total
Artefact	49	76.56
Potential archaeological deposit	7	10.94
Modified tree (carved or scarred)	5	7.81
Rockshelter with art	3	4.69
Total	**64**	**100.00**

Mapping of the Heritage NSW data indicates that there are three registered artefact sites within the study area: two artefact scatters and one isolated find.

- MFH 2 (#45-5-2495): an artefact scatter. This site was investigated by Dallas (2000) for a proposed housing subdivision and was found to comprise a low-density background scatter of stone artefacts, with types common in the region and therefore with low archaeological significance. It is unclear whether the site has been partially or completely impacted during construction of the SWRL, or whether it was only subjected to impacts during the test excavations.

- MLE 1 (#45-5-2744): an isolated artefact. This site was identified by GML (2000) for a proposed housing subdivision and was found on a graded track on a prominent spur/ridgeline overlooking Bunbury Curran Creek. The site was reportedly authorised for destruction under an Aboriginal Heritage Impact Permit; and the surrounding area was extensively disturbed during construction of the SWRL. AMBS (2010) assessed the surrounding area as having moderate potential to contain subsurface cultural material.

- SWRL 15/AAS1 (#45-5-4253): an artefact scatter. This site was identified by AMBS (2010) during preliminary assessment for the SWRL, as an area of moderate archaeological sensitivity on a ridge/spur between Bunbury Curran and Maxwells Creeks. Test and salvage excavation resulted in the recovery of 33 artefacts from 13 m^2 (AMBS 2010), effectively reflecting a low density or transient occupation of the region in the past. The site was extensively disturbed during construction of the SWRL and has an AHIMS site status of “destroyed”.

Additionally, one Aboriginal site (BC1 (Liverpool) / #45-5-3639) has been registered on AHIMS as being located just outside of the study area’s southern boundary. This site is an isolated find and is in an area of ground surface exposure extending ~110 m along the eastern edge of the modified extent of Bunbury Curran Creek, and ~45 m south of the study area boundary. When considering the original alignment of Bunbury Curran Creek (e.g., see **Figure 4**), this site would have originally been located on the immediate banks of the natural creekline.

5.5 Predictive Model

Archaeological predictive models identify, locate and map where archaeological resources are likely to survive. This section provides a summary of the predictive model created for the study area. The model for the study area is shown in **Figure 20**, and is based on a series of environmental and archaeological variables:

- **Areas of High Potential:** Corridors of high potential are associated with relatively undisturbed land within 250 m of Bunbury Curran Creek, which would have been considered the primary water-gathering resource in the area when compared with the heavily incised streambank of the Georges River, where sheer cliffs would have made accessing water difficult. Other areas of high potential are associated with steep cliff landforms along the incised banks of the Georges River and Bunbury Curran Creek, as potential sandstone overhang and rockshelter locations, and isolated stands of vegetation throughout the study area that appear not to have been cleared throughout the historic period, and might retain evidence for Aboriginal cultural modification and/or scarring.

- **Areas of Moderate Potential:** Corridors of moderate potential are associated with those partly developed areas within 250 m of Bunbury Curran Creek and the Georges River, as well as relatively undisturbed land on elevated ridgeline and spur landforms, and land within 50 m of other first- and second-order tributaries throughout the study area.

- **Areas of Low Potential:** Areas of low potential are associated with partly developed land within the Glenfield town centre located on a ridgeline landform, as well as those areas within 250 m of Bunbury Curran Creek that have been subject to major disturbance, and those areas of the study area that are within 50-250 m of first- and second-order watercourses.

- **Areas of Very Low to Nil:** Areas of very low to nil potential are associated with land that is not within 250 m of any watercourse or ridgeline landform and which has been subject to significant ground surface disturbance from development, namely for the construction of the railway, dams, roads and other local infrastructure.

The results of previous investigations and predictive modelling in the region suggest that there is likely to be some site patterning across the study area. Certain landforms and locations are likely to have been favoured for occupation and are therefore likely to retain higher densities of artefacts; in particular lower slope and terrace landforms, and areas near confluences of watercourses where good access to water was provided. Within these areas, discrete high-density deposits may be present, possibly associated with micro-landforms. According to AMBS, this is represented by higher densities of artefacts (~19/m^2) occurring within 50 m of third order watercourses and higher; with a lower density of artefacts and sparse distribution within 250 m of lower order watercourses.

The archaeological potential of the high ground and elevated spurs, in comparison, is less clear. The indications from previous studies are variable, with some indicating higher archaeological potential on higher ground (notably, the identification of sites MLE 1 and SWRL 15 on the spur above Bunbury Curran Creek), with others finding low densities or no stone artefacts (e.g., AMAC and SAS 2018). In either case, the high ground may be associated with intangible heritage values.

The Aboriginal archaeological resource that is considered most likely to be present within the study area consists of stone artefacts, both on the ground surface and in subsurface archaeological deposits. There is some possibility for the presence of mature trees with cultural scarring along drainage channels where pre-contact/remnant vegetation has not been entirely removed. There is also some potential for the presence of rockshelter sites where suitable outcropping sandstone is present along sections of the Georges River and Bunbury Curran Creek. The evidence is likely to relate to Aboriginal occupation of the area from c. 6,000 BP onwards, though earlier deposits may be present within deep alluvial contexts along the Georges River and Bunbury Curran Creek, with recent work immediately northeast of the site finding cultural material ~20,000 years old (Extent Heritage 2018b).

5.5.1 Post-Contact Material

There is some potential for the presence of archaeological evidence relating to post-contact Aboriginal occupation of the former Throsby estate. However, the nature and location of evidence of post-Contact Aboriginal occupation is very difficult to predict. Throsby House is actually situated in Casula, some distance from the study area, but the property curtilage encompasses much of the western portion of the precinct.

Tharawal families who sought refuge during periods of conflict in the 1810s may have continued to occupy their previously favoured locations, in which case the predictive model developed for pre-Contact evidence would apply. However, they may instead have chosen to camp in proximity to Throsby's homestead or adjacent to outbuildings, or they may have occupied these structures themselves. They may have continued to use traditional materials and techniques, they may have used introduced materials in traditional ways, or they may have used introduced materials in ways that are not possible to differentiate from the Europeans in the archaeological record.

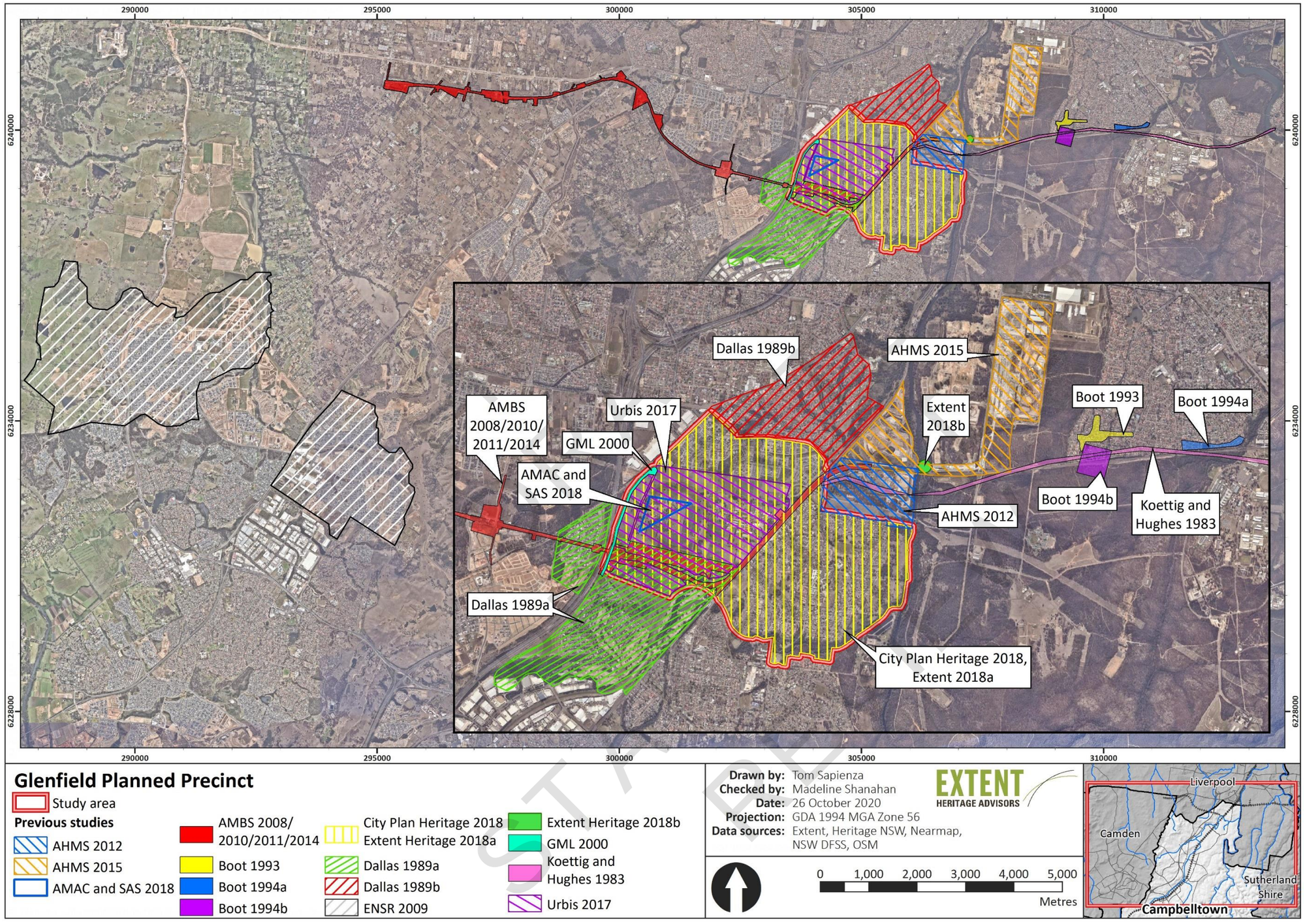


Figure 18. Previous archaeological investigations with relevance to the study area.

EXTENT
HERITAGE ADVISORS

Glenfield Planned Precinct

Study area

AHIMS search area

AHIMS site features

Art (pigment or engraved), Rockshelter	*(3)*
Artefact	*(47)*
Artefact, Potential archaeological deposit (PAD)	*(2)*
Modified tree (carved or scarred)	*(5)*
Potential archaeological deposit (PAD)	*(5)*
Isolated artefacts	*(23)*

Drawn by: Tom Sapienza
Checked by: Madeline Shanahan
Date: 26 October 2020
Projection: GDA 1994 MGA Zone 56
Data sources: Extent, GA, Heritage NSW, Nearmap, NSW DFSS, OSM

0 500 1,000 1,500
Metres

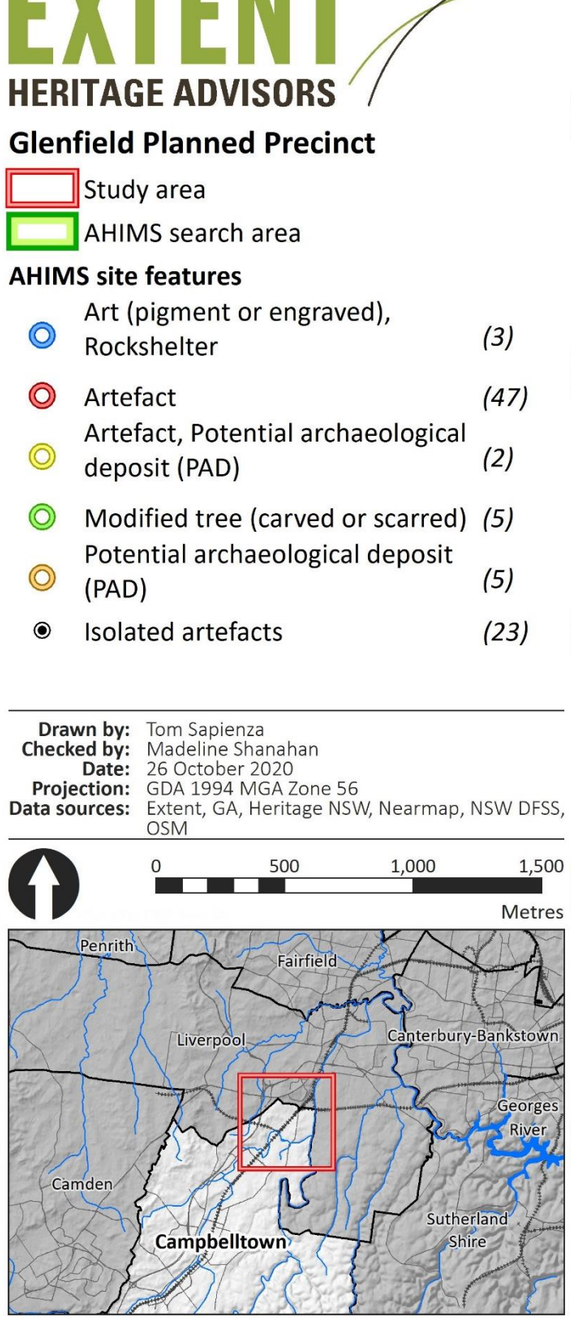


Figure 19. Registered Aboriginal sites in a 5 km^2 area surrounding the study area.

EXTENT
HERITAGE ADVISORS

Glenfield Planned Precinct

Study area

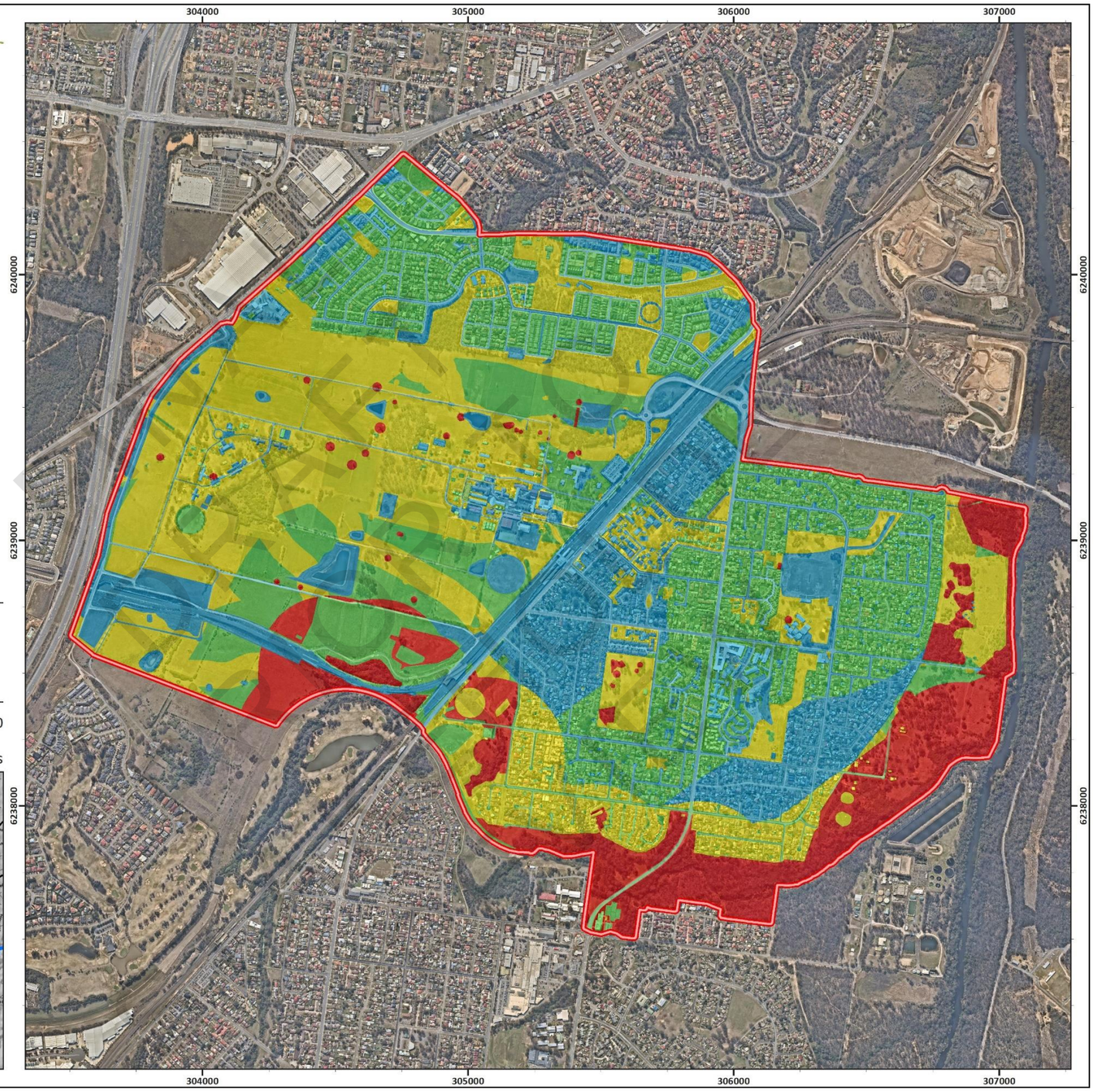
Predicted potential

High

Moderate

Low

Very low to nil



Drawn by: Tom Sapienza
Checked by: Madeline Shanahan
Date: 26 October 2020
Projection: GDA 1994 MGA Zone 56
Data sources: Extent, GA, Nearmap, NSW DFSS, OSM

0 250 500 750 1,000
Metres

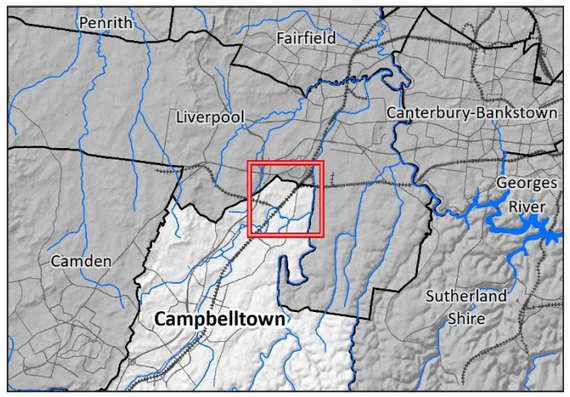


Figure 20. Predictive model of Aboriginal archaeological potential, based on desktop assessment undertaken prior to fieldwork.

6. Field Investigation

6.1 Key Findings

- The field survey and desktop investigation resulted in the identification of 10 Aboriginal archaeological sites within the study area. This included seven artefact sites (artefact scatters #45-5-2495 and #45-5-4253, and isolated finds #45-5-2744, 'GPP IF1', 'GPP IF4', 'GPP IF6' and 'GPP IF7'), one culturally modified tree ('GPP MT2'), one unmodified tree of cultural value ('GPP MT5'), and one potential archaeological deposit ('GPP PAD10'). Four potentially modified trees ('GPP MT3', 'GPP MT8', 'GPP MT9', 'GPP MT 11') were subsequently investigated by an arboriculturist, and considered unlikely to be of cultural origin. GPP MT5 was also investigated by the same arboriculturist, but its identification as a 'cultural site' remains unchanged.

- Due to access restrictions, the three previously registered artefact sites (#45-5-2495, #45-5-2744 and #45-5-4253) could not be inspected during field survey. All three are located within the SWRL rail corridor footprint, in the south-west section of the study area, and are likely to have been impacted during archaeological test excavation and/or during construction of the SWRL.

- A potential scarred tree within the electricity transmission line easement, identified through the community consultation process, could not be relocated during the survey. While the transmission alignment was not entered, extensive linear transects ran either side of the 50 m wide corridor, and no clear identification of the reported scarred tree could be discerned. Portions of the corridor were further re-inspected by an arboriculturist during his work, and failed to identify any culturally modified trees.

- The eastern section of the study area is characterised by developed residential areas, urban parks and the Nature Reserve associated with the Georges River and Bunbury Curran Creek. The eastern portion has been subjected to significant disturbance from residential development, with the exception of the nature reserve, which has been identified as a PAD due to the observation of sand units similar to those found to the northeast (in the Moorebank Intermodal Terminal) and shown to be highly significant.

- The western portion of the study area is characterised by school properties, agricultural facilities and dams, as well as the SWRL to the south and residential development to the north. Construction of the schools and their associated outbuildings, as well as agricultural activities has caused some degree of disturbance. However this has not completely removed the potential for cultural material, particularly in the form of potential modified trees and isolated finds.

- Little mature native vegetation remains within the study area, with most vegetation present reflective of recent regrowth. Only small portions of remnant vegetation were identified within the riparian corridor and as isolated trees within the school property and residential parks. The majority of these were inspected for cultural modifications during the survey.

- Ground surface visibility across the study area was generally low due to dense grass cover. Areas of higher visibility were limited to unsurfaced vehicle and cattle tracks, creek bed sections, areas of disturbance such as dam embankments and other exposures. It is therefore unlikely that all archaeological sites within the study area have been identified.

6.2 Approach and Methods

The results of the background and desktop research, as outlined above and presented in the predictive model, indicated that several parts of the study area were of moderate to high archaeological potential. Some areas were identified as having low potential, either because historical ground disturbance was likely to have resulted in substantial damage to previous archaeological deposits, or because a greater distance from water indicated that these locations would have been less favoured for occupation. Research indicated that there are recorded Aboriginal archaeological sites within the study area, and that additional sites were also likely to be present. The main aims of the field investigation were to:

- Verify the results of the desktop review.
- Identify and record any extant Aboriginal objects or sites, potential deposits or landforms of archaeological interest present within the study area through visual observation.
- Identify evidence of previous and existing disturbance that may have resulted in partial or complete removal of Aboriginal objects that may have been present.
- Discuss and identify firsthand any cultural values of the study area with the Aboriginal stakeholders.

All field investigations were undertaken in accordance with Heritage NSW's *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (DECCW 2010). The survey was undertaken from 7-12 February 2019 by the following archaeological and RAP representatives:

Table 4. Representatives who participated in the survey.

Organisation	Representative(s)
Cubbitch Barta	Daniel Chalker
Darug Aboriginal Cultural Heritage Assessments	Gordon Morton
Darug Land Observations	Mark Newham
Tharawal Local Aboriginal Land Council	Kiah Ely
Tocomwall	John Phillips
Barking Owl Aboriginal Corporation	Jody Kulakowski
Extent Heritage	Dr Alan Williams Rebekah Hawkins Cameron Neal

The survey methodology involved the field team (archaeologists and RAP representatives) traversing those parts of the study area that were 1) accessible 2) proposed for future development 3) and/or which covered multiple landforms. Priority was given to areas predicted to have moderate and high archaeological sensitivity (e.g., landforms within close proximity to water sources appearing relatively undisturbed), registered AHIMS sites within the study area, and areas containing exposed soils. Any areas of good ground exposure were examined for archaeological evidence (such as stone artefact scatters or isolated finds), and areas containing old growth vegetation. Where identified, cuttings and soils in sections were also examined to document landscape configuration, soil profiles, soil disturbance, erosion and potential for subsurface archaeological deposits. During the survey, detailed field notes, GPS coordinates and photographs were taken to document landform units, soil profiles, ground surface visibility and vegetation types. Aboriginal sites, when located, were recorded in a notebook with coordinates and photographs taken. Where stone artefacts were present, measurements of length, width and thickness were taken, along with observations of the artefact morphology. Possible scarred trees were also assessed with measurements of tree circumference, scar height, scar width and scar height from ground.

With regard to the potentially culturally modified trees identified during the site investigations, an arboriculturist (Danny Draper, from Urban Tree Management) and Extent personnel re-inspected each tree in late April 2019. Detailed observations and measurements were undertaken to determine whether the modifications were of cultural origin, or whether the modifications may be more readily explained by natural processes.

6.3 Survey Results

The study area was divided into four survey units for the purposes of reporting, and are broadly defined by existing land use areas. Detailed descriptions of the survey units are included in **Table 5**, **Figure 21** and **Appendix D** and are summarised below. On commencement of the survey, it was found that ground surface visibility across the study area varied considerably. As a result, the following areas were targeted: locations with good ground surface visibility, previously recorded sites, outcropping sandstone, relatively undisturbed locations, and locations in proximity to water.

Overall the study area can be defined as a general ridge that encompasses the northern parts of the study area, before gently dropping down to the Georges River to the east, and Bunbury

Curran Creek to the south. Extensive views of the surrounding region were only evident, however from the edge of the ridge in the southwest corner of the site (encompassed by the Ajuga School). For the most part, the school properties encompassing much of the western central portion, represented gentle to moderate slopes that often exhibited a history of agricultural and pastoral activities. Soil profiles were generally shallow and frequently truncated to under-lying subsoils.

The eastern portion of the site was residentially developed, with generally modified green spaces intermittently distributed throughout. Similarly to the west, these areas generally exhibited often disturbed and truncated shallow duplex soils. The areas adjacent to Georges River and Bunbury Curran Creek generally appeared less disturbed, and in some cases were indicative of deep alluvial soils (commonly of archaeological interest). Visibility in these areas was poor, but revealed only limited evidence of any major disturbance. The environs around Bunbury Curran Creek proved more rugged, and there is high potential for rockshelter/overhang features along much of its length, however it is clearly prone to significant inundation, and which results in scouring of deposits along much of its reach that was observed. Overall, the investigations investigated ~480 ha of the study area, with an average effective coverage of ~19% (**Table 5**).

The first survey unit (Unit 1) encompassed the combined land of the four schools in the western portion of the study area. These schools include Hurlstone Agricultural High School (HAHS), Ajuga School, Glenfield Park School and Campbell House. Transects 1-7 were undertaken within this unit (Table 5). Unit 1 slopes gently down towards the east from a high crest in the west that affords considerable views over the surrounding area (**Plate 1**). The south-eastern portion of Unit 1 includes open depressions or creek flats associated with Bunbury Curran Creek. The area was extensively cleared for use as paddocks, dams, sporting fields and school facilities (**Plate 2** - **Plate 4**). Some areas of recent regrowth exist with several rows of planted trees (**Plate 5**), and there were few isolated mature trees (**Plate 6**). The paddocks were primarily of low to medium grasses with fences defining their boundaries, and were still in use as part of HAHS. Ground surface exposures within Unit 1, primarily along dirt tracks, dam embankments and where grass cover had been eroded, revealed a compact and heavily eroded soil profile, usually a thin organic unit (O horizon) onto subsoil (B2 horizon) (**Plate 7** - **Plate 8**). This eroded profile is characteristic of soils of the Blacktown and Luddenham soil landscapes, which are easily susceptible to erosion as a result of livestock grazing, and which leave an exposed clay subsoil. This has not completely removed the potential for cultural material that may have deflated onto the remaining surface, but it does suggest the potential for deeply buried or stratified soil profiles are unlikely to be present.

Unit 2 encompassed the riparian corridor associated with both the Georges River and Bunbury Curran Creek along the western and southern boundaries of the study area. Transects 8-13 were undertaken within this unit (**Table 5**). The riparian corridor of the Georges River was included in the Georges River Nature Reserve, which has been partly cleared, but was primarily dominated by dense remnant vegetation along the steep river banks (**Plate 9**). Extensive parts of the creeklines were observed, with only a small section of Bunbury Curran Creek encompassed within private property and inaccessible; areas in the vicinity of Canterbury Road were also not investigated due to the extensive ground cover making much of it inaccessible. Where investigated, the elevated ground running along Georges River (perhaps 5 m above the

water level) revealed several exposures of light brown fine sand (**Plate 10**). This appeared to be primarily an alluvial deposit, although parts of the sand unit were observed being wind-blown up to 100 m from the riverbank. Due to the proximity and visual similarities with the soil profile excavated by Extent (2018b) 700 m northeast along the Georges River at Moorebank Intermodal Terminal – and within which significant cultural material was found – this area was identified as a PAD. Disturbance within Unit 2 was evident, with several dilapidated structures and old fence lines reflecting the previous agricultural use of the creek flats adjacent to Georges River (**Plate 11**). Cambridge Avenue previously ran through the northern section of this Unit before its realignment after 1970 CE, and the road is still evident today (**Plate 12**). While extensive clearing has occurred, a number of trees have been identified as possibly remnant in the western half of Unit 2 north of Belmont road; and within which occasional scarring was observed. The riparian corridor associated with Bunbury Creek, while more vegetated, was more accessible due to increasingly steep creek banks. The creek cuts through sandstone bedrock, with a number of overhangs noted (**Plate 13**). However, inundation of these features, and scouring of any deposits (at least those that were observed), suggest the survival of cultural materials in several parts of the creek would be unlikely. The creek has been channelised to the west of Canterbury Road, with the construction of a canal now following the southern boundary of the study area (**Plate 14**). This area shows significant earthworks and modifications to the surrounding region, and is unlikely the current creek edges reflect their natural alignment or form. Some vegetation associated with the original route of Bunbury Curran creek remains south of Seddon Park and east of the Glenfield Dog Park (**Plate 15**).

Survey unit 3 was characterised by the residential area to the east of Railway Parade, bounded to the east and south by the riparian corridor. The unit was characterised by dense residential housing in private ownership, with occasional public reserves and parks spread throughout the suburb. Several parks (Seddon Park, Glenfield Park, Blinman Oval, Childs Reserve and Trobriand Park) within this unit were surveyed (transects 14-16) and found to be mostly cleared and heavily modified, with few remnant mature trees (**Plate 16** - **Plate 20**). Levelling and removal of the upper soil profile was evident at Seddon Park and Blinman Oval to produce the sporting fields, as well as a range of under-ground services (e.g., irrigation). Exposed sections along the oval provided excellent coverage for several locales, with no cultural material observed; further, they suggest a very shallow duplex soil characterised these areas, and was frequently truncated (**Plate 21** - **Plate 22**).

Unit 4 encompassed the residential area in the north-western section of the study area (south of Glenfield Road and north of the electricity easement). This area has been recently developed, and even the vegetated areas appear to have been subject to modification (potentially entirely introduced through the residential works) (transect 17). Assessment of this unit was only possible in vegetated areas along drainage lines, where it was apparent that no remnant vegetation remained (**Plate 23** - **Plate 24**). Furthermore, the ground on which the regrowth was located was mixed (clay and soil), indicating major disturbance to the entire area due to residential development.

Some portions of the study area were inaccessible due to dense vegetation; or were not accessed because they formed private and/or restricted land and permission from landowners and public/government agencies to access these lots had not been obtained. Those parts of the study area that were not surveyed included:

- The electrical transmission line to the south of residential properties in Unit 4 and north of the school facilities in Unit 1. Permission to inspect the easement was not obtained for this assessment; however, the area is not likely to be the subject of future development under the current ILP, unless the extension of Cambridge Avenue is implemented. Visual inspection of the transmission line from outside of the fence-line reveals this area to be mostly cleared open land, with few remaining trees and no major development. A reported scarred tree was not observed as part of this inspection.

- The SWRL corridor along the south western boundary of the study area, to the south of the school facilities in Unit 1, and within the central portion of the study area. Access to this area was via a single access road between Quarter Sessions Road and the Hume Highway, which is gated at Beech Road. Permission to inspect the SWRL corridor was not obtained for this assessment; and the southernmost area (former SWRL construction compound) is proposed for residential development as part of the current ILP. Visual inspection of the corridor from Unit 1 suggests this area is predominantly cleared open paddock, the north eastern corner of which has been extensively disturbed by construction of the South West Rail Link/Glenfield to Leppington Rail line project. The three registered AHIMS sites within the study area are located within this survey unit, though at least one (#45-5-4253), and possibly the other two (#45-5-2744 and #45-5-2495) of these sites have since been impacted and assigned an AHIMS site status of “destroyed” due to these works and the re-channelling of Bunbury Curran Creek. They are all identified by other consultants as of low significance. Some remnant vegetation remains in the eastern corner associated with the original channel of Bunbury Curran Creek, and is considered sensitive.

Overall, very little mature native vegetation remains within the study area, with the majority existing along the banks of the Georges River and Bunbury Curran Creek (Unit 2), and in isolated stands within the school grounds (Unit 1). Furthermore, ground surface visibility was overall generally low, being limited to unsurfaced vehicle, dam walls and cutting exposures. All Aboriginal stone artefacts were identified within these areas of exposure.

Table 5. Summary of survey units with corresponding transects investigated as part of the field investigation.

Unit	Location	Unit area (m^2)	Transect	Landform unit description	Transect Area (m^2)	Visibility (%)	Exposure (%)	Effective Coverage Area (m^2)	Effective Coverage (%)
1	School buildings, agricultural facilities, cleared paddocks and dams associated with Hurlstone Agricultural High School, Ajuga School, Glenfield Park School and Campbell House School.	1,316,000	1	Mid slope, flat. Characterised by sporting fields and open paddocks.	121,300	40	30	14,556	12
			2	Mid slope, flat. Characterised by sporting fields and open paddocks.	80,310	40	30	9,637.20	12
			3	Ridgeline, mid slope, flat. Ridgeline south of Roy Watts Rd characterised by rows of planted trees, with open paddocks and dam along mid slope and flat.	111,800	20	30	6,708	6
			4	Ridgeline, mid slope, creek flat. Ridgeline north of Roy Watts Rd characterised by agricultural buildings and open paddocks with dam and modified drainage line.	70,806	40	30	8,496.7	12
			5	Ridgeline. School buildings, recreational facilities and landscaped areas associated with Ajuga School, Campbell House and Glenfield Park School.	70,568	30	80	16,936.3	24
			6	Ridgeline, mid slope, creek flats. Open cleared paddocks, dams and agricultural buildings east of Quarter Sessions Road.	359,100	20	70	50,274	14
			7	Ridgeline, mid slope. Open cleared paddocks, dams and agricultural buildings north of Roy Watts Road and south of transmission easement.	151,800	30	50	22,770	15
2	Riparian corridor to the west of the Georges River, includes Georges River nature reserve and banks	608,100	8	Georges River and Bunbury Curran Creek flat and gorges. Nature reserve and open parklands south of Belmont Road.	147,600	30	50	22,140	15
			9	Georges River flat and gorge. Nature reserve and open parklands.	190,900	30	80	45,816	24

Unit	Location	Unit area (m^2)	Transect	Landform unit description	Transect Area (m^2)	Visibility (%)	Exposure (%)	Effective Coverage Area (m^2)	Effective Coverage (%)
	of Bunbury Curran Creek.		10	Lower slope, creek flats and creek gorge. Lower slopes and creek flats south of Loftus Street and adjacent to Bunbury Curran Creek, with sandstone overhangs.	60,510	50	80	24,204	40
			11	Creek flats and creek bank. Located around Canterbury road bridge over Bunbury Curran Creek.	30,120	20	50	3,012	10
			12	Creek flats and landscaped area within Seddon Park.	108,900	40	80	34,848	32
			13	Creek flats. South of Aseki Avenue and north of re-aligned Bunbury Curran Creek.	20,190	30	50	3,028.5	15
3	Eastern residential area located between Railway Parade and riparian corridor.	2,036,000	14	Mid and lower slopes. Glenfield Park, comprising cleared land.	51,620	30	80	12,384.5	24
			15	Mid-slope. Childs Reserve, comprising cleared land.	19,740	30	80	4,737.6	24
			16	Mid and lower slopes and creek flats. Blinman Oval and Trobriand Park, comprising sports fields and cleared parkland.	71,460	30	80	17,150.4	24
4	Northern residential area located between Glenfield Road and Roy Watt's Road in the western portion of the study area.	867,200	17	Upper, mid and lower slopes. Bound to north by Atlantic Boulevard and to south by transmission line.	155,400	20	80	24,864	16
Average		*1,206,825*			*104,170*	*31*	*61*	*18,915*	*19*
Total		**4,827,300**			**1,666,724**			**321,563**	

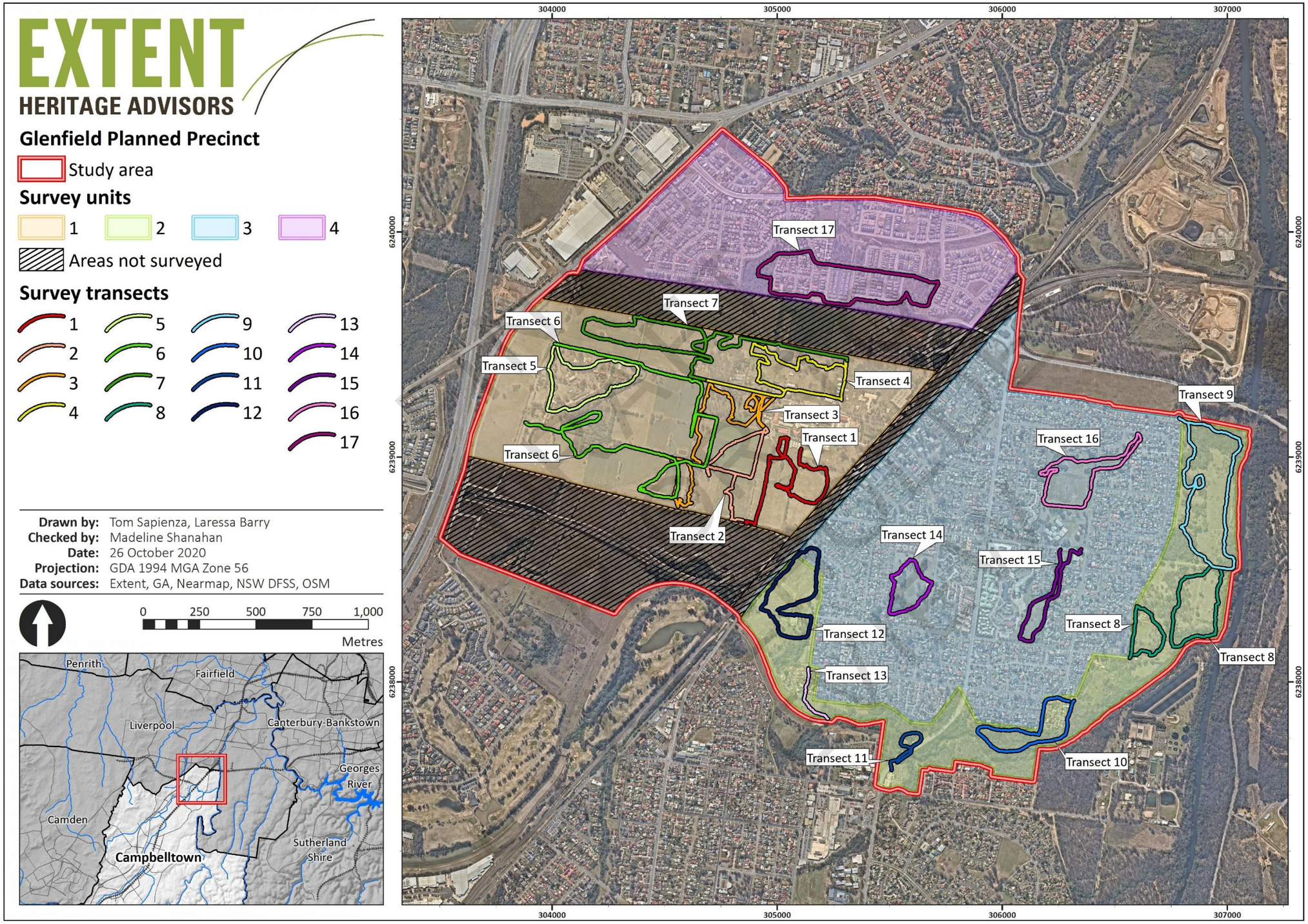


Figure 21. Survey units, transects of surveys, and areas not surveyed.

Plate 1. Expansive views towards the south-east from crest, Unit 1.

Plate 2. Example of school facilities - Glenfield Park School, view to the west.

Plate 3. Example of dams associated with agricultural use of the school properties. View to the northwest.

Plate 4. Cleared paddocks within school boundaries associated with agricultural use. View to the south.

Plate 5. Example of rows of planted trees within Glenfield Park School. View south-west.

Plate 6. Example of remnant mature trees within Unit 1. View to the north.

Plate 7. Exposures along dirt track between paddocks. View to the west.

Plate 8. Exposures along cutting for cricket pitch. View to the south-east.

Plate 9. Dense vegetation along Georges River steep bank. View to the east.

Plate 10. Exposure showing fine sand deposit adjacent to Georges River. View to the north.

Plate 11. Dilapidated buildings associated with previous agricultural use of the land within Unit 2. View to the south.

Plate 12. Previous route of Cambridge Avenue through northern section of Unit 2. View to the west.

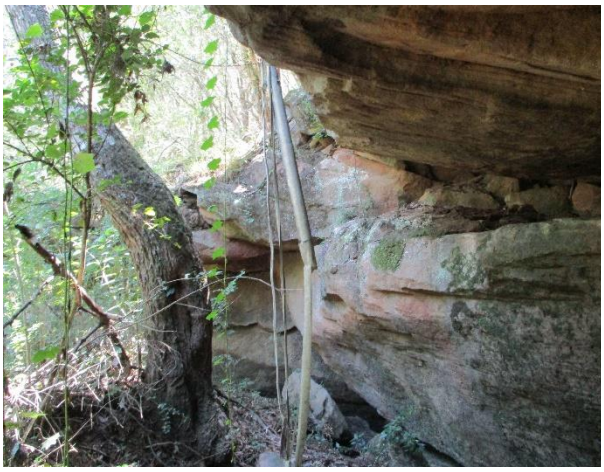


Plate 13. Example of sandstone overhangs along Bunbury Curran Creek. View to the west.

Plate 14. Re-channelling of Bunbury Curran Creek south of Seddon Park. View to the south.

Plate 15. Remnant vegetation associated with Bunbury Curran Creek. View to the east.

Plate 16. View of Seddon Park facing south-west.

Plate 17. Glenfield Park, view to the west.

Plate 18. Childs Reserve, view to the south.

Plate 19. Blinman Oval, view to the north-east.

Plate 20. Trobriand Reserve, view to the north.

Plate 21. Exposure due to cutting and levelling at the eastern edge of Seddon Park, view to the south.

Plate 22. Exposure due to cutting and levelling at the western edge of Blinman Oval, view to the north-west.

Plate 23. Regrowth area adjacent to Hillsborough Crescent. View to the south.

Plate 24. Drainage line through the southern part of Unit 4. View facing east.

6.4 Aboriginal Sites Identified

In conjunction with the results of the desktop research, the survey resulted in the identification of ten Aboriginal archaeological sites: three previously identified Aboriginal archaeological sites and seven newly identified sites (**Table 15** and **Figure 22**). Seven of the 10 sites are artefact sites (artefact scatters #45-5-2495 and #45-5-4253, and isolated finds #45-5-2744, 'GPP IF1', 'GPP IF4', 'GPP IF6' and 'GPP IF7'), one is a culturally modified tree ('GPP MT2'), one is an unmodified tree of cultural value ('GPP MT5'), and one is a potential archaeological deposit ('GPP PAD10').

Three potentially culturally modified trees were originally documented during fieldwork ('GPP MT3', 'GPP MT8', 'GPP MT9'), and details for these trees are included in the following sections. However, subsequent investigations by an arboriculturist suggests that they are unlikely to be of cultural original (**Appendix E**). Furthermore, another tree was investigated (identified here as GPP MT 11) during this validation phase which was not inspected in the original survey. This tree was also found to have a wound caused by natural processes (longicorn borers).

Due to access restrictions, the three previously registered artefact sites (#45-5-2495, #45-5-2744 and #45-5-4253) could not be inspected during field survey. All three are within the SWRL rail corridor footprint in the south-west section of the study area and are likely to have been partially or completely impacted during archaeological test excavation or during construction of the SWRL. Regardless, all have been documented and assessed by other consultants.

Of the ten sites, two are located on mid slope landform contexts, four are located on lower slopes and two are located on creek landform contexts. Most sites are small artefact scatters and isolated finds found in areas of ground surface exposure, with one area along the Georges River terrace believed to contain significant deposits of sandy alluvium, and which may contain Aboriginal cultural material of a considerable density, scale and antiquity. The remaining sites are modified or culturally identified trees spread in a seemingly random distribution across the landscape, but constrained to areas with old-growth vegetation.

Descriptions of the newly identified sites are provided below.

6.4.1 Newly Identified Sites

GPP IF1

Site feature: Artefact (isolated find)

Coordinates (GDA94/MGA Zone 56): 304959 mE, 6238965 mN

Location: Hurlstone Agricultural High School, Glenfield NSW (Lot 21 DP1035516)

Description: GPP IF1 was identified on an area of exposed ground along the fence line of a cattle grazing paddock, ~130 m south of Dairy Lane and ~295 m south of Roy Watts Road, within Unit 1, Transect 1. The site was situated on a gentle slope partway between the school and the open depression to the south. It was found on the surface on an alignment of well-established but non-remnant red gums (**Plate 25**). It comprised a single coarse grey-red silcrete flake (**Plate 26**), measuring 30 mm (L) x 20 mm (W) x 10 mm (T) (**Table 6**). The site is within a disturbed context and the artefact was considered unlikely to be *in situ*.

Table 6. GPP IF1 stone artefact attributes.

Artefact ID	Material	Artefact Type	Colour	Length (mm)	Width (mm)	Thickness (mm)
1	Silcrete	Flake	Grey-red	30	20	10

Plate 25. Location of isolated find 'GPP IF1' in cattle track exposure along fence line, Unit 1, Transect 1. View to the northwest.

Plate 26. Detail of isolated find silcrete flake, 'GPP IF1'.

GPP MT2

Site feature: Culturally modified tree

Coordinates (GDA94/MGA Zone 56): 304795 mE, 6238771 mN

Location: Hurlstone Agricultural High School, Glenfield NSW

Description: GPP MT2 comprised a culturally modified tree possessing two scars, located in an open paddock in the southern ground of Hurlstone Agricultural High School. The site was close to the fenceline bordering the rail corridor (**Plate 27**). It was identified in Unit 1, Transect 1. The tree, a *Eucalyptus moluccana,* was shown in aerial photography to date to at least the early 20th Century. The tree, stands ~10 m high with a circumference of ~4 m. Both scars on the tree were ovoid in shape. The first potential scar continues to base of tree on the southern side, and is close to 1 m long (**Plate 28**). On the northern side, a much smaller scar was situated ~800 mm from the base. Neither exhibited any cut marks, or other evidence of human modification, and both were considered to likely be of natural origin, however further assessment was recommended.

The larger south-facing scar was identified as being of cultural origin upon re-inspection by an arboriculturist (**Appendix E**). This conclusion was reached on the basis of the tree's approximate age (~250-300 years), the approximate age of the wound itself (~150-200 years) and the lack of any other likely causes. The smaller north-facing scar was determined to be caused by other factors (boring insects, mechanical abrasion).

Table 7. GPP MT2 attributes

	Scar #1	Scar #2
Species	*Eucalyptus moluccana*	
Age of tree (years)	250-300	
Tree circumference (m)	4	
Length of scar (mm)	1050	300
Shape of scar	Ovoid	Ovoid
Height from ground (mm)	0	800
Scar orientation	South	North
Wound origin	Cultural: Aboriginal cultural activity	Non-cultural: Longicorn borers or mechanical abrasion

Plate 27. Location of ‘GPP MT2’ within Hurlstone Agricultural School, Unit 1, Transect 1. View to the west.

Plate 28. Detail of ovoid scar at base of tree, ‘GPP MT2’.

GPP MT3

Site feature: *Not a site*

Coordinates (GDA94/MGA Zone 56): 304690 mE, 6238929 mN

Location: Hurlstone Agricultural High School, Glenfield NSW

Description: GPP MT3 was originally recorded as a potential culturally modified tree located within the western portion of HAHS' grounds, ~100 m to the east of the fence line abutting Lot 1 DP175963, within Unit 1, Transect 1 (**Plate 29**). The site was immediately north of the large dam on the property, and south of the boarding school structures. The tree was dead, and made the species indeterminate. It was ~5 m high, and 2.5 m in circumference. A potential scar extending from the base to ~1.4 m in height was located on the southern side of the trunk (**Plate 30**). The scar did not exhibit any cut marks, or other evidence of human modification, and was considered more likely of natural origin, however further assessment was recommended.

Upon further inspection, during which time a second scar was identified, an arboriculturist concluded that both scars were likely of non-cultural origin. This conclusion was reached on the basis of predation by longicorn borers as the cause, the recent death of the tree (<15 years), and the fact that scarring occurred as the tree declined in health.

Table 8. GPP MT3 attributes

	Scar #1
Species	*Corymbia maculata*
Age of tree (years)	120-150
Tree circumference (m)	2.5
Length of scar (mm)	1400
Shape of scar	Ovoid
Height from ground (mm)	0
Scar orientation	South
Wound origin	Non-cultural: Longicorn borers

Plate 29. Location of 'GPP MT3' within Hurlstone Agricultural High School, Unit 1, view to the southwest.

Plate 30. Detail of ovoid scar at base of tree, 'GPP MT3'.

GPP IF4

Site feature: Artefact (isolated find)

Coordinates (GDA94/MGA Zone 56): 304888 mE, 6239195 mN

Location: Hurlstone Agricultural School, Glenfield NSW

Description: 'GPP IF4' was located within an active market garden west of Dairy Lane and directly south of Roy Watts Road, within Unit 1 and Transect 2 (**Plate 31**). It comprised a single quartzite flake, observed on the ground surface on a ploughed soil profile (**Table 9** and **Plate 32**). It is considered that the artefact was likely situated within the soil profile in this general location, however extensive survey of the remaining market gardens (with excellent visibility) identified no further cultural material.

Table 9. GPP IF4 stone artefact attributes.

Artefact ID	Material	Artefact Type	Colour	Length (mm)	Width (mm)	Thickness (mm)
1	Quartzite	Flake	Grey	45	25	15

Plate 31. ‘GPP IF4’ located within former market garden west of Dairy Lane, view to the north.

Plate 32. Detail quartzite flake ‘GPP IF4’.

GPP MT5

Site feature: Tree of cultural value

Coordinates (GDA94/MGA Zone 56): 304913 mE, 6239395 mN

Location: Hurlstone Agricultural School, Glenfield NSW

Description: A living *Eucalyptus microcarpa* ~20 m high and with a 3 m circumference, situated north of Roy Watts Road, and at the northeast corner of a gas bottle depot (**Plate 33**). The tree exhibited no evidence of cultural modification, but CBNTAC representative indicated that shape of the tree and number of major branches extending from the trunk suggested a cultural importance. As such the tree was identified at their request.

Upon further re-inspection with an arboriculturist, identified no evidence of cultural modification, but suggested the general lower shape and crown of the tree may reflect branch thinning known to occur in agricultural/horticultural practises to cultivate under-lying pasture.

However, based on the identification by the CBNTAC representative, we consider GPP MT5 to possess contemporary cultural significance.

Plate 33. GPP MT5, a remnant grey box identified as of cultural importance. View to the southeast.

GPP IF6

Site feature: Artefact (isolated find)

Coordinates (GDA94/MGA Zone 56): 305302 mE, 6239423 mN

Location: Hurlstone Agricultural High School, Glenfield NSW

Description: This site consisted of a broken quartz cobble situated on an access track connecting to Roy Watts Road in the northeast corner of HAHS (**Plate 34** and **Plate 35**). The artefact was adjacent a gate post in the vicinity of a water storage tank. The isolated object appeared to be a split cobble, with dorsal scarring from a cortex/natural platform on one side. It may have been artificially formed through repeated use of the track in the past. Investigations of the track (which had excellent visibility) in the vicinity of the artefact identified no further cultural material. Recorded as a precautionary principle, and at the request of the Aboriginal participants.

Table 10. GPP IF6 stone artefact attributes.

Artefact ID	Material	Artefact Type	Colour	Length (mm)	Width (mm)	Thickness (mm)
1	Quartz	Split Pebble	White	35	35	30

Plate 34. GPP IF6 found on an access track (shown by the clipboard in centre of shot). View to the south.

Plate 35. GPP IF6, a quartz split cobble with dorsal scarring evident on the worked face (to the right of this photograph).

GPP IF7

Site feature: Artefact (isolated find)

Coordinates (GDA94/MGA Zone 56): 304409 mE, 6238857 mN

Location: south-western internal corner of the embankment for the largest dam within Unit 1 in transect 6.

Description: 'GPP IF7' comprised an isolated stone artefact situated on the southern embankment of a dam, within the grounds of HAHS. It comprised a single red/yellow silcrete flake measuring 40x25x15 mm (**Table 11** and **Plate 36**). The artefact was identified on ground that has been significantly disturbed due to the construction of the dam with sediment removed from the dam area and pushed to the edges to form the embankment (**Plate 37**). Despite good visibility, investigations of the area recovered no further cultural material; the potential for sub-surface deposits was considered low.

Table 11. GPP IF7 stone artefact attributes.

Artefact ID	Material	Artefact Type	Colour	Length (mm)	Width (mm)	Thickness (mm)
1	Silcrete	Flake	Red/yellow	40	25	15

Plate 36. Isolated fine, silcrete complete flake, site 'GPP IF7'.

Plate 37. Location shot for site 'GPP IF7'. Internal section of dam embankment, view east.

GPP MT8

Site feature: *Not a site*

Coordinates (GDA94/MGA Zone 56): 304835 mE, 6239499 mN

Location: In remnant vegetation between North Lane and Roy Watts Road, Unit 1 Transect 7

Description: GPP MT8 was originally identified as a potential culturally modified tree located within remnant vegetation between North Lane and Roy Watts Road, Unit 1 Transect 7 (**Plate 38**). The tree was a *Eucalyptus tereticornis,* and was ~20 m high, with a circumference of ~2.5m. The scar situated on the northeast side of the tree, was an ovoid shape, measuring 1300 mm (L) x 200 mm (W) (**Plate 39**). The scar did not exhibit any cut marks, or other evidence of human modification, and further assessment was recommended.

This site was re-inspected by an arboriculturist and suggested that the scar was unlikely to be of cultural origin. This conclusion was reached on the basis of the recent date of the scar (~25-40 years), as well as predation by longicorn borers as the probable cause.

Table 12. GPP MT8 attributes

	Scar #1
Species	*Eucalyptus tereticornis*
Age of tree (years)	120-150
Tree circumference (m)	2.6
Length of scar (mm)	1300
Shape of scar	Elongated ovoid
Height from ground (mm)	100
Scar orientation	North-east
Wound origin	Non-cultural: Longicorn borers

Plate 38. Location shot for site 'GPP MT8'. Amongst remnant vegetation north of Roy Watts Road, view south.

Plate 39. Detail 'GPP MT8' with large ovoid scar at base of tree.

GPP MT9

Site feature: *Not a site*

Coordinates (GDA94/MGA Zone 56): 306862 mE, 6238881 mN

Location: In remnant vegetation within the Georges River Nature Reserve to the west of the Georges river in Survey unit 2, Transect 9.

Description: GPP MT9 was originally documented as a potential culturally modified tree located within remnant vegetation to the west of the Georges river, within the Georges River Nature Reserve (**Plate 40**). The site was in close proximity to a range of former structures, and may reflect European modification. The tree was a living *Eucalyptus moluccana*, some 10m in height and with a circumference of ~2.2 m. The scar was west facing, and was an elongate ovoid in shape, measuring 1310 mm (L) x 200 mm (W) (**Plate 41**). The scar did not exhibit any cut marks or other evidence of human modification, and further assessment was recommended.

This site was re-inspected by an arboriculturist and suggested that the scar was unlikely to be of cultural origin. This conclusion was reached on the basis of the recent date of the scar (~25-40 years), as well as mechanical abrasion as the probable cause.

Table 13. GPP MT9 attributes

	Scar #1
Species	*Eucalyptus moluccana*
Age of tree (years)	30-50
Tree circumference (m)	2.2
Length of scar (mm)	1100
Shape of scar	Elongated ovoid
Height from ground (mm)	200
Scar orientation	South-west
Wound origin	Non-cultural: Mechanical abrasion event

Plate 40. General location of 'GPP MT10', within Georges River Nature Reserve, view to the east.

Plate 41. Detail ovoid scar near base of tree 'GPP MT10'.

GPP PAD10

Site feature: Potential Archaeological Deposit (PAD)

Coordinates (GDA94/MGA Zone 56): 306964 mE, 6238822 mN

Location: Within the Georges River Nature Reserve to the west of the Georges river and north of Belmont Road in Unit 2, Transect 9.

Description: 'GPP PAD10' was a potential archaeological deposit on an alluvial terrace next to the Georges River, measuring approximately 600 m long (north-south) and 160 m wide (east-west) (**Plate 42**). The PAD was characterised on the surface by patches of fine brown sand (**Plate 43**), which has the potential to represent a deep alluvial soil profile. Similar findings were made by Extent (2018b) 700 m north at the Moorebank Intermodal Terminal, and here the PAD ultimately proved to be an ~800 mm deep sand unit encompassing some 60,000 years of formation on the ridge overlooking the river. In this case, the deposit appears to be constrained close to the river, with duplex soil profiles evident ~50-75 m from the river. In several areas these duplex soils were partially buried by a thin unit of the sand, being subject to aeolian reworking. Dense grass cover limited ground surface visibility of the PAD, and it could not be definitively identified to the south of Belmont Road, although the area has been identified based on being part of the same landform.

Plate 42. Potential Archaeological Deposit on alluvial terrace next to Georges River (immediately right/east of this photograph) view north.

Plate 43. Detail of alluvial sands visible in exposures within Georges River Nature Reserve.

GPP MT11

Site feature: *Not a site*

Coordinates (GDA94/MGA Zone 56): 304894 mE, 6239644 mN

Location: Transmission line easement paddock to the north of Roy Watts Road in a portion of the study area not previously subject to survey (between Units 1 and 4)

Description: GPP MT11 was a tree with a potential scar investigated as part of the arboriculturist assessment of the previously identified trees (Appendix E). It was not identified in the original survey, but was observed during a second visit to inspect GPP MT 9. The tree was a mature *Eucalyptus tereticornis,* approximately 18 m in height and 2.4 m in circumference. It possessed an east-facing, asymmetrical oval-shaped scar measuring 1070 mm (L) x 550 mm (W) at widest (**Appendix E**).

This site was re-inspected by an arboriculturist, who stated that the scar was unlikely to be of cultural origin. This conclusion was reached on the basis of the recent date of the scar (~25-40 years), as well as longicorn borers as the probable cause.

Table 14. GPP MT11 attributes.

	Scar #1
Species	*Eucalyptus tereticornis*
Age of tree (years)	75-100
Tree circumference (m)	1.4
Length of scar (mm)	1285
Shape of scar	Elongated ovoid
Height from ground (mm)	200
Scar orientation	East
Wound origin	Non-cultural: Longicorn borers

Table 15. Aboriginal sites identified within the study area. All coordinates are given in GDA 1994/MGA Zone 56. Site locations are shown in **Figure 22**.

Unit	Site Name	Landform Context	Co-ordinates (GDA 1994)	Site Type/ Features	Description
1	GPP IF1	Lower slope	304959 E 6238965 N	Artefact	One coarse grey silcrete flake (30x20x10 mm) identified on an area of exposed ground located on the fence line of a cattle grazing paddock in Hurlstone Agricultural High School's. Artefact is present near a row of well established but recently planted red gums.
1	GPP MT2	Creek flat	304795 E 6238771 N	Culturally modified tree	Possible scarred tree (grey box) located within the grounds of Hurlstone Agricultural High School, close to the fence line bordering the rail corridor (Transect 6). Two potential scars observed, the first 1050 mm long, 300 mm wide and continues to base of tree, the second 300 mm long, 50 mm wide and 800 mm from the ground. This second scar is unlikely to be a result of cultural modification. Tree stands ~10 m high with a circumference of ~4 m. Larger, south-facing scar found to be of Aboriginal cultural origin upon re-inspection
1	GPP MT3	Lower slope	304690 E 6238929 N	Not a site	Possible scarred tree located within the western portion of Hurlstone Agricultural High School, close to western border shared with other schools situated within study area. Tree has been dead for some time and as such species was indeterminate. Potential scar is 1400 mm long, 400 mm wide and continues to the base of tree. Tree is ~5 m high with a circumference of ~2.5 m. Scar found to be caused by longicorn borers upon re-inspection.
1	GPP IF4	Mid slope	304888 E 6239195 N	Artefact	One isolated quartzite flake (450x250x150 mm) identified in market garden west of Dairy Lane. Given the artefact's location it has likely been disturbed over time and is unlikely to be situated within its original context.
1	GPP MT5	Mid slope	304913 E 6239395 N	Cultural tree	Potential culturally modified tree located in Hurlstone Agricultural High School paddock north of Roy Watts Road. Tree was identified by RAP representative Daniel Chalker (Cubbitch Barta) as possessing cultural significance, although no clear evidence of scarring is present. No evidence of cultural modification could be determined upon re-inspection, although we still consider it to be of contemporary cultural significance.
1	GPP IF6	Lower slope	305302 E 6239423 N	Artefact	One broken quartz pebble core (30x25x75 mm) located on access track north of Roy Watts Road. Given the artefact's location it has likely been disturbed over time and is unlikely to be situated within its original context.
1	GPP IF7	Lower slope	304409 E 6239857 N	Artefact	Complete red/yellow silcrete flake with crushed platform (40x25x15 mm). Identified on the southern dam embankment inside of the south-west corner. Context indicates disturbance and movement from original location of deposition.

Unit	Site Name	Landform Context	Co-ordinates (GDA 1994)	Site Type/ Features	Description
1	GPP MT8	Lower slope	304835 E 6239499 N	Not a site	Possible scarred tree located to the north of Roy Watts road within an area of remnant vegetation. Scar height is 1300 mm, width 200 mm, height from floor 100 mm, tree circumference 2.60 m. Scar found to be caused by longicorn borers upon re-inspection.
2	GPP MT9	Creek flats	306862 E 6238881 N	Not a site	Possible scarred tree within remnant vegetation to the west of the Georges river. Scar height is 1100 mm, width 200 mm, height from floor 200 mm, tree circumference 2.2 m. Scar found to be caused by longicorn borers upon re-inspection.
2	GPP PAD10	Creek flats	306964 E 6238822 N	PAD	Potential archaeological deposit (PAD) on an alluvial terrace next to the Georges River, measuring approximately 600 m long (north-south) and 160 m wide (east-west). The PAD is characterised by patches of fine sand mixed with duplex soils and displays similarities to the deposit investigated by Extent (2018) 700m north at Moorebank Intermodal. Results from these excavations of the alluvial deposit revealed two distinct phases of transient occupation during the last 22,000 years. Dense grass cover limited ground surface visibility of the PAD further south of Belmont Road, in Transect 8, however the landform characteristics are identical and the PAD likely extends further south along the riverbank.
N/A	GPP MT11	Mid slope	304894 E 6239644 N	Not a site	Possible scarred tree within transmission easement paddock north of Roy Watts Road. This area was not subject to inspection during original survey, but was re-investigated by Extent Heritage and Urban Tree Management Australia (UTMA). Scar height is 1285 mm, width 200 mm, height from floor 40 mm, tree circumference 1.4 m. Scar found to be caused by longicorn borers.
N/A	MFH#2 (#45-5-2495)	Creek flat	304405 E 6238490 N	Artefact	Artefact scatter comprising three red silcrete flaked pieces, one yellow silcrete multiplatform core and one grey chert flake (Dallas, 1989). The five artefacts were identified over an area of 100x200 m on the southern bank of Bunbury Curran Creek. Subsequent test excavations by Dallas (2000) confirmed the presence of a low-density background scatter with low archaeological significance. This site could not be inspected and is likely to have been impacted by test excavation and SWRL construction.
N/A	MLE1 (#45-5-2744)	Crest	303605 E 6238740 N	Artefact	One grey/yellow chert broken flake (20x15x10 mm) located on the surface of a grader track on a spur. ~500-700 m from Bunbury Curran Creek. The site could not be inspected and is likely to have been impacted by SWRL construction.
N/A	SWRL Site 15/AAS1 (#45-5-4253)	Crest	303584 E 6238681 N	Artefact	Artefact scatter identified during archaeological test excavation, where 33 artefacts were recovered from 13 m^2. This site could not be inspected and is likely to have been impacted by test excavation and SWRL construction.

EXTENT
HERITAGE ADVISORS

Glenfield Planned Precinct

Study area

Aboriginal Sites

Site Features

- Artefact
- Culturally Modified Tree
- Unmodified Tree of Cultural Value
- Potential Archaeological Deposit
- *Not a site*
- PAD extent

Drawn by: Tom Sapienza
Checked by: Madeline Shanahan
Date: 26 October 2020
Projection: GDA 1994 MGA Zone 56
Data sources: Extent, GA, Nearmap, NSW DFSS, OSM

0 250 500 750 1,000
Metres

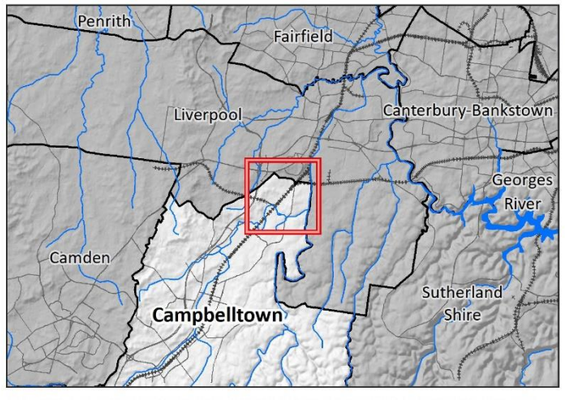


Figure 22. Identified Aboriginal sites within the study area.

7. The Archaeological and Cultural Resource

This section provides a summary of the background research, field investigation and archaeological model of the study area. These conclusions will be used in subsequent sections to determine archaeological and cultural significance, identify potential impacts, and propose strategies to manage and mitigate impacts to Aboriginal cultural deposits prior to and during development.

7.1 Identified Archaeological Sites

The documentary research and archaeological survey resulted in the identification of 10 Aboriginal archaeological and cultural sites within the study area. This included seven artefact sites (artefact scatters #45-5-2495 and #45-5-4253, and isolated finds #45-5-2744, 'GPP IF1', 'GPP IF4', 'GPP IF6' and 'GPP IF7'), one culturally modified trees ('GPP MT2'), one unmodified tree of cultural value ('GPP MT5'), and one potential archaeological deposit (PAD) ('GPP PAD10'). Four trees with modifications were observed ('GPP MT3', 'GPP MT8', 'GPP MT9', 'GPP MT11'), but were ultimately discounted by an arboriculturist investigation (**Appendix E**).

Three of these sites (#45-5-2495, #45-5-2744 and #45-5-4253) were not inspected during the field survey, but are likely to have been partially or completely impacted by archaeological test excavation and the construction of the SWRL. Further, they have been previously documented and assessed by other consultants. However, there has been no systematic investigation to determine whether these sites extend beyond of the footprint of the SWRL corridor.

A further Aboriginal site, comprising a culturally modified (scarred) tree was identified by the Aboriginal community through the consultation process (see **Section 2.3**). However, the site is presently not registered on the AHIMS database, and its current location, condition and significance are poorly understood. The information provided by the CBNTC representative suggests that it is the stump of an Aboriginal scarred tree and is located within the electrical transmission line easement along the HAHS boundary. However, transects running the full length of the transmission line (albeit not within it) failed to identify such a feature. Regardless, it is understood that the transmission corridor is not proposed for development as part of this work.

Of the identified sites, the predominant site features were Aboriginal flaked stone artefact scatters and isolated finds on the ground surface, as well as occasional culturally modified trees. The surface artefact sites have, in general, been identified in locations that have been subject to substantial ground disturbance, either from residential development, agricultural use and road and/or rail infrastructure. That is, the identification of the sites is likely to be largely due to the presence of good ground visibility in these areas of exposure. It is therefore possible that the identified surface sites are not the result of focussed or repeated occupation, but are simply visible surface expressions of a widespread low-density artefact distribution known to be present across most of the Cumberland Plain. Further, the dominance of isolated finds in the record is a general indication of the broader background scatter of stone artefacts across the Cumberland Plain, and provides no indication of where foci of past activity may have occurred. Those artefact

scatters that were documented reflect very low densities of Aboriginal objects when compared with known nodes of past occupation. As such, key areas of past archaeological activity are more likely to be present within areas determined as of high or very high archaeological potential.

7.2 Areas of Archaeological Potential

In addition to the discrete sites identified, regional archaeological models identify that cultural materials are prevalent near the major river systems, and in areas of sandstone outcrop where suitable surfaces for engraving and art, and overhangs for shelter can be identified. The Glenfield Planned Precinct is bordered by two major watercourses – to the east by Georges River and to the south by Bunbury Curran Creek – and as such the banks of these watercourses are considered to have high archaeological potential.

The field survey suggests that parts of Bunbury Curran Creek are less likely to fit this model, since it is composed of rugged sandstone country that is clearly inundated during heavy rains. Conversely, the steep edges of Georges River initially believed to be less likely to be suitable for past occupation proved similar to nearby environments where cultural deposits of deep antiquity and high significance have been recovered. Specifically, excavations at the Moorebank Intermodal Terminal, on the edge of the Georges River, revealed a dense and diverse artefactual assemblage indicative of extensive, prolonged and/or repeated use of the river's edge in two distinct phases, likely over the last 22,000 years (Extent Heritage 2018b). The field investigations undertaken as part of this assessment identified similar areas of archaeological interest to the west of Georges River, with a vast area of elevated levee highlighted as a PAD ('GPP PAD10'), and much of the creek's edge considered to have been subject to low disturbance (**Figure 23**).

In addition, the documentary evidence indicates continued Aboriginal occupation of land within the Throsby estate in the early colonial period. This estate extended into the western portion of the study area, although the house itself is situated in Casula. However, the location and nature of any potential archaeological evidence associated with this period of occupation is difficult to predict; and no evidence for post-Contact Aboriginal sites was identified during the field investigation.

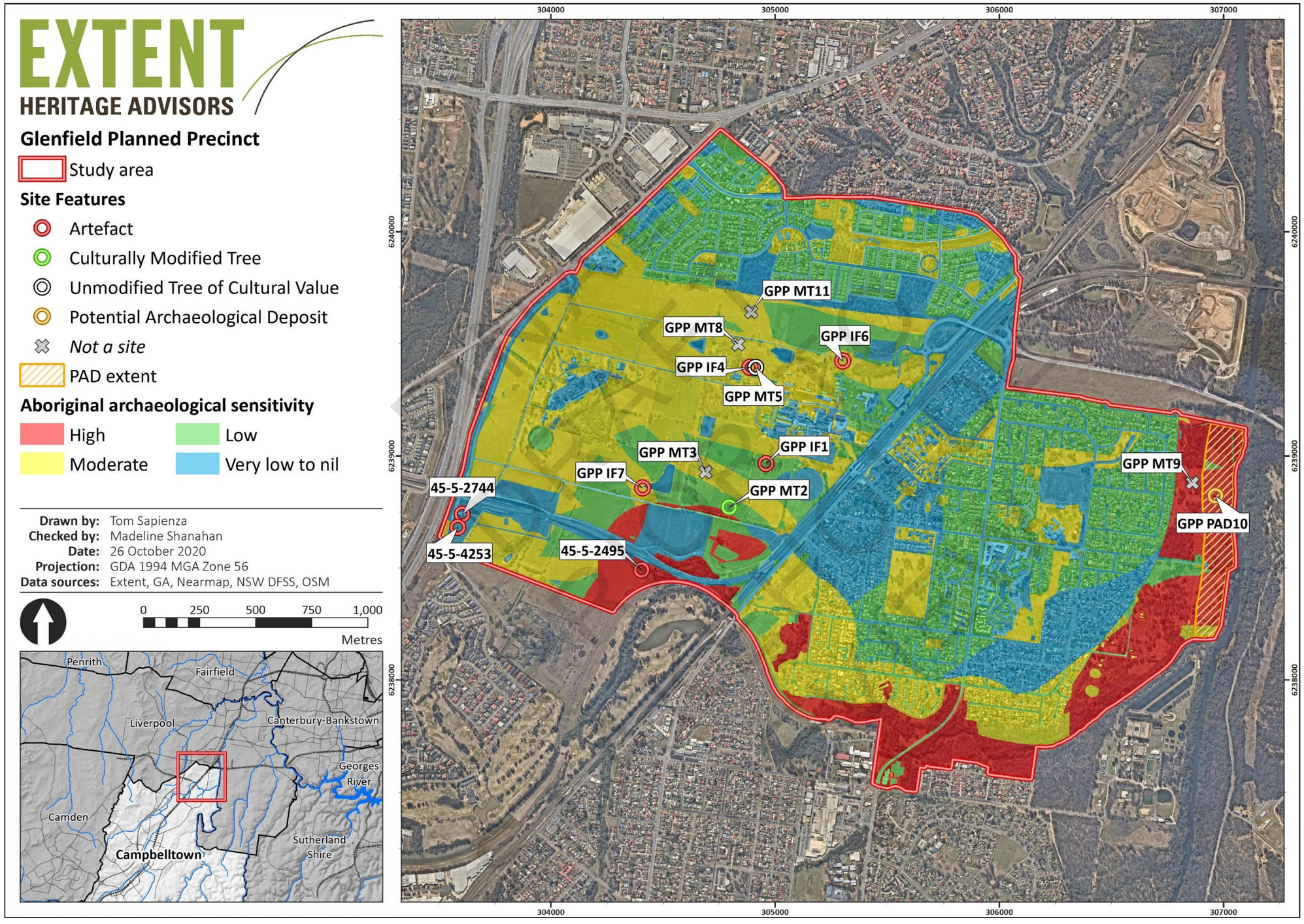


Figure 23. Aboriginal archaeological and cultural sensitivity of the study area.

8. Significance Assessment

The statement of significance for each site was assessed based on a framework and range of criteria which are discussed in detail in **Appendix F**. Heritage NSW specifies that heritage significance should be assessed according to four criteria; social/cultural or spiritual, historic, scientific (archaeological) and aesthetic (OEH 2011:7; Australia ICOMOS 2013). The significance of the Aboriginal sites within the study area is summarised in **Table 16**. Since some sites could not be inspected, the relevant information is taken from the original reports or site card descriptions.

8.1 Statement of Significance

The study area consists of 10 Aboriginal archaeological sites, comprising low density artefact scatters, isolated finds, potential archaeological deposits and a culturally modified tree. The assessment also highlights the banks of the Georges River and Bunbury Curran Creek as having high potential for cultural materials to be present.

In general, preliminary comments received from the RAPs over the course of the project indicate that all Aboriginal sites are considered to be of social/cultural significance, with particular significance being attributed to larger artefact scatters, rock shelters and engravings and scarred trees (with the exception of the latter, none of these were observed within the study area). In general, comments received from the RAPs do not distinguish ranking of social/cultural significance, but 'high' has been used for sites that were identified as being of particular interest or importance and/or where recorded in previous site registrations. The importance of conservation of modified trees within the study area, as adjacent areas are redeveloped, was also noted.

For the most part, the discrete Aboriginal sites present within the study area consist of moderately disturbed, low-density artefact scatters or isolated objects in shallow duplex soils, and therefore have limited ability to inform our understanding of past Aboriginal activity. Such sites can only provide limited information on the habitats and behaviours of past people, and limited chronology on when the site was utilised or occupied. As such these sites are considered to have low scientific significance, are not rare to the region, nor are they particularly good examples of these types of site (i.e., representativeness). The sites are likely to be of low historical significance, as no evidence has been found to indicate that these sites are associated with events or people of particular historical importance in the pre-Contact, Contact, or post-Contact period. They do hold some aesthetic significance, and it is still possible to appreciate the natural setting of the sites, being in a relatively undeveloped region on mid- to -lower slopes.

In contrast to the majority of sites, potential archaeological deposit 'GPP PAD10' and the areas in close proximity to Georges River and to a lesser extent Bunbury Curran Creek have greater potential to contain substantive cultural material, and to provide information about past Aboriginal occupation and behaviour. Specifically, based on other excavations in the area, cultural deposits in the vicinity of Georges River (and to a lesser extent, Bunbury Curran Creek) have recovered diverse and stratigraphically controlled cultural material of high scientific and

cultural significance. These sites have provided extensive information about the use of the region by Aboriginal people in the past. As such, it is considered that similar sites found within the study area, such as 'GPP PAD10' have the potential to contain comparable cultural material, have moderate to high research potential, and potential for rare and representativeness examples of important cultural materials. All of these areas also have some aesthetic significance, being situated adjacent major waterways in relatively undisturbed contexts.

Table 16. Significance assessment of the Aboriginal sites identified within the study area.

Site Name (AHIMS No.)	Site feature	Scientific significance	Aesthetic significance	Historical significance	Social/ Cultural significance	Overall Significance
GPP IF1	Artefact	Low	Low	Low	Low	Low
GPP MT2	Culturally modified tree	Low	Low	Low	High	High
GPP MT3	Not a site	-	-	-	-	-
GPP IF4	Artefact	Low	Low	Low	Low	Low
GPP MT5	Cultural site	Low	Low	Low	High	High
GPP IF6	Artefact	Low	Low	Low	Low	Low
GPP IF7	Artefact	Low	Low	Low	Low	Low
GPP MT8	Not a site	-	-	-	-	-
GPP MT9	Not a site	-	-	-	-	-
GPP PAD10	PAD	High	Moderate	Low	Low	High
GPP MT11	Not a site	-	-	-	-	-
MFH#2 (#45-5-2495)	Artefact	Low	Low	Low	Low	Low*
MLE1 (#45-5-2744)	Artefact	Low	Low	Low	Low	Low*
SWRL Site 15/AAS1 (#45-5-4253)	Artefact	Moderate	Low	Low	Low	Moderate*

** Based on rankings assigned by the consultants that investigated these sites (see **Section 5**).*

9. Impact Assessment

9.1 Indicative Layout Plan (ILP)

The Department of Planning and Environment, in conjunction with City of Campbelltown Council, is in the process of planning for the future development of the Glenfield Planned Precinct – one of the precincts of the Glenfield to Macarthur Urban Renewal Corridor. Based on the findings of preliminary technical studies and their recommendations, an Indicative layout Plan has been prepared (**Figure 24** and **Figure 25**). In general, the proposed layout is guided by existing and potential flood levels, riparian corridors and constrained/unconstrained land.

9.2 Potential Aboriginal Heritage Impacts

Rezoning of the study area will not in itself result in Aboriginal heritage impact. However, the potential Aboriginal heritage impact of subsequent development in accordance with the zonings proposed in the ILP is outlined below.

In general, development in accordance with the ILP would require ground disturbance and result in impact to identified and potential Aboriginal archaeological sites. Conservation may be possible within those areas or zones where development will not necessarily require ground surface disturbance or vegetation removal. These areas include:

- Open space / local park
- School Sports and other sporting recreational facilities
- River / Creek riparian corridor
- Other landscaped areas, where modification is minimal or not required.

The harm has been described according to the Heritage NSW categories below (**Table 17**). The potential impact to the identified archaeological sites is summarised in **Table 18**.

Table 17. Heritage NSW categories of harm.

Type of harm	Degree of harm	Consequence of harm
Will not be harmed	Whole	Total loss of value
Movement (collection) only	Partial	Partial loss of value
Excavation	None	No loss of value
Community collection		
Directly harmed		

9.2.1 Identified Sites

Ten Aboriginal sites have been identified within the Glenfield Planned Precinct. It is likely that two of these sites (#45-5-4253 and #45-5-2744) have previously been completely impacted by developments. Of the eight sites that remain within the study area, it is likely that one (#45-5-2495) has been partially impacted prior to the current investigation. Development in accordance with the ILP is likely to result in complete impacts to two of the eight sites (GPP IF1 and GPP IF7), while the potential for conservation has been identified for the remainder of the sites (#45-5-2495) (**Figure 26** and **Table 18**):

- Culturally modified tree 'GPP MT2' is flagged for protection, despite being in an area zoned for construction of medium rise (3-6 storey) residential development and associated internal roads. This area is east of the proposed playing fields in the western half of the study area.
- Artefact 'GPP IF4' and a tree of cultural value 'GPP MT5' are likely to be conserved within open space/local park near the Memorial Forest, in the western half of the study area.
- If the existing Georges River Nature Reserve and Belmont Road are retained unmodified, potential archaeological deposit 'GPP PAD10' is likely to be conserved within open parkland, along the eastern boundary of the study area.
- If the existing unnamed drainage line and riparian corridor are retained unmodified, artefact 'GPP IF6' is likely to be conserved within open parkland, to the south of the potential Cambridge Avenue upgrade in the western half of the study area.
- Artefact scatter 'MFH 2' (#45-5-2495) is likely to have been impacted by previous archaeological test excavation and SWRL construction. Any remaining artefact comprising this low-density scatter are likely to be partially conserved within open parkland to the south of the rail corridor.
- Artefact scatter 'SWRL 15/AAS1' (#45-5-4253) is listed in AHIMS as having a site status of "destroyed", likely due to impacts from the construction of the SWRL. Although it has an AHIMS site status of "valid", it is likely that artefact 'MLE 1' (#45-5-2744) has also been completely impacted by SWRL construction. Should any artefacts be present still at these sites, these are likely to be conserved within open parkland in the south western corner of the study area.
- Artefact 'GPP IF1' will likely be impacted by the construction of mixed use (7+ storey) lots and associated internal roads in the Civic Space in the western half of the study area, but see section **9.2.1.1**.
- Artefact 'GPP IF7' is likely to be impacted by the construction of playing fields in the western half of the study area, but see section **9.2.1.1**.

The potential impact would result in the removal of 2 of the 6 sites assessed as being of low significance and some harm to the site identified as of moderate significance. Three sites of

high significance, one site of moderate significance and four sites of low significance may be conserved.

While the potential for conservation has been identified for six sites (five in full, and part of an additional site), avoidance of ground disturbance and vegetation removal will be required in order to realise this conservation potential.

Table 18. Potential impacts to identified Aboriginal archaeological sites on the basis of the ILP.

AHIMS No.	Site Name	Significance	Type of Harm	Degree of Harm	Consequence of Harm
N/A	GPP IF1	Low	Directly harmed *(but see **9.2.1.1**)*	Whole	Total loss of value
N/A	GPP MT2	High	Directly harmed	Whole	No loss of value
N/A	GPP IF4	Low	Directly harmed	Whole	No loss of value
N/A	GPP MT5	High	Directly harmed	Whole	No loss of value
N/A	GPP IF6	Low	Will not be harmed	None	No loss of value
N/A	GPP IF7	Low	Directly harmed *(but see **9.2.1.1**)*	Whole	Total loss of value
N/A	GPP PAD10	High	Will not be harmed	None	No loss of value
45-5-2495	MFH 2	Low	*Previously completely impacted*	None	No loss of value
45-5-2744	MLE 1	Low	*Previously completely impacted*	None	No loss of value
45-5-4253	SWRL Site 15/AAS1	Moderate	*Previously partially impacted* Directly harmed	Partial	Partial loss of value

9.2.1.1 Impacts to GPP IF1 and GPP IF7

Isolated finds GPP IF1 and GPP IF7 will both likely be impacted by developments undertaken in accordance with the ILP. Without any other intervention, the type of harm to these sites will be direct harm (see **Table 17**). A better option would be the collection of these artefacts by Aboriginal stakeholders and the relocation and/or reburial of the artefacts elsewhere in an area that will not be impacted by future development. This option can be specified on the specific AHIP application that will eventually be made to impact these artefacts.

9.2.2 Areas of Aboriginal Archaeological Sensitivity

The identified Aboriginal sites are likely to form only a small part of the total archaeological resource of the Glenfield Planned Precinct. A model of archaeological sensitivity has been developed to identify areas where further archaeological material may be present, using four categories from nil to high. Development in accordance with the ILP would result in impacts to areas predominantly identified as having low and moderate sensitivity, and to a small portion of land identified as having high sensitivity (**Figure 27**). This is primarily along the southern boundary of the study area, where impacts are likely from the extension of Loftus and Bosavi Streets and Canterbury Road, and the construction of an electrical substation, detention basin, and playing fields.

Notably, however, significant portions of the areas identified as having high sensitivity (and associated with a landform of interest along the Georges River corridor) would remain as open space and parklands and are likely to be conserved under the ILP (**Figure 27**).

INDICATIVE LAYOUT PLAN

Pg 1

GROUPGSA

Figure 24. ILP for the central western portion of the Glenfield Planned Precinct. This ILP layout supersedes the same area shown in the previous 2018 ILP. See Figure 25 for the merged version of both ILPs (Source: DPIE 2020).

Figure 25. Version of the ILP merging the 2018 ILP with the detailed 2020 ILP update for the central western portion (Source: DPIE 2018 and 2020).

EXTENT
HERITAGE ADVISORS

Glenfield Planned Precinct

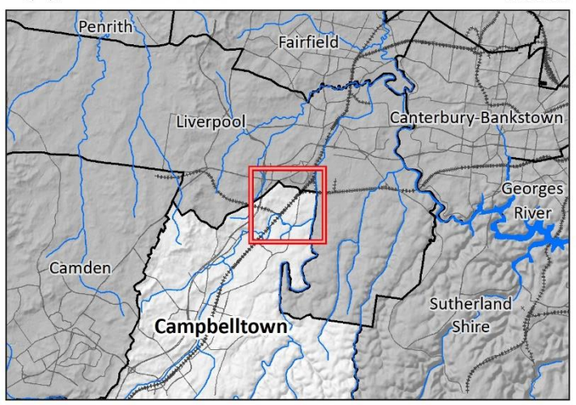
Study area

Site Features

- Artefact
- Culturally Modified Tree
- Unmodified Tree of Cultural Value
- Potential Archaeological Deposit
- *Not a site*
- PAD extent

Drawn by: Tom Sapienza
Checked by: Madeline Shanahan
Date: 22 November 2020
Projection: GDA 1994 MGA Zone 56
Data sources: Extent, GA, NSW DFSS, NSW DPIE, OSM

0 250 500 750 1,000
Metres



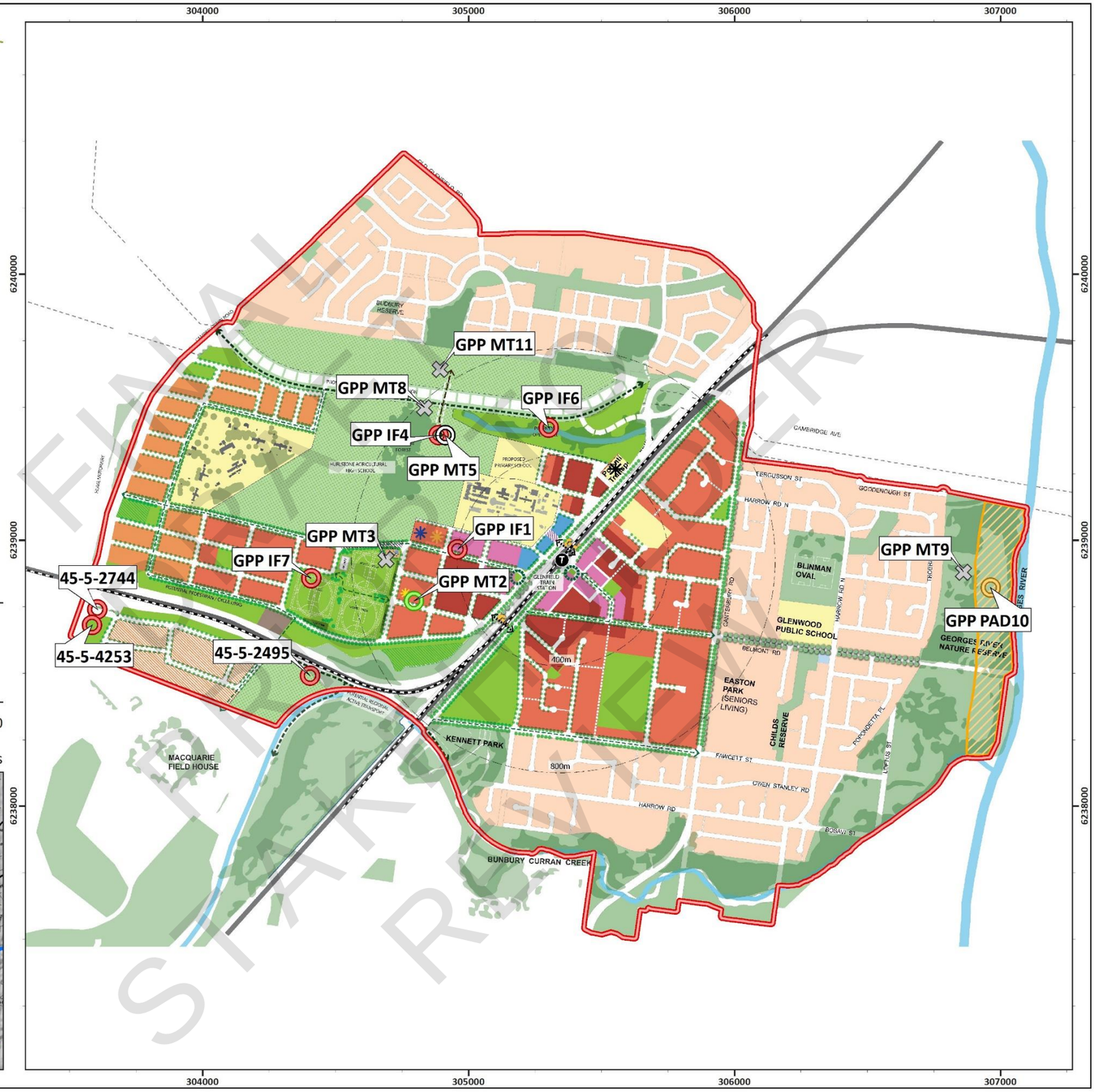


Figure 26. Indicative Layout Plan for the Glenfield Planned Precinct with Aboriginal sites.

EXTENT
HERITAGE ADVISORS

Glenfield Planned Precinct

Study area

Site Features

- Artefact
- Culturally Modified Tree
- Unmodified Tree of Cultural Value
- Potential Archaeological Deposit
- *Not a site*
- PAD extent

Aboriginal archaeological sensitivity

- High
- Moderate
- Low
- Very low to nil

Drawn by: Tom Sapienza
Checked by: Madeline Shanahan
Date: 22 November 2020
Projection: GDA 1994 MGA Zone 56
Data sources: Extent, GA, NSW DFSS, NSW DPIE, OSM

0 250 500 750 1,000
Metres

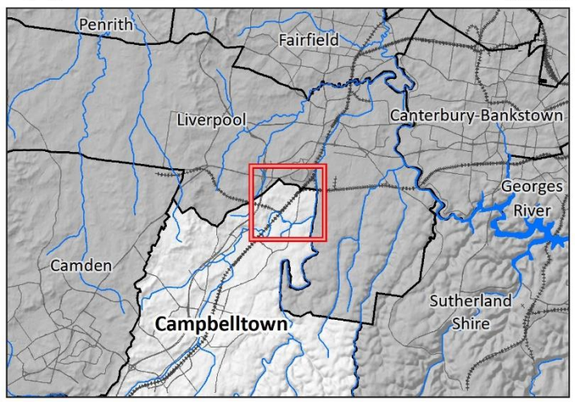


Figure 27. Indicative Layout Plan for the Glenfield Planned Precinct overlain with Aboriginal sites and archaeological sensitivity.

10. Conclusions and Recommendations

10.1 Key Findings

- Ten Aboriginal sites have been documented within the study area, including artefact scatters, isolated finds, potential archaeological deposits, a culturally modified tree and a culturally important tree.
- As well as discrete Aboriginal sites, the banks and areas in close proximity to the Georges River and to a lesser extent Bunbury Curran Creek are also considered to have potential to contain substantial and significant cultural materials based on other nearby studies.
- While the ILP and rezoning would not in itself cause direct impact, the subsequent development will likely result in impacts to two Aboriginal sites (GPP IF1 and GPP IF7), though the ILP design allows for the other sites to be conserved.
- Recommendations have been made to ensure appropriate investigation and assessment is undertaken to ensure Aboriginal heritage is managed, conserved and/or impact is mitigated in the future.

10.2 Management Strategy

Rezoning according to the ILP would not have a direct impact on the Aboriginal cultural and archaeological resource of the study area. However, it is anticipated that the eventual redevelopment would result in direct impacts to the ground surface and existing vegetation, and that harm would occur to Aboriginal sites. Further, the high-level scope of this assessment means that a comprehensive understanding of the Aboriginal resource across the study area has not been undertaken, and the potential for impact to unknown, and potentially significant, cultural heritage remains.

Based on this assessment, the study area contains 10 Aboriginal sites, as well as large areas with archaeological potential, primarily adjacent to the Georges River and Bunbury Curran Creek; and within which substantial and significant cultural material is likely to be present. The results of previous assessments have been used in the creation of the ILP, and which notably has incorporated a significant number of them into areas of no, limited or low impact development (e.g., open space, local parks, sporting facilities, riparian corridor). It is understood a number of sites are in open space/parkland zones, which is effectively unchanged from its current condition, and would effectively allow for a form of conservation in the current development context.

All Aboriginal heritage is protected under the *National Parks and Wildlife Act 1974*, and harm or destruction of cultural material requires approvals from Heritage NSW and/or DPIE depending on the approval pathway. To ensure that future activities appropriately investigate, assess and manage Aboriginal heritage, a number of recommendations are made below. These include the

need to undertake due diligence assessments and/or Aboriginal Cultural Heritage Assessment Reports (ACHAR) in accordance with Heritage NSW guidelines, which form the current best practice to assess and characterise cultural heritage on a site-by-site basis.

10.3 Recommendations

The following recommendations are made with respect to Aboriginal cultural heritage:

- Following an arboriculturist review of a number of culturally modified trees, a single tree, GPP MT 2, was identified as an Aboriginal site. Given the rarity of such sites in southwest Sydney, this site along with a suitable buffer of not less than 20 metres should be protected and conserved in the ILP.

- Along with the ANZAC memorial forest, a range of exotic and endemic tree species were observed throughout the Hurlstone Agricultural School grounds, and were identified as species Aboriginal people were known to use in the past. With the exception of GPP MT5 and Horne Park (Eco Logical Australia, 2016), none were specifically identified as of cultural value. However, following the ILP, consideration of re-use, re-planting and/or interpretation of the site's current tree species within the broader development is recommended. This could form part of the wider interpretive outputs recommended below.

- When AHIPs are eventually applied for in order to permit development at the locations of GPP IF1 and GPP IF7, the conditions of the AHIPs should be structure in a way that would allow the collection of these artefacts and the relocation and/or reburial of the artefacts elsewhere in areas that will not be impacted by development.

- The findings and information in this report, along with a simplified heritage constraints map presented by lot/property, should be provided to Campbelltown City Council, DPIE and Heritage NSW in digital spatial format. This would ensure the Consent authorities involved in future environmental assessments across the study area under Part 4 or 5 of the *Environmental Planning and Assessment Act 1979* are aware of the potential cultural heritage implications of any given project.

- Regardless of the outcomes of the ILP and/or Development Control Plan (DCP) process, Aboriginal objects, sites and places as shown in **Figure 22** - **Figure 27** are protected under the *National Parks and Wildlife Act 1974*, and any proposal for activities in these areas should ensure appropriate Aboriginal heritage assessment is undertaken in accordance with Heritage NSW guidelines prior to any ground disturbance.

- Consultation with the Registered Aboriginal Parties should be maintained during the remainder of the rezoning process. Please note that should consultation lapse due to a discontinuation of communications for more than six months, the consultation process may no longer be in compliance with Heritage NSW's policies and may need to be restarted.

- An Aboriginal Heritage Interpretation Strategy (HIS) and Aboriginal Heritage Interpretation Plan (HIP) should be developed in consultation with the Registered Aboriginal Parties to incorporate the promotion, celebration and/or commemoration of the Aboriginal cultural values and importance of the study area in future development. This may include naming conventions, cultural heritage walks, signage and/or artworks, etc. These documents should be incorporated into the DCP and/or provided to the Consent Authorities for inclusion in Development Approval conditions, to ensure implementation is undertaken in an holistic approach across the Precinct.

Enacted recommendations

The following was a recommendation made in earlier drafts of this report that has now been implemented in the latest Development Control Plans. It is included here for reasons of full disclosure.

- The Development Control Plans (DCP) or equivalent produced from the ILP process must ensure appropriate Aboriginal heritage management requirements are included. These must include, but not be limited to:
    - In areas of known Aboriginal sites, and areas of moderate and high Aboriginal sensitivity (**Figure 22** - **Figure 27**): an Aboriginal Cultural Heritage Assessment Report (ACHAR) must be undertaken in accordance with Heritage NSW guidelines prior to a Development Application (or equivalent) being approved.
    - In areas of low Aboriginal sensitivity (**Figure 22** - **Figure 27**): an Aboriginal Due Diligence Assessment must be undertaken in accordance with Heritage NSW guidelines prior to a Development Application (or equivalent) being approved.
    - In areas of very low to nil Aboriginal sensitivity (**Figure 22** - **Figure 27**): no further Aboriginal heritage assessment is required prior to a Development Application (or equivalent) being approved.

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Appendix A. Legislation

A1.1. Commonwealth Legislation

Aboriginal and Torres Strait Islander Heritage Protection Act 1984

The Aboriginal and Torres Strait Islander Heritage Protection Act 1984 was enacted at a Federal level to preserve and protect areas (particularly sacred sites) and objects of particular significance to Aboriginal Australians from damage or desecration. Steps necessary for the protection of a threatened place are outlined in a gazetted Ministerial Declaration (Sections 9 and 10). This can include the preclusion of development.

As well as providing protection to areas, it can also protect objects by Declaration, in particular Aboriginal skeletal remains (Section 12). Although this is a Federal Act, it can be invoked on a State level if the State is unwilling or unable to provide protection for such sites or objects.

Environment Protection and Biodiversity Conservation Act 1999

The Environment Protection and Biodiversity Conservation Act 1999 provides for the protection of natural and cultural heritage places. The Act establishes (amongst other things) a National Heritage List (NHL) and a Commonwealth Heritage List (CHL). Places on the NHL are of natural or cultural significance at a national level and can be in public or private ownership. The CHL is limited to places owned or occupied by the Commonwealth which are of heritage significance for certain specified reasons.

Places listed on the NHL are considered to be of State and local heritage value, even if State or local various heritage lists do not specifically include them.

The heritage values of places on the NHL or the CHL are protected under the terms of the EPBC Act. The Act requires that the Minister administering the EPBC Act assess any action which has, will have, or is likely to have, a significant impact on the heritage values of a listed place. The approval (or rejection) follows the referral of the matter by the relevant agency's Minister.

Native Title Act 1993

The Native Title Act 1993 provides recognition and protection for native title. The Act established the National Native Title Tribunal to administer native title claims to rights and interests over lands and waters by Aboriginal people. The Tribunal also administers the future act processes that attract the right to negotiate under the Native Title Act 1993.

The Act also provides for Indigenous Land Use Agreements (ILUA). An ILUA is an agreement between a native title group and others about the use and management of land and waters. ILUAs were introduced as a result of amendments to the Native Title Act in 1998. They allow people to negotiate flexible, pragmatic agreements to suit their particular circumstances.

An ILUA can be negotiated over areas where native title has, or has not yet, been determined. They can be part of a native title determination, or settled separately from a native title claim. An ILUA can be negotiated and registered whether there is a native title claim over the area or not.

A1.2. NSW State Legislation

Environmental Planning and Assessment Act 1979

The Environmental Planning and Assessment Act 1979 (EP&A Act) requires that environmental and heritage impacts are considered by consent authorities prior to granting development approvals. The relevant sections of the EP&A Act are:

- Part 3A: A single assessment and approval system for major development and infrastructure projects [note that Part 3A has now been repealed and replaced with Part 4 (Division 4.1)].
- Part 4: Development that requires consent under consideration of environmental planning instruments.
- Part 5: An assessment process for activities undertaken by Public Authorities and for developments that do not require development consent but an approval under another mechanism.

Where Project Approval is to be determined under Part 4 (Division 4.1) of the Act, further approvals under the National Parks and Wildlife Act 1974, are not required. In those instances, management of Aboriginal heritage follows the applicable Aboriginal assessment guidelines (the Guidelines for Aboriginal Cultural Heritage Impact Assessment and Community Consultation, July 2005) and any relevant statement of commitments included in the Development Approval.

National Parks and Wildlife Act 1974

The National Parks and Wildlife Act 1974 (NPW Act) provides blanket protection for Aboriginal objects (material evidence of Indigenous occupation) and Aboriginal places (areas of cultural significance to the Aboriginal community) across NSW. 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.*

An Aboriginal place is any place declared to be an Aboriginal place by the Minister for the Environment, under Section 84 of the Act.

It is an offence to disturb Aboriginal objects or places without a permit authorised by the Director-General of the Office of Environment and Heritage. In addition, anyone who discovers an Aboriginal object is obliged to report the discovery to OEH.

The operation of the NPW Act is administered by OEH. With regard to the assessment of Aboriginal cultural heritage, OEH has endorsed the following guidelines:

- Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales (2010).
- Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales (2010).
- Aboriginal Cultural Heritage Consultation Requirements for Proponents (2010).
- Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW (2011).

Aboriginal Land Rights Act 1983

The Aboriginal Land Rights Act 1983 allows for the transfer of ownership to a Local Aboriginal Land Council of vacant Crown land not required for an essential purpose or for residential land. These lands are then managed and maintained by the Local Aboriginal Land Council.

Appendix B. Aboriginal Consultation

B.1. Aboriginal consultation log

Organisation/Group	Representative	Date	Comments	Extent Heritage Contact
OEH Regional Operations Group (Greater Sydney Branch) NTS Corp Tharawal LALC Campbelltown City Council Greater Sydney Local Land Services	-	30.8.18	Request for details of Aboriginal individuals or groups who may have an interest in the study area.	Fenella Atkinson
National Native Title Tribunal	-	30.8.18	Search of the NNTT registers online, and via Native Title Vision. The study area is not affected by a registered or confirmed Native Title Claim.	Fenella Atkinson
Office of the Registrar, *Aboriginal Land Rights Act 1983*	-	30.8.18	Request for search of the Register of Aboriginal Owners.	Fenella Atkinson
Greater Sydney Local Land Services	Margaret Bottrell	3.9.18	Margaret advised that GSLLS is not a source for Aboriginal stakeholder details, and recommended contacting OEH.	Fenella Atkinson

Organisation/Group	Representative	Date	Comments	Extent Heritage Contact
OEH Regional Operations Group (Greater Sydney Branch)	Giles Hamm	10.9.18	Giles provided the OEH list of Aboriginal stakeholders for the Greater Sydney Branch	Fenella Atkinson
Badu	Karia Lea Bond	11.9.18	Distributed project information and an invitation to register an interest.	Fenella Atkinson
Barking Owl Aboriginal Corporation	Jody Kulakowski			
Barraby Cultural Services	Lee Field			
Biamanga	Seli Storer			
Bidjawong Aboriginal Corporation	James Carroll			
Bilinga	Simalene Carriage			
Bilinga Cultural Heritage Technical Services	Robert Brown			
Butucarbin Aboriginal Corporation	Jennifer Beale			
Corroboree Aboriginal Corporation	Steve Johnson Marilyn Carroll			

Organisation/Group	Representative	Date	Comments	Extent Heritage Contact
Cubbitch Barta Native Title Claimants Aboriginal Corporation	Glenda Chalker			
Cullendulla	Corey Smith			
Darug Aboriginal Cultural Heritage Assessments	Celestine Everingham			
Darug Aboriginal Landcare Inc	Des Dyer			
Darug Custodian Aboriginal Corporation	Justine Coplin			
Darug Land Observations	Gordon Workman			
Darug Tribal Aboriginal Corporation	John Reilly			
D'harawal Mens Aboriginal Corporation	Elwyn Brown			
Dharug	Andrew Bond			
Didge Ngunawal Clan	Paul Boyd Lilly Carroll			

Organisation/Group	Representative	Date	Comments	Extent Heritage Contact
Duncan Falk Consultancy	Duncan Falk			
Garrara Aboriginal Corporation	Raymond Ingrey			
Ginninderra Aboriginal Corporation	Steven Johnson			
Goobah Development	Basil Smith			
Gulaga	Wendy Smith			
Gunjeewong Cultural Heritage Aboriginal Corporation	Cherie Carroll Turrise			
Guntawang Aboriginal Resources Inc	Wendy Morgan			
Gunyuu	Kylie Ann Bell			
Gunyuu Cultural Heritage Technical Services	Darlene Hoskins-McKenzie			
Jerringong	Jodi Anne Stewart			
Kamilaroi-Yankuntjatjara Working Group	Phil Khan			
Kawul Cultural Services	Vicky Slater			

Organisation/Group	Representative	Date	Comments	Extent Heritage Contact
Merrigarn Indigenous Corporation	Shaun Carroll			
Minnamunnung	Aaron Broad			
Munyunga	Kaya Dawn Bell			
Munyunga Cultural Heritage Technical Services	Suzannah McKenzie			
Muragadi Heritage Indigenous Corporation	Jesse Johnson			
Murra Bidgee Mullangari Aboriginal Corporation	Darleen Johnson			
Murramarang	Roxanne Smith			
Murrumbul	Mark Henry			
Murrumbul Cultural Heritage Technical Services	Levi McKenzie-Kirkbright			
Nerrigundah	Newton Carriage			
Nundagurri	Newton Carriage			
Pemulwuy CHTS	Johnson			

Organisation/Group	Representative	Date	Comments	Extent Heritage Contact
Tharawal Local Aboriginal Land Council	-			
Thauaira	Shane Carriage			
Thoorga Nura	John Carriage			
Tocomwall	Scott Franks			
Wailwan Aboriginal Group	Phil Boney			
Walbunja	Hika Te Kowhai			
Walgalu	Ronald Stewart			
Warragil Cultural Services	Aaron Slater			
Wingikara	Hayley Bell			
Wingikara Cultural Heritage Technical Services	Wandai Kirkbright			
Wullung	Lee-Roy James Boota			
Wurrumay Consultancy	Kerrie Slater			
Yerramurra	Robert Parsons			

Organisation/Group	Representative	Date	Comments	Extent Heritage Contact
Yulay Cultural Services	Arika Jalomaki			
Yurrandaali Cultural Services	Bo Field			
Tocomwall	Scott Franks	11.9.18	Scott registered an interest in the project.	Fenella Atkinson
Ginninderra Aboriginal Corporation	Krystle Elliott	11.9.18	Krystle registered an interest in the project.	Fenella Atkinson
Guntawang Aboriginal Resources Inc	Wendy Morgan	11.9.18	Wendy registered an interest in the project.	Fenella Atkinson
Darug Tribal Aboriginal Corporation	John Reilly	11.9.18	John registered an interest in the project.	Fenella Atkinson
Darug Boorooberongal Elders Aboriginal Corporation	Gordon Workman	11.9.18	Gordon registered an interest in the project.	Fenella Atkinson
Tharawal Local Aboriginal Land Council	Rebecca Jarvis	11.9.18	Rebecca registered an interest in the project.	Fenella Atkinson
Darug Land Observations	Anna	11.9.18	Anna registered an interest in the project.	Fenella Atkinson
Campbelltown Macarthur Advertiser	-	12.9.18	Advertisement placed inviting registrations of interest in the project.	Fenella Atkinson
Wailwan Aboriginal Group	Phil Boney	12.9.18	Phil registered an interest in the project.	Fenella Atkinson

Organisation/Group	Representative	Date	Comments	Extent Heritage Contact
Kamilaroi-Yankuntjatjara Working Group	Phil Khan	12.9.18	Phil registered an interest in the project.	Fenella Atkinson
Barraby Cultural Services	Lee Field	12.9.18	Lee registered an interest in the project.	Fenella Atkinson
Yulay Cultural Services	Arika Jalomaki	12.9.18	Arika registered an interest in the project.	Fenella Atkinson
Yurrandaali Cultural Services	Bo Field	12.9.18	Bo registered an interest in the project.	Fenella Atkinson
Didge Ngunawal Clan	Paul Boyd Lilly Carroll	12.9.18	Paul and Lilly registered an interest in the project.	Fenella Atkinson
Gulaga	Wendy Smith	12.9.18	Wendy registered an interest in the project.	Fenella Atkinson
Cubbitch Barta Native Title Claimants Aboriginal Corporation	Glenda Chalker	14.9.18	Glenda registered an interest in the project.	Fenella Atkinson
Kamilaroi-Yankuntjatjara Working Group	Phil Khan	15.9.18	Phil followed up with a letter registering his interest in the project.	Fenella Atkinson
Kamilaroi-Yankuntjatjara Working Group	Phil Khan	18.9.18	Phil requested a hard copy of documentation.	Fenella Atkinson
Muragadi Heritage Indigenous Corporation	Anthony Johnson	19.9.18	Anthony registered an interest in the project.	Fenella Atkinson

Organisation/Group	Representative	Date	Comments	Extent Heritage Contact
Kamilaroi-Yankuntjatjara Working Group	Phil Khan	19.9.18	Mailed hard copy to Phil.	Fenella Atkinson
PD Ngunawal Consultancy	Peiro Delponte	19.9.18	Peiro registered an interest in the project.	Fenella Atkinson
Darug Aboriginal Landcare	Des Dyer	19.9.18	Des registered an interest in the project.	Fenella Atkinson
Darug Aboriginal Cultural Heritage Assessments	Celestine Everingham	21.9.18	Celestine registered an interest in the project.	Fenella Atkinson
Ngunawal Heritage Aboriginal Corporation	Graeme Dobson	23.9.18	Graeme registered an interest in the project.	Fenella Atkinson
Darug Custodian Aboriginal Corporation	Justine Coplin	25.9.18	Justine registered an interest in the project.	Fenella Atkinson
Office of the Registrar, *Aboriginal Land Rights Act 1983*	Jodie Rikiti	26.9.18	Jodie provided the results of a search of the Register of Aboriginal Owners.	Fenella Atkinson
Barking Owl Aboriginal Corporation	Jody Kulakowski	26.9.18	Jody registered an interest in the project.	Fenella Atkinson
Barking Owl Aboriginal Corporation	Jody Kulakowski	3.10.18	Provided the proposed assessment methodology to the RAPs for their review, requested comments by 31 October.	Fenella Atkinson
Barraby Cultural Services	Lee Field			

Organisation/Group	Representative	Date	Comments	Extent Heritage Contact
Cubbitch Barta Native Title Claimants Aboriginal Corporation	Glenda Chalker			
Darug Aboriginal Cultural Heritage Assessments	Celestine Everingham			
Darug Aboriginal Landcare	Des Dyer			
Darug Boorooberongal Elders Aboriginal Corporation	Gordon Workman			
Darug Custodian Aboriginal Corporation	Justine Coplin			
Darug Land Observations	Anna Jamie Workman			
Darug Tribal Aboriginal Corporation	John Reilly			
Didge Ngunawal Clan	Paul Boyd Lilly Carroll			
Ginninderra Aboriginal Corporation	Krystle Elliott			

Organisation/Group	Representative	Date	Comments	Extent Heritage Contact
Gulaga	Wendy Smith			
Guntawang Aboriginal Resources Inc	Wendy Morgan			
Kamilaroi-Yankuntjatjara Working Group	Phil Khan			
Muragadi Heritage Indigenous Corporation	Anthony Johnson			
Ngunawal Heritage Aboriginal Corporation	Graeme Dobson			
PD Ngunawal Consultancy	Peiro Delponte			
Tharawal Local Aboriginal Land Council	Rebecca Jarvis			
Tocomwall	Scott Franks			
Wailwan Aboriginal Group	Phil Boney			
Yulay Cultural Services	Arika Jalomaki			
Yurrandaali Cultural Services	Bo Field			

Organisation/Group	Representative	Date	Comments	Extent Heritage Contact
Tocomwall	Scott Franks	3.10.18	Scott noted that the study area contained a continued camp site. He advised that he supported the proposed methodology.	Fenella Atkinson
A1 Indigenous Services	Carolyn Hickey	3.10.18	Carolyn registered an interest in the project.	Fenella Atkinson
Darug Custodian Aboriginal Corporation	Justine Coplin	3.10.18	Justine provided some background information on the interests, experience and activities of Darug Custodian AC, and context for understanding the significance of Darug archaeological sites and landscapes. She noted concern with the ongoing destruction of Darug sites as a result of development, and raised issues with the current OEH consultation process. Justine provided support for the proposed assessment methodology.	Fenella Atkinson
Wailwan Aboriginal Group	Phil Boney	3.10.18	Lee provided support for the methodology.	Fenella Atkinson
Amanda Hickey Cultural Services	Amanda Hickey	4.10.18	Amanda registered an interest in the project.	Fenella Atkinson
Barraby Cultural Services	Lee Field	4.10.18	Lee provided support for the methodology.	Fenella Atkinson
Yulay Cultural Services	Arika Jalomaki	4.10.18	Arika provided support for the methodology.	Fenella Atkinson
Yurrandaali Cultural Services	Bo Field	4.10.18	Bo provided support for the methodology.	Fenella Atkinson

Organisation/Group	Representative	Date	Comments	Extent Heritage Contact
A1 Indigenous Services	Carolyn Hickey	4.10.18	Sent a copy of the proposed methodology to Carolyn for review.	Fenella Atkinson
Amanda Hickey Cultural Services	Amanda Hickey	4.10.18	Sent a copy of the proposed methodology to Amanda for review.	Fenella Atkinson
Widescope Indigenous Group	Donna Hickey	4.10.18	Donna rang to ask why Widescope had not been notified of the project and invited to register an interest. Laressa followed up with an email, advising that Campbelltown LGA was not included in Widescope's area of interest in the OEH list of stakeholders.	Laressa Barry
Widescope Indigenous Group	Steven Hickey	4.10.18	Steven registered an interest in the project. Fenella sent a copy of the proposed methodology to Donna and Steven to review.	Fenella Atkinson
Amanda Hickey Cultural Services	Amanda Hickey	4.10.18	Amanda provided support for the methodology.	Fenella Atkinson
A1 Indigenous Services	Carolyn Hickey	4.10.18	Carolyn provided support for the methodology.	Fenella Atkinson
Darug Boorooberongal Elders Aboriginal Corporation	Gordon Workman	5.10.18	Gordon provided support for the methodology.	Fenella Atkinson
Widescope Indigenous Group	Steven Hickey	7.10.18	Steven provided support for the methodology.	Fenella Atkinson

Organisation/Group	Representative	Date	Comments	Extent Heritage Contact
Darug Aboriginal Landcare	Des Dyer	9.10.18	Des provided support for the methodology. He recommended that any artefacts found in the course of the works be salvaged and moved, that any rock carvings and scarred trees be recorded and preserved, and that any artefacts be reburied in a safe place or put on display in the local museum or on site.	Fenella Atkinson
Barking Owl Aboriginal Corporation	Jody Kulakowski	9.10.18	Jody advised that she was happy to proceed with the methodology as proposed.	Fenella Atkinson
Tharawal Local Aboriginal Land Council	Rebecca Jarvis	10.10.18	Submitted list of project RAPs.	Fenella Atkinson
Office of Environment and Heritage	-	10.10.18	Submitted list of project RAPs.	Fenella Atkinson
Darug Tribal Aboriginal Corporation	John Reilly	11.10.18	John rang to discuss the project and methodology. He is happy with the methodology, so long as it includes survey. He recommended consulting with Glenda Chalker regarding any previous archaeological investigation in the area, and local Aboriginal heritage more generally.	Fenella Atkinson
Kamilaroi-Yankuntjatjara Working Group	Phil Khan	12.10.18	Phil provided support for the proposed assessment methodology.	Fenella Atkinson
Darug Land Observations	Anna	16.10.18	Anna send a response supporting the proposed assessment methodology. DLO recommends reburial of	Fenella Atkinson

Organisation/Group	Representative	Date	Comments	Extent Heritage Contact
	Jamie Workman Gordon Workman		any artefacts on Country, and would like to be involved in any fieldwork to be carried out as part of the project.	
A1 Indigenous Services	Carolyn Hickey	22.10.18	Carolyn followed up to provide support for the methodology, as she could not find a record of responding previously.	Fenella Atkinson
Didge Ngunawal Clan	Paul Boyd Lilly Carroll	22.10.18	Paul and Lilly provided support for the proposed methodology.	Fenella Atkinson
Barking Owl Aboriginal Corporation	Jody Kulakowski	23.10.18	Jody followed up to ask about engagement for the fieldwork and provide some details on experience and availability. Fenella told Jody that no plans had yet been made for the fieldwork, but that engagement of RAPs would be discussed with the proponent, and she would pass information on to Jody as soon as available.	Fenella Atkinson
Cubbitch Barta Native Title Claimants Aboriginal Corporation	Glenda Chalker	29.10.18	Glenda advised that the proposed methodology was suitable. She said that a recent test excavation was undertaken by AMAC at the Glenfield Special School (Campbell House School?), but did not recovern ay artefacts. Construction of the new Leppington railway line has involved the salvage and destruction of sites through the area. Mary Dallas tested an area near the	Fenella Atkinson

Organisation/Group	Representative	Date	Comments	Extent Heritage Contact
			creek line some time ago. And there is a scarred tree (stump only) in the transmission easement.	
Barraby Cultural Services	Lee Field	7.11.18	Lee, Bo and Arika followed up to ask if they were going to be involved in the fieldwork.	Fenella Atkinson
Yulay Cultural Services	Arika Jalomaki			
Yurrandaali Cultural Services	Bo Field			
Barraby Cultural Services	Lee Field	12.11.18	Fenella advised that details for the fieldwork and RAP engagement had not yet been determined.	Fenella Atkinson
Yulay Cultural Services	Arika Jalomaki			
Yurrandaali Cultural Services	Bo Field			
Guntawang Aboriginal Resources Inc	Wendy Morgan	28.12.18	Wendy sent through details of rates and insurances, with certificates of currency, incorporation, ABN. She also provided a summary of the culture and heritage officer's relevant knowledge and experience, and an explanation of how information is distributed to and from GARI membership.	Fenella Atkinson
Cubbitch Barta Native Title Claimants Aboriginal Corporation		09.01.19	Notification sent to RAPs for engagement for survey work. Requested a response for if RAPs are interested and available to participate in the survey work; happy with the daily rate offered for the survey work; and to	Alistair Hobbs

Organisation/Group	Representative	Date	Comments	Extent Heritage Contact
Darug Aboriginal Cultural Heritage Assessments Darug Aboriginal Landcare Inc Darug Custodian Aboriginal Corporation Darug Land Observations Darug Tribal Aboriginal Corporation Tharawal Local Aboriginal Land Council Tocomwall Barking Owl Aboriginal Corporation Darug Boorooberongal Elders Aboriginal Corporation			provide copies of insurances i.e., public liability, professional indemnity and workers compensation.	
Barraby Cultural Services Didge Ngunawal Clan		09.01.19	Notification sent to RAPs not engaged for survey work, provided the option of a site visit.	Alistair Hobbs

Organisation/Group	Representative	Date	Comments	Extent Heritage Contact
Ginninderra Aboriginal Corporation Gulaga Guntawang Aboriginal Resources Inc Kamilaroi-Yankuntjatjara Working Group Muragadi Heritage Indigenous Corporation Ngunawal Heritage Aboriginal Corporation PD Ngunawal Consultancy Wailwan Aboriginal Group Yulay Cultural Services Yurrandaali Cultural Services A1 Indigenous Services				

Organisation/Group	Representative	Date	Comments	Extent Heritage Contact
Amanda Hickey Cultural Services Widescope Indigenous Group				
Tocomwall	Scott Franks	09.01.19	Scott confirmed that Tocomwall are available to undertake the survey work	Alistair Hobbs
Muragadi	Anthony Johnson	09.01.19	Anthony emailed to say Muragadi will not be attending on a voluntary basis.	Alistair Hobbs
Guntawang Aboriginal Resources Inc	Wendy Morgan	09.01.19	Wendy emailed to say Guntawang are happy to participate in the survey on a voluntary basis.	Alistair Hobbs
Amanda Hickey Cultural Services	Amanda Hickey	09.01.19	Amanda emailed to decline the offer of a voluntary site visit but stated she would be grateful to be involved in future stages of the project.	Alistair Hobbs
Cubbitch Barta Native Title Claimants Aboriginal Corporation	Glenda Chalker	09.01.19	Phone call from Glenda saying Cubbitch Barta will be available to undertake the site visit.	Alistair Hobbs

Organisation/Group	Representative	Date	Comments	Extent Heritage Contact
Tharawal Local Aboriginal Land Council	Rebecca Jarvis	09.01.19	Phone call from Rebecca and Robin expressing their concern that a RAP group will not be engaged for the full duration of the survey. Robin expressed that this would maintain consistency for the survey in dealing with cultural values.	Alistair Hobbs
Barking Owl Aboriginal Corporation	Jody Kulakowski	09.01.19	Emailed to say they will be available for the survey work. Provided insurances and work docs. Put into the work folder.	Alistair Hobbs
Darug Boorooberongal Elders Aboriginal Corporation	Gordon Workman	10.01.19	Gordon emailed to say they will be available to undertake the site visit and provided insurances. Documents put into the job folder.	Alistair Hobbs
PD Ngunawal Consultancy	Tammy Muscat	21.01.19	Tammy emailed to confirm that Pete Delponte would like to attend the survey on a voluntary basis.	Alistair Hobbs
Cubbitch Barta Native Title Claimants Aboriginal Corporation Darug Custodian Aboriginal Corporation Tharawal Local Aboriginal Land Council		05.02.19	Notified RAPs engaged for survey work of a change of schedule.	Cameron Neal

Organisation/Group	Representative	Date	Comments	Extent Heritage Contact
Darug Aboriginal Cultural Heritage Assessments				
Cubbitch Barta Native Title Claimants Aboriginal Corporation	Glenda Chalker	06.02.19	Glenda emailed to confirm a representative would be on site.	Cameron Neal
Darug Tribal Aboriginal Corporation	John Reilly	06.02.19	John emailed to advise that no DTAC representatives would be available for the survey.	Cameron Neal
DPE	Luke Johnson	08.03.19	Provided DPE with a draft copy of the ACHAR for review.	Laressa Barry
GARI	Wendy Morgan	18.03.19	Wendy emailed asking whether the site works had been completed and if there were any opportunities for GARI to be involved if the works were continuing	Rebekah Hawkins
DPE	Luke Johnson	18.03.19	Provided quotation for an arborist to inspect potential scarred trees on site.	Alan Williams
GARI	Wendy Morgan	20.03.19	Replied to Wendy's email and advised that the survey works had been completed though there is discussion about a possible additional phase. GARI should be	Rebekah Hawkins

Organisation/Group	Representative	Date	Comments	Extent Heritage Contact
			contacted if any further works are undertaken as part of this project.	
		17.04.19	Arborist investigation	
UTMA	Danny Draper	16.05.19	Provided copy of draft Scarred Tree Report	Alan Williams
DPE	Thomas Holmes	17.05.19	Advised that DPE were discussing amendments to the ILP in response to the findings of the ACHAR, and requested feedback as to whether the report could be updated to reference a new ILP. Revised draft report sent to DPE for review on 21 May 2019. Thomas resolved to get back to Extent with revised comments.	Alan Williams
DPE	Thomas Holmes	18.07.19	Provided DPIE comments for report, and sought clarification on next steps in project.	Alan Williams
All RAPs	Various	18.12.19	Provided project update to all RAPs, noting that the project was on hold whilst DPIE sorted out internal matters with the Education Department. Advised that the project was likely to kick back up again, and that shortly in the New Year we would amend the ACHAR and provide it to the RAPs for review.	Laressa Barry

Organisation/Group	Representative	Date	Comments	Extent Heritage Contact
GARI	Wendy Morgan	18.12.19	Thanked Extent for the update	Laressa Barry
KYWG	Phil Khan	18.12.19	Thanked Extent for the update	Laressa Barry
DTAC	John Reilly	19.12.19	Thanked Extent for the update	Laressa Barry
Muragadi	Jesse Johnson	16.01.20	Asked for an update on the ACHAR. Laressa replied that we had provided updated costings a week earlier, but had not yet been instructed to commence with the reporting updates.	Laressa Barry
All RAPS	Various	07.04.20	Provided update to all RAPS, noting that the intended reporting updates had not yet gone ahead. Advised we would check in with DPIE, and get back as soon as any more information was provided.	Laressa Barry
All RAPs	Various	17.09.20	Provided project update to all RAPs, noting that the project had been on hold since December while DPIE sorted out internal matters, and though we had thought we would make updates in Feb-March, this never eventuated. Advised that the project was likely to kick back up again, and that hopefully the updated ACHAR could be provided to the RAPs soon.	Laressa Barry
Ginnindera	Krystle Carroll-Elliot	17.09.20	Thanked Laressa for the update	Laressa Barry

B.2. List of identified Aboriginal stakeholders

- Badu
- Barking Owl Aboriginal Corporation
- Barraby Cultural Services
- Biamanga
- Bidjawong Aboriginal Corporation
- Bilinga
- Bilinga Cultural Heritage Technical Services
- Butucarbin Aboriginal Corporation
- Corroboree Aboriginal Corporation
- Cubbitch Barta Native Title Claimants Aboriginal Corporation
- Cullendulla
- Darug Aboriginal Cultural Heritage Assessments
- Darug Aboriginal Landcare Inc
- Darug Custodian Aboriginal Corporation
- Darug Land Observations
- Darug Tribal Aboriginal Corporation
- D'harawal Mens Aboriginal Corporation
- Dharug
- Didge Ngunawal Clan
- Duncan Falk Consultancy
- Garrara Aboriginal Corporation
- Ginninderra Aboriginal Corporation
- Goobah Development
- Gulaga
- Gunjeewong Cultural Heritage Aboriginal Corporation
- Guntawang Aboriginal Resources Inc
- Gunyuu
- Gunyuu Cultural Heritage Technical Services
- Jerringong
- Kamilaroi-Yankuntjatjara Working Group
- Kawul Cultural Services
- Merrigarn Indigenous Corporation
- Minnamunnung

- Munyunga
- Munyunga Cultural Heritage Technical Services
- Muragadi Heritage Indigenous Corporation
- Murra Bidgee Mullangari Aboriginal Corporation
- Murramarang
- Murrumbul
- Murrumbul Cultural Heritage Technical Services
- Nerrigundah
- Nundagurri
- Pemulwuy CHTS
- Tharawal Local Aboriginal Land Council
- Thauaira
- Thoorga Nura
- Tocomwall
- Wailwan Aboriginal Group
- Walbunja
- Walgalu
- Warragil Cultural Services
- Wingikara
- Wingikara Cultural Heritage Technical Services
- Wullung
- Wurrumay Consultancy
- Yerramurra
- Yulay Cultural Services
- Yurrandaali Cultural Services

B.3. List of registered Aboriginal parties for the project

- Tocomwall
- Ginninderra Aboriginal Corporation
- Guntawang Aboriginal Resources Inc
- Darug Tribal Aboriginal Corporation
- Darug Boorooberongal Elders Aboriginal Corporation
- Tharawal Local Aboriginal Land Council
- Wailwan Aboriginal Group
- Kamilaroi-Yankuntjatjara Working Group
- Barraby Cultural Services
- Yulay Cultural Services
- Yurrandaali Cultural Services
- Didge Ngunawal Clan
- Gulaga
- Cubbitch Barta Native Title Claimants Aboriginal Corporation
- Kamilaroi-Yankuntjatjara Working Group
- Muragadi Heritage Indigenous Corporation
- PD Ngunawal Consultancy
- Darug Aboriginal Landcare
- Darug Aboriginal Cultural Heritage Assessments
- Ngunawal Heritage Aboriginal Corporation
- Darug Custodian Aboriginal Corporation
- A1 Indigenous Services
- Barking Owl Aboriginal Corporation

B.4. Pre-notification documentation sent and received

EXTENT
HERITAGE ADVISORS
TO AUSTRALIA AND
THE ASIA PACIFIC

? August 2018

<<Organisation>>

<<Address 1>>
<<Address 2>>
<<email>>

Attn: <<Name>>

Re: Request for Information on Aboriginal Stakeholders for an Aboriginal Cultural Heritage Assessment Report of Glenfield Planned Precinct (Campbelltown Local Government Area)

Dear Sir / Madam,

Extent Heritage Pty Ltd has been engaged by the Department of Planning and Environment to develop an Aboriginal Cultural Heritage Assessment Report (ACHAR) to inform planning for the Glenfield Planned Precinct in the Campbelltown Local Government Area (**Figure 1**).

The proponent's representative is Luke Johnson, Planning Officer, Greater Macarthur Growth Area, and his contact details are: [redacted] address GPO Box 39, Sydney NSW 2001.

The purpose of the ACHAR is to characterise the archaeological resource of the subject area in order to assess the potential impact from the proposed development, and form the basis for management recommendations for the subject area. The ACHAR may be used to support an application for an Aboriginal Heritage Impact Permit (AHIP), if required.

In accordance with the NSW Office of Environment and Heritage's (OEH) *Aboriginal cultural heritage consultation requirements for proponents 2010*, I am writing to you to seek information on relevant Aboriginal individuals and/or communities that you are aware of, who may hold cultural knowledge for the area relevant to determining the significance of Aboriginal objects and/or places. It would be appreciated if you could provide this information to me as soon as possible, to the Sydney address below or by email to [redacted]

Please don't hesitate to contact me on (02) 9555 4000 if you have any queries or concerns.

Yours sincerely,

Fenella Atkinson

Senior Heritage Advisor | Extent Heritage

Built & Urban Heritage | Aboriginal Heritage | Archaeology | Interpretation | Intangible Cultural Heritage | World Heritage

EXTENT HERITAGE PTY LTD
ABN 24 608 666 306 ACN 608 666 306
info@extent.com.au
extent.com.au

SYDNEY
3/73 Union Street
Pyrmont
P 02 9555 4000

MELBOURNE
13/240 Sydney Road
Coburg
P 03 9388 0622

BRISBANE
Level 7, 757 Ann Street
Fortitude Valley
P 07 3667 8881

PERTH
Level 24,
108 St. Georges Terrace
P 08 9381 5206

Figure 1. Location of the subject area (source: DPE 2018).

OFFICE OF THE REGISTRAR
ABORIGINAL LAND RIGHTS ACT 1983 (NSW)

19 September 2018

Fenella Atkinson
Extent Heritage Pty Ltd
3/73 Union Street
PYRMONT NSW 2009

Dear Fenella

Re: Request - Search for Registered Aboriginal Owners

I refer to your email dated 30 August 2018 regarding an Aboriginal Cultural Heritage Assessment to inform planning for the Glenfield Planned Precinct, located in the Campbelltown area, NSW.

I have searched the Register of Aboriginal Owners and the project area described does not have Registered Aboriginal Owners pursuant to Division 3 of the *Aboriginal Land Rights Act 1983*.

I suggest that you contact Tharawal Local Aboriginal Land Council on 02 4681 0059regarding the project. They may also be able to assist you in identifying other Aboriginal stakeholders that wish to participate.

Yours sincerely

[redacted]

Jodie Rikiti
Administration Officer
Office of the Registrar, ALRA

Address: Level 3, 2 – 10 Wentworth Street, PARRAMATTA NSW 2150
Post: P.O Box 5068, PARRAMATTA NSW 2124
Phone: 02 8633 1266

NSW GOVERNMENT | Office of Environment & Heritage

Our reference: SF/18 7188
gs.ach@environment.nsw.gov.au

Fenella Atkinson
Senior Heritage Advisor
EXTENT HERITAGE PTY LTD
3/73 Union Street
PYRMONT NSW 2009
[redacted]

Dear Fenella,

Thank you for your email dated 31 August 2018 to the Office of Environment and Heritage (OEH) regarding obtaining a list of the Aboriginal stakeholders that may have an interest in the Aboriginal cultural heritage assessment report for the Glenfield Planned Precinct project in Campbelltown City Council local government area.

Please find attached the list of Aboriginal stakeholders known to OEH that may have an interest in the project. OEH's list of regional stakeholders is a list of groups, organisations or individuals who may hold cultural knowledge relevant to a proposal in a region. You should contact the stakeholders who have indicated an interest in the Local Government Area (LGA) relevant to your project. Contact details are correct as at the time of registration. Consultation with Aboriginal people should not be confused with employment. Inclusion on the OEH's list is not an automatic right to employment. It is the decision of a proponent on who they choose to engage to deliver services based on a range of considerations including skills, relevant experience, and WHS considerations. To be clear, the proponent is under no obligation to employ Aboriginal people registered for consultation.

Further, receipt of this information does not remove the requirement of a proponent/consultant to advertise in local print media and contact other bodies seeking interested Aboriginal parties. Consultation with Aboriginal stakeholders must be in accordance with the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* which can be found on the Office of Environment and Heritage (OEH) public website by accessing the following link:

http://www.environment.nsw.gov.au/resources/cultureheritage/commconsultation/09781ACHconsultreq.pdf

Level 2, 10 Valentine Avenue, Parramatta NSW 2150
PO Box 644, Parramatta NSW 2124
Tel: (02) 9995 5477
ABN 30 841 387 271
www.environment.nsw.gov.au

Assessment of Aboriginal cultural heritage at the precinct planning stage allows for the values to be identified, avoided and conserved up front. Please note that work undertaken for precinct planning is unlikely to be sufficiently detailed or specific enough to support an AHIP application for developments associated with smaller areas within the precinct. However, the precinct planning work could provide important broader and landscape information that could be included in future AHIP applications.

If you wish to discuss any of the above matters further, please email gs.ach@environment.nsw.gov.au.

Yours sincerely

[redacted]

SUSAN HARRISON
Senior Team Leader Planning
Greater Sydney Branch
Communities and Greater Sydney Division

LIST OF ABORIGINAL STAKEHOLDERS FOR THE GREATER SYDNEY BRANCH HELD BY OEH FOR THE PURPOSES OF THE *ABORIGINAL CULTURAL HERITAGE CONSULTATION REQUIREMENTS FOR PROPONENTS 2010*

These lists are provided to proponents in accordance with section 4.1.2 of the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (the "Consultation Requirements") which commenced on 12 April 2010.

The consultation process involves getting the views of, and information from, Aboriginal people and reporting on these. It is not to be confused with other field assessment processes involved in preparing a proposal and an application. Consultation does not include the employment of Aboriginal people to assist in field assessment and/or site monitoring. Aboriginal people may provide services to proponents through a contractual arrangement however, this is separate from consultation. The proponent is not obliged to employ those Aboriginal people registered for consultation. Consultation as per these requirements will continue irrespective of potential or actual employment opportunities for Aboriginal people.

A copy of the Consultation Requirements can be found on the OEH website at: http://www.environment.nsw.gov.au/resources/cultureheritage/commconsultation/09781ACHconsultreq.pdf.

Under the Consultation Requirements; a proponent is required to provide Aboriginal people who hold cultural knowledge relevant to determining the cultural significance of Aboriginal objects and/or places as relevant to the proposed project area, with an opportunity to be involved in consultation. Section 3.3.1 of the Consultation Requirements states that Aboriginal people who can provide this information are, based on Aboriginal lore and custom, the traditional owners or custodians of the land that is the subject of the proposed project.

The Consultation Requirements also state that:

> *Traditional owners or custodians with appropriate cultural heritage knowledge to inform decision making who seek to register their interest as an Aboriginal party are those people who:*
> - *continue to maintain a deep respect for their ancestral belief system, traditional lore and custom*
> - *recognise their responsibilities and obligations to protect and conserve their culture and heritage and care for their traditional lands or Country*
> - *have the trust of their community, knowledge and understanding of their culture, and permission to speak about it.*

Please note: the placement of an organisation's name on any OEH Aboriginal stakeholder list for the Consultation Requirements does not override a proponent's requirement to also advertise in the local newspaper and to seek from other sources the names of any other Aboriginal people who may hold cultural knowledge as required under clause 80C of the National Parks and Wildlife Regulation 2009.

How to use this list

1. **Determine which Local Government Area/s (LGA/s) your project area falls into**
2. **Identify which organisations and individuals on the list have an interest in the LGA/s relevant to your project – identified in column 6 of the list**
3. **Contact the organisations/individuals who have indicated an interest in the relevant LGA/s and invite them to register an interest in your project**

Do not reproduce the attached list in publicly available reports and other documents. Your report should only contain the names of the organisations and individuals who you have invited to register an interest in your project and those who have registered as stakeholders for your project.

PLEASE NOTE: THE STAKEHOLDER LIST HAS NOT BEEN UPDATED TO INCLUDE THE RECENT COUNCIL MERGERS AND NAME CHANGES. PLEASE CONSIDER THE PRE-MERGER COUNCIL BOUNDARIES WHEN DETERMINING WHO SHOULD BE INVITED TO REGISTER FOR YOUR PROJECT.

Note that the actual list of stakeholders has been omitted for sensitivity reasons.

From: Margaret Bottrell [redacted]
Sent: Monday, 3 September 2018 7:33 AM
To: Fenella Atkinson [redacted]
Subject: Request for Information on Aboriginal Stakeholders for an Aboriginal Cultural Heritage Assessment Report of Glenfield Planned Precinct (Campbelltown Local Government Area)

To Fenella Atkinson,

RE: **Request for Information on Aboriginal Stakeholders for an Aboriginal Cultural Heritage Assessment Report of Glenfield Planned Precinct (Campbelltown Local Government Area)**

Thank you for your email dated 30 August 2018, requesting assistance with identifying Aboriginal stakeholder groups or persons who may have an interest in your project area.

Greater Sydney Local Land Services (GS LLS) acknowledges that Local Land Services have been listed in *Section 4.1.2 (g)* of the*Aboriginal cultural heritage consultation requirements for proponents 2010,* under *Part 6, National Parks and Wildlife Act 1974* as a source of information to obtain the "names of Aboriginal people who may hold cultural knowledge relevant to determining the significance of Aboriginal *objects* and/or *places*".

GS LLS is a partner with many Aboriginal communities in the region on many natural resource management (NRM) projects. However, GS LLS is not the primary source for contacting or managing contact lists for Aboriginal communities or persons that may inform or provide comment on planning issues. GS LLS considers cultural heritage issues that relate to land-use planning in general and only considers culture and heritage issues in the context of NRM.

We strongly recommend that you make contact with the Office of Environment and Heritage (OEH), Cultural Heritage Division, for all-inclusive contact lists of persons and organisations that may assist with your investigation.

Note: Hawkesbury Nepean Catchment Management Authority (HNCMA) no longer exists. All work previously carried out by HNCMA in now delivered by Greater Sydney Local Land Services (GS LLS).

Regards,

--
Margaret Bottrell Senior Strategic Land Services Officer
(Aboriginal Communities)
Greater Sydney Local Land Service
Level 4, 2-6 Station Street Penrith
PO Box 4515 Penrith Westfields NSW 2750
[redacted]
W: http://www.lls.nsw.gov.au

B.5. Notification documentation sent and registrations received

EXTENT
HERITAGE ADVISORS
TO AUSTRALIA AND
THE ASIA PACIFIC

11 September 2018

Re: Aboriginal Cultural Heritage Assessment of Glenfield Planned Precinct (Campbelltown Local Government Area): Project Notification and Invitation to Register an Interest

Dear Sir or Madam,

In accordance with the NSW Office of Environment and Heritage's (OEH) *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010*, I am writing to notify you that Extent Heritage Pty Ltd has been engaged by the Department of Planning and Environment (the proponent) to develop an Aboriginal Cultural Heritage Assessment Report (ACHAR) to inform planning for the Glenfield Planned Precinct in the Campbelltown Local Government Area (**Figure 1**).

The land in question is within the Campbelltown Local Government Area. It comprises approximately 605 hectares, and is bounded by Glenfield Road to the north, the Georges River to the east, Bunbury Curran Creek to the south, and the Hume Highway and Campbelltown Road to the west. The proponent's representative is Luke Johnson, Planning Officer, Greater Macarthur Growth Area, and his contact details are: ph. [redacted], email [redacted] address GPO Box 39, Sydney NSW 2001.

Extent Heritage will be undertaking the assessment in accordance with the relevant OEH guidelines. An important part of the assessment will be Aboriginal community consultation that aims to identify cultural values and places of importance within the study area. The purpose of the consultation is to assist the proponent in preparing the ACHAR for the study area, and if necessary to assist OEH in considering the assessment and any Aboriginal Heritage Impact Permit (AHIP) application.

We are inviting registrations from Aboriginal individuals and/or organisations, who may hold relevant cultural knowledge for determining the Aboriginal cultural heritage of the area, and who wish to be involved in the community consultation process. If you or your organisation is interested in being part of the consultation process, please provide a registration of interest to Fenella Atkinson at the Sydney address below or by email to [redacted]

Registrations are requested by **26 September 2018**.

Built & Urban Heritage | Aboriginal Heritage | Archaeology | Interpretation | Intangible Cultural Heritage | World Heritage

EXTENT HERITAGE PTY LTD
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info@extent.com.au
extent.com.au

SYDNEY
3/73 Union Street
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P 02 9555 4000

MELBOURNE
13/240 Sydney Road
Coburg
P 03 9388 0622

BRISBANE
Level 7, 757 Ann Street
Fortitude Valley
P 07 3667 8881

PERTH
Level 24,
108 St. Georges Terrace
P 08 9381 5206

To assist us with communicating project information effectively, it would be appreciated if you could include the following information in your registration of interest:

1. A clear identification of the organisation registering an interest in the project.
2. Your preferred method of communication with Extent Heritage and the proponent during consultation for this project, including a nominated contact person and contact details.
3. Comment on the level of consultation/project involvement you wish to have. Do you wish to be actively involved in heritage identification, assessment and management, or do you only want to be kept informed about the assessment process and outcomes?
4. If you wish to be involved in any meetings or fieldwork, please ensure we have current copies of your public liability, workers compensation and professional indemnity insurances (if available) as soon as possible.

As part of the consultation process we are obliged to provide the contact details of registered parties to OEH and Tharawal Local Aboriginal Land Council, unless instructed otherwise. Please advise us if you do not wish this to occur.

Please also consider the following, but note that these issues can also be discussed over the course of the project:

1. Guidance on the protocols, sensitivity, use and/or distribution of any cultural information that you provide to Extent Heritage and the proponent as part of this project;
2. Identification of any Aboriginal objects or places of cultural significance that you are aware of within or in the vicinity of the proposed activity area.

.

Please don't hesitate to contact me on (02) 9555 4000 if you have any queries or concerns.

Yours sincerely,

[redacted]

Fenella Atkinson

Senior Heritage Advisor | Extent Heritage

Built & Urban Heritage | Aboriginal Heritage | Archaeology | Interpretation | Intangible Cultural Heritage | World Heritage

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PERTH
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108 St. Georges Terrace
P 08 9381 5206

Figure 1. Location of the subject area (source: DPE 2018).

From: Caza X [redacted]
Date: Wednesday, 3 October 2018 at 4:09 pm
To: Fenella Atkinson [redacted]
Subject: Fw: Glenfield Planned Precinct - invitation to register an interest

A1 Indigenous Services
Contact: Carolyn
M: [redacted]
E: [redacted]
A: [redacted]
ABN: [redacted]

Hi Fenella,
A1 would like to register for consultation and an field work for this project.
I hold cultural knowledge and connection to this area.
Insurances are attached
Thank you
Carolyn Hickey

From: Amanda Hickey [redacted]
Date: Thursday, 4 October 2018 at 9:20 am
To: Fenella Atkinson [redacted]
Subject: Glenfield Planned Precinct, in Campbelltown Local Government Area

Hi Fenella

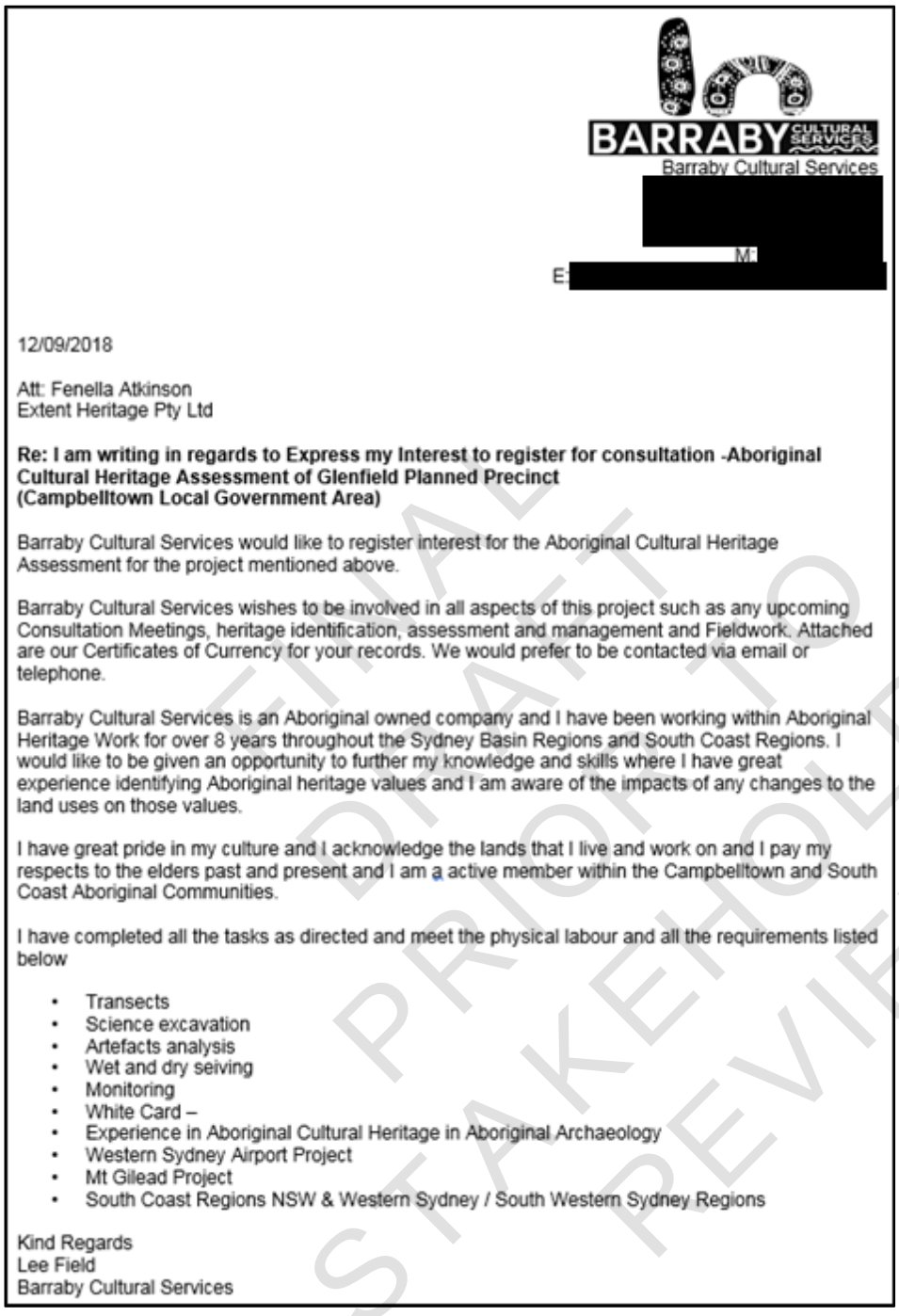
AHCS would like to register interest for upcoming field work at Glenfield Planned Precinct, in Campbelltown
AHCS holes cultural knowledge to determine indigenous artefacts and cultural awareness to the land
Thank you for your time looking forward to hear from you
Amanda Hickey from AHCS

From: lee field [redacted]
Date: Wednesday, 12 September 2018 at 1:14 pm
To: Fenella Atkinson [redacted]
Subject: Re: Glenfield Planned Precinct - invitation to register an interest

Att: Fenella Atkinson,

Barraby Cultural Services would like to register our interest in this project.
Please see our attached Letter of Registration and Current copies of Insurances for field work.

Kind Regards
Lee Field
Barraby Cultural Services
[redacted]



BARRABY CULTURAL SERVICES
Barraby Cultural Services
[redacted]
M:
E: [redacted]

12/09/2018

Att: Fenella Atkinson
Extent Heritage Pty Ltd

Re: I am writing in regards to Express my Interest to register for consultation -Aboriginal Cultural Heritage Assessment of Glenfield Planned Precinct (Campbelltown Local Government Area)

Barraby Cultural Services would like to register interest for the Aboriginal Cultural Heritage Assessment for the project mentioned above.

Barraby Cultural Services wishes to be involved in all aspects of this project such as any upcoming Consultation Meetings, heritage identification, assessment and management and Fieldwork. Attached are our Certificates of Currency for your records. We would prefer to be contacted via email or telephone.

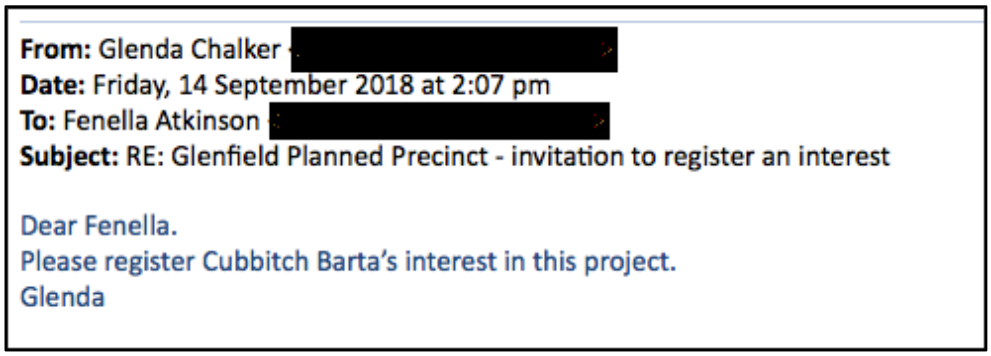
Barraby Cultural Services is an Aboriginal owned company and I have been working within Aboriginal Heritage Work for over 8 years throughout the Sydney Basin Regions and South Coast Regions. I would like to be given an opportunity to further my knowledge and skills where I have great experience identifying Aboriginal heritage values and I am aware of the impacts of any changes to the land uses on those values.

I have great pride in my culture and I acknowledge the lands that I live and work on and I pay my respects to the elders past and present and I am a active member within the Campbelltown and South Coast Aboriginal Communities.

I have completed all the tasks as directed and meet the physical labour and all the requirements listed below

- Transects
- Science excavation
- Artefacts analysis
- Wet and dry seiving
- Monitoring
- White Card –
- Experience in Aboriginal Cultural Heritage in Aboriginal Archaeology
- Western Sydney Airport Project
- Mt Gilead Project
- South Coast Regions NSW & Western Sydney / South Western Sydney Regions

Kind Regards
Lee Field
Barraby Cultural Services



From: Glenda Chalker [redacted]
Date: Friday, 14 September 2018 at 2:07 pm
To: Fenella Atkinson [redacted]
Subject: RE: Glenfield Planned Precinct - invitation to register an interest

Dear Fenella.
Please register Cubbitch Barta's interest in this project.
Glenda

Environme
nt &
Heritage

Darug Aboriginal Land Care

(Uncle Des Dyer)

[redacted]

Fenella Atkinson
Archaeologist
Extent Heritage
3 / 73 Union Street
Pyrmont
NSW

Re: Glrnfielf Planned Precinct .

Dear Jillian,

Darug Aboriginal Land care / Uncle Des Dyer. Have no objections to the planned development.

The Darug Aboriginal Land care would like to **register** for this project and be consulted and take part in survey and test excavations. This project falls within the Darug land.

We are Traditional Owner, our members have lived on Darug land for most of their lives and worked in the area. We have responsibility to look after the plants, creeks and rivers on Darug land. We have been doing Cultural Heritage Assessments for over 20 year and still do today.

Our members are family and have lived in the area, we consult with them by Email and phone.
We would like to take part in any field survey and test excavations. Attend any meetings.

We have over 20years experience and all our works have White cards
Our preferred method of communication is by Email.

Our Site Officer Ricky Fields

Mobile [redacted]
Email [redacted]

For all Survey test excavation and salvage works please contact him for all work matters.
please contact him

We agree and understand you can give our contacted details to others.

The area is an important part of our culture and valued by the community as most of the people that lived there were Darug. We can provide cultural knowledge during the survey.
Our preferred option to receive the project information is by E-mail.

Thank you
Kind regards
Des Dyer. Manager.
Darug Elder
Email [redacted]
Mobile [redacted]

DARUG BOOROOBEROGAL ELDERS ABORIGINAL CORPORATION

[redacted]

11/9/2018

TO: Fenella Atkinson
Senior Heritage Advisor

RE: Glenfield Planned Precinct

Notification and Registration of ALL Darug Aboriginal Interests
Glenfield Planned Precinct

Please be advice that Darug Boorooberongal Elders Aboriginal Corporation (DBEAC) is seeking to be involved in any and all consultation meetings and field work.

This office specialises in Darug Aboriginal and community consultation. The membership comprises of traditional owners from the area in question who retain strong story, song lines, oral history and continued contact. We have a continued spiritual connection to Darug nation territories. We would also like to state, that we do not except or support any person or organisation that are NOT from the DARUG Nation to have input on the project area.

Please also be advised that this Aboriginal organisation does not do volunteer work or attend unpaid meetings. I hope that you advise your client of this, so that, this group will not be discriminated against and refused paid field work.

We will be delighted to discuss this project with you in the near future.
Please do not hesitate to send all correspondence should be emailed to our email [redacted]

Yours faithfully

Uncle
Gordon Workman
Darug Elder

Sites Officer
[redacted]

DARUG LAND
OBSERVATIONS PTY LTD
ABN [redacted]

Email: [redacted]
PO BOX [redacted]
Mobile: [redacted]

11th September, 2018

Att: Fenella Atkinson
Extent Heritage Pty Ltd
3/73 Union Street
PYRMONT NSW 2009

Notification and Registration of ALL Aboriginal Interests

RE: PROPOSED PLANNING FOR THE GLENFIELD PLANNED PRECINCT

Aboriginal Cultural Heritage Assessment

Dear Fenella,

Please be advised that Darug Land Observations Pty Ltd is seeking to be involved in any and all consultation meetings and fieldwork.

This office specialises in Aboriginal and community consultations, and has a membership that comprises of Traditional owners from the area in question. Those retain strong story, song lines, oral history and continued contact.

We would also like to state that we do not accept or support any person or organisation that are NOT from the DARUG Nation that comments regarding the said area.

Please also be advised that this Aboriginal organisation does not do volunteer work or attend unpaid meetings. I hope that you advise your client of this so that, 'This Group', will not be discriminated against and refused paid fieldwork. DLO's rate is [redacted] including GST.

All correspondence should be emailed to: [redacted] and any further consultation during this project can be directed to Anna O'Hara on mobile [redacted]

Yours sincerely,

[redacted]
Jamie Workman

[redacted]
Uncle Gordon Workman

DARUG CUSTODIAN
ABORIGINAL CORPORATION

DARUG CUSTODIAN
ABORIGINAL
CORPORATION

PO BOX [redacted]
PHONE: [redacted]
MOBILE: [redacted] Leanne Watson
Justine Coplin
EMAIL: [redacted]

Attention extent

Subject: Glenfield Planned Precinct

Dear Fenella

Our group is a non- profit organisation that has been active for over forty years in Western Sydney, we are a Darug community group with over three hundred members. The main aim in our constitution is the care of Darug sites, places, wildlife and to promote our culture and provide education on the Darug history.

The Glenfield area is an area that our group has a vast knowledge of, we have worked and lived in for many years, this area is significant to the Darug people due to the connection of sites and the continued occupation. Our group has been involved in all previous assessments and works in this area as a traditional owner Darug group for the past 40 plus years.

Therefore we would like to register our interest for full consultation and involvement in the above project area.

Please contact us with all further enquiries on the above contacts.

Regards

[redacted]

Justine Coplin

From: lilly carroll [redacted]
Date: Wednesday, 12 September 2018 at 1:29 pm
To: Fenella Atkinson [redacted]
Subject: Re: Glenfield Planned Precinct - invitation to register an interest

Hi Fanella,

DNC would like to register an interest into Glenfield Planned Precinct Project
P.S we miss your muffins
Kind Regards
Paul Boyd & Lilly Carroll
Directors DNC

From: Ginninderra Aboriginal Corporation [redacted]
Sent: Tuesday, 11 September 2018 12:44 PM
To: Fenella Atkinson [redacted]
Subject: Re: Glenfield Planned Precinct - invitation to register an interest

Hi Fenella,

Ginninderra Aboriginal Corporation would love to be involved. I'll send through our expression of interest shortly.

Have a lovely day.

Kind regards,

Krystle Elliott
Ginninderra Aboriginal Corporation
M: [redacted]

From: Gulaga [redacted]
Date: Wednesday, 12 September 2018 at 7:46 pm
To: Fenella Atkinson [redacted]
Subject: Re: Glenfield Planned Precinct - invitation to register an interest

This is confirmation that we wish to register our interest in the above project
Glenfield Planned Precinct
Kind Regards
Wendy Smith
Cultural Heritage Officer
Gulaga
[redacted]

Guntawang Aboriginal Resources Incorporated

Ref: Knowledge and Experience of Aboriginal Culture and Heritage

1/ The Culture and Heritage Officer Brad Maybury has worked for Gandangara local Aboriginal Land Council from 2015-2018, he has lived in this area for 40 years. He is a member of the Local Aboriginal Land Council and he knows where the cultural Aboriginal sites are in the location of the area.

Brad has previously gone back and lived on his Aboriginal Country, he is from the Dyiringanj people of Wallaga Land in the Yuin Nation. Brad has also learnt about Aboriginal sites from his Uncles, including grinding grooves, scar trees, rock shelters and has conducted a repatriation ceremony within the Cabrogal Lands. Brad is a Traditional Owner of Biamanga and Gulaga Mountains and Native Title Claimant NSD 1331/2017 with the South Coast Peoples.

2/ Guntawang Aboriginal Resources Inc is an Aboriginal Group of Elders in the Liverpool and Fairfield LGA. Information will be provided and sourced from Board Members and Associate Members of Guntawang through presentations to the Board and members.

3/ Brad's previous experience as the Cultural and Heritage Officer at Gandangara Local Aboriginal Land Council has led him to provide surveys and reports to management and Aboriginal Community Members.

Brad was invited by Sydney Water to speak about the significance of Aboriginal Sites at the National AAA Conference at Terrigal on the Central Coast in 2016.

Brad was involved with Paul Irish from MDCA in a Cultural Aboriginal Study for Fairfield Council.

4/ Guntawang rates are [redacted]

5/ Please see the attached document of insurance coverage for Guntawang Aboriginal Resources Inc.

Kind regards

Wendy Morgan

[redacted]

From: Wendy Morgan [redacted]
Sent: Tuesday, 11 September 2018 1:14 PM
To: Fenella Atkinson [redacted]
Subject: Re: Glenfield Planned Precinct - invitation to register an interest

Hi Fenella,

GARI will be available for the stakeholders meeting and GARI would like to express an interest.

Kind regards

Wendy Morgan
President
[redacted]

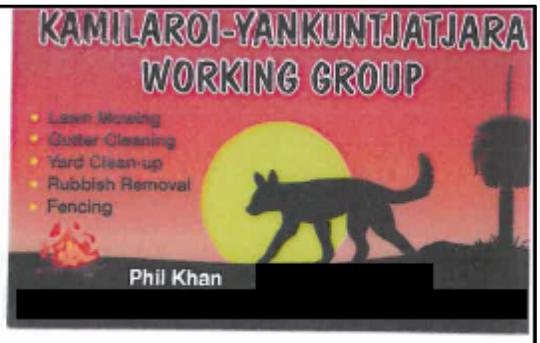
From: philip khan [redacted]
Date: Wednesday, 12 September 2018 at 9:24 am
To: Fenella Atkinson [redacted]
Subject: Re: Glenfield Planned Precinct - invitation to register an interest

Hi Fenella

KAMILAROI YANKUNTJARA WORKING GROUP would like to be involved in the Glenfield Planned Precinct, in Campbelltown Local Government Area , hope to hire more about it.

All The Best

Phil Khan,



Pollowan Phillip Khan
[redacted]

Fenella Atkinson
Extent Heritage
3/73 Union Street
Pyrmont NSW 2009

13/09/2018

Dear Fenella

Thank you for your letter informing me that Extent has been engaged to undertake archaeological work at Glenfield Planned Precinct Campbelltown Local Government, and, that you are inviting Aboriginal organisations to register, if they wish to be involved in the community consultation process and the Fieldwork.

As Senior Aboriginal person who has for the past forty or so years (40) actively participated in the Protection Aboriginal Cultural Heritage throughout the Sydney Basin , and particularly throughout Western Sydney, I, on behalf of the Kamilaroi Yankuntjatjara Working Group, wish to provide to you my organisations' registration of interest.

Information in my registration of Interest:

1. I am a Senior Aboriginal and Principal of the Kamilaroi -Yankuntjatjara Working Group, and all Aboriginal entity [redacted]

2. I prefer communicating by, Mail, Telephone, and; and I am, the Principal, person to contact, and;
   My contact details are:
   Phillip Khan
   [redacted]

3. I wish to be involved and participate in all levels of consultation/project involvement. I wish to attend all meetings, and, participate in available field work; and would receive a copy of the report.

4. I attach to this letter a copy of Kamilaroi- Yankuntjatjara Working Group's; GIO Public Liability Insurance; GIO Workers Compensation Certificate.

Should you wish me to provide further information, please do not hesitate to contact me on [redacted]

Yours Sin[redacted]

Pollowan Phillip Khan

From: Muragadi [redacted]
Sent: Wednesday, 19 September 2018 12:22 PM
To: Fenella Atkinson [redacted]
Subject: RE: Glenfield Planned Precinct - invitation to register an interest

Hi Fenella,
Please register our corporations interest in the above project, we look forward to working with you.
Thanks
Anthony

From: Perio Delponte [redacted]
Sent: Wednesday, 19 September 2018 3:20 PM
To: Fenella Atkinson [redacted]
Subject: Registration of Interest for Glenfield Planned Precinct

Good afternoon.

PD Ngunawal Consultancy is pleased to express our interest in participating in the proposed Glenfield Planned Precinct.

Our consultants are passionate about their Aboriginal heritage and dedicated to working with Governments, proponents, archeologists and other Aboriginal organisations to ensure that Aboriginal objects and places with Aboriginal cultural heritage significance are appropriately protected.

Our consultants have extensive experience in Aboriginal heritage assessment work, having worked on a variety of sites around the Canberra and South Eastern NSW region and have helped to identify many different types of objects and places with Aboriginal cultural heritage significance.

We look forward to your response.

If you require any further information, please do not hesitate to contact me.

Kind regards,
Peiro Delponte
[redacted]

From: Information Officer [redacted]
Sent: Tuesday, 11 September 2018 2:29 PM
To: Fenella Atkinson [redacted]
Subject: RE: Glenfield Planned Precinct - invitation to register an interest

Good afternoon Fenella

Thank you for your email. Tharawal LALC would like to register as an interested party for all work undertaken at Glenfield Planned Precinct.
We look forward to hear from you.

Yours in Unity
Rebecca JARVIS
Cultural & Heritage Officer
Tharawal Local Aboriginal Land Council
220 West Parade
Couridjah NSW 2571
[redacted]

I acknowledge and pay my respects to the traditional custodians of the land on which I work and live. I pay my respects to my Elders both past and present and thank them for their leadership, guidance and knowledge.

From: Scott Franks [redacted]
Sent: Tuesday, 11 September 2018 12:35 PM
To: Fenella Atkinson <fatkinson@extent.com.au>
Subject: Re: Glenfield Planned Precinct - invitation to register an interest

Fenella,

Thank you for the information, could you please register Tocomwall for this project please.

Regards
Scott Franks

Consultant
Tocomwall Pty Ltd
[redacted]

From: Phillip Boney [redacted]
Date: Wednesday, 12 September 2018 at 5:14 pm
To: Fenella Atkinson <[redacted]
Subject: Glenfield project

Hi Fenella,

My name is Phil Boney/Wailwan Aboriginal Group. I am registering for the Glenfield project. My number is [redacted] My email is [redacted] and attaches is my insurance. If successful i look forward to working with you. Thank you.

With regards, Phil Boney
Wailwan Aboriginal Group
Get Outlook for Android

From: "WIDESCOPE ." [redacted]
Date: Thursday, 4 October 2018 at 3:20 pm
To: Fenella Atkinson [redacted]
Subject: RE:Re: Aboriginal Cultural Heritage Assessment of Glenfield Planned Precinct (Campbelltown Local Government Area): Project Notification and Invitation to Register an Interest

Subject: Glenfield Planned Precinct - invitation to register an interest

letter attached for registration

Hi Fenella,

Please Register my Expression of Interest Re: Aboriginal Cultural Heritage Assessment Report (ACHAR) Glenfield Planned Precinct, in Campbelltown Local Government Area

I am a Aboriginal cultural knowledge holder I have knowledge relevant in determining Aboriginal objects and places I hold a cultural connection to Campbelltown and surrounding areas

Contact person is myself Steven Hickey: mobile number [redacted] or
Administration Donna Hickey [redacted]
Landline [redacted]
Preferred method of contact is via email
[redacted]

Regards
Steven Hickey

From: arika jalomaki [redacted]
Date: Wednesday, 12 September 2018 at 1:18 pm
To: Fenella Atkinson [redacted]
Subject: Re: Glenfield Planned Precinct - invitation to register an interest

Dear Fenella Atkinson,

Yulay Cultural Services would like to register our interest in this project.
Please see our attached Letter of Registration and Current Insurances

Many Thanks
Arika Jalomaki
Yulay Cultural Services

YULAY CULTURAL SERVICES

[redacted]

Date: 12th September 2018

To:
Fenella Atkinson
Extent Heritage Pty Ltd

RE: I am writing in regards to Express my Interest to register for consultation - Aboriginal Cultural Heritage Assessment of Glenfield Planned Precinct (Campbelltown Local Government Area)

Yulay Cultural Services would like to register interest for the Aboriginal Cultural Heritage Assessment for the project mentioned above.

Yulay Cultural Services wishes to be involved in all aspects of this project such as any upcoming Consultation Meetings, heritage identification, assessment and management and Fieldwork. Attached are our Certificates of Currency for your records. We would prefer to be contacted via email or telephone.

Yulay Cultural Services is an Aboriginal owned company and I have been working within Aboriginal Heritage Work for over 8 years throughout the Hunter and Sydney Basin Regions in which I have already completed field work on the M12 and Western Sydney Airport and I would like to be given an opportunity to further my knowledge and skills where I have great experience identifying Aboriginal heritage values and I am aware of the impacts of any changes to the land uses on those values.
I have great pride in my culture and I acknowledge the lands that I live and work on and I pay my respects to the elders past and present and I am a active member within the Campbelltown and Blacktown Aboriginal Communities.

I have completed all the tasks as directed and meet the physical labour and all the requirements listed below

- Transects
- Science excavation
- Artefacts analysis
- Wet and dry seiving
- Monitoring
- White Card – On request
- Experience in Aboriginal Cultural Heritage in Aboriginal Archaeology
- RMS on the Hunter Expressway (15-18 months)
- Various Mines in the Hunter Region
- Local Sydney Basin - Western Sydney / South Western Sydney Regions
- Mt Gillard Project
- Western Sydney Airport
- RMS – M12
- Casual Sites Officer – Tharawal Aboriginal Land Council

If you require any further information regarding this letter please don't hesitate in contacting me or the following references

Name: Andrew Costello
Company: SNR Archaeologist Jacob Pty Ltd
Heritage Pty Ltd
Phone: [redacted]

Name: Vanessa Hardy
Company: Archaeologist Virtus

Phone: [redacted]

Kind Regards

Arika Jalomaki
Yulay Cultural Services

From: Bo Field [redacted]
Date: Wednesday, 12 September 2018 at 1:21 pm
To: Fenella Atkinson [redacted]
Subject: Re: Glenfield Planned Precinct - invitation to register an interest

Dear Fenella,

Yurrandaali would like to register our interest in this project.

Please see attached:
Letter of Registration
Workers Compensation Certificate
Public Liability Certificate

Regards
Bo Field
Yurrandaali Cultural Services
Sent from Outlook

Yurrandaali Cultural Services

[redacted]

12/09/2018

Att: Fenella Atkinson
Extent Heritage Pty Ltd

Re: I am writing in regards to Express my Interest to register for consultation - Aboriginal Cultural Heritage Assessment of Glenfield Planned Precinct (Campbelltown Local Government Area)

Yurrandaali Cultural Services would like to register interest for the Aboriginal Cultural Heritage Assessment for the project mentioned above.

Yurrandaali Cultural Services wishes to be involved in all aspects of this project such as any upcoming Consultation Meetings, heritage identification, assessment and management and Fieldwork. Attached are our Certificates of Currency for your records. We would prefer to be contacted via email or mobile.

Yurrandaali Cultural Services is an Aboriginal owned company and I have been working within Aboriginal Heritage Work for over 10 years throughout the South Coast and Sydney Basin Regions.

I would like to be given an opportunity to further my knowledge and skills where I have great experience identifying Aboriginal heritage values and I am aware of the impacts of any changes to the land uses on those values.

I have completed all the tasks as directed and meet the physical labour and all the requirements listed below

- Transects
- Science excavation
- Artefacts analysis
- Wet and dry seiving
- Monitoring
- White Card –
- Experience in Aboriginal Cultural Heritage in Aboriginal Archaeology
- RMS on the Hunter Expressway (15-18 months)
- South Coast Regions & Western Sydney / South Western Sydney
- Mt Gillard Project
- Western Sydney Airport
- RMS – M12

I have great pride in my culture and I acknowledge the lands that I live and work on and I pay my respects to the elders past and present and I am a active member within the Campbelltown and South Coast Aboriginal Communities.

Kind Regards
Bo Field
Yurrandaali Cultural Services

EXTENT
HERITAGE ADVISORS
TO AUSTRALIA AND
THE ASIA PACIFIC

10 October 2018

Office of Environment and Heritage

Senior Team Leader Planning
Greater Sydney
PO Box 644
Parramatta NSW 2124

Attn: Susan Harrison

Aboriginal Cultural Heritage Assessment of Glenfield Planned Precinct (Campbelltown Local Government Area): Registered Aboriginal Parties

Dear Susan,

On behalf of the Department of Planning and Environment, Extent Heritage is preparing an Aboriginal Cultural Heritage Assessment Report for Glenfield Planned Precinct. As part of the ACHAR, we are following the *Aboriginal cultural heritage consultation requirements for proponents 2010* (DECCW 2010). I am writing to provide you with a list of the Registered Aboriginal Parties (RAPs) for the project, and a copy of the notification, in accordance with Section 4.1.6 of the Requirements.

The RAPs for the project are the following:

- A1 Indigenous Services
- Amanda Hickey Cultural Services
- Barking Owl Aboriginal Corporation
- Barraby Cultural Services
- Cubbitch Barta Native Title Claimants Aboriginal Corporation
- Darug Aboriginal Cultural Heritage Assessments
- Darug Aboriginal Landcare Inc
- Darug Boorooberongal Elders Aboriginal Corporation
- Darug Custodian Aboriginal Corporation
- Darug Land Observations
- Darug Tribal Aboriginal Corporation
- Didge Ngunawal Clan
- Ginninderra Aboriginal Corporation
- Gulaga
- Guntawang Aboriginal Resources Inc
- Kamilaroi-Yankuntjatjara Working Group

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13/240 Sydney Road
Coburg
P 03 9388 0622

BRISBANE
Level 7, 757 Ann Street
Fortitude Valley
P 07 3667 8881

PERTH
Level 24,
108 St. Georges Terrace
P 08 9381 5206

- Muragadi Heritage Indigenous Corporation
- Ngunawal Heritage Aboriginal Corporation
- PD Ngunawal Consultancy
- Tharawal Local Aboriginal Land Council
- Tocomwall
- Wailwan Aboriginal Group
- Widescope Indigenous Group
- Yulay Cultural Services
- Yurrandaali Cultural Services

A copy of the project notification is enclosed. If you have any questions, please do not hesitate to let me know.

Yours faithfully,

Fenella Atkinson

Senior Heritage Advisor | Extent Heritage

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EXTENT
HERITAGE ADVISORS
TO AUSTRALIA AND
THE ASIA PACIFIC

10 October 2018

Tharawal Local Aboriginal Land Council
PO Box 168
Picton NSW 2571

Attn: Rebecca Jarvis

Aboriginal Cultural Heritage Assessment of Glenfield Planned Precinct (Campbelltown Local Government Area): Registered Aboriginal Parties

Dear Rebecca,

On behalf of the Department of Planning and Environment, Extent Heritage is preparing an Aboriginal Cultural Heritage Assessment Report for Glenfield Planned Precinct. As part of the ACHAR, we are following the *Aboriginal cultural heritage consultation requirements for proponents 2010* (DECCW 2010). I am writing to provide you with a list of the Registered Aboriginal Parties (RAPs) for the project, and a copy of the notification, in accordance with Section 4.1.6 of the Requirements.

The RAPs for the project are the following:

- A1 Indigenous Services
- Amanda Hickey Cultural Services
- Barking Owl Aboriginal Corporation
- Barraby Cultural Services
- Cubbitch Barta Native Title Claimants Aboriginal Corporation
- Darug Aboriginal Cultural Heritage Assessments
- Darug Aboriginal Landcare Inc
- Darug Boorooberongal Elders Aboriginal Corporation
- Darug Custodian Aboriginal Corporation
- Darug Land Observations
- Darug Tribal Aboriginal Corporation
- Didge Ngunawal Clan
- Ginninderra Aboriginal Corporation
- Gulaga
- Guntawang Aboriginal Resources Inc
- Kamilaroi-Yankuntjatjara Working Group
- Muragadi Heritage Indigenous Corporation
- Ngunawal Heritage Aboriginal Corporation
- PD Ngunawal Consultancy

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- Tharawal Local Aboriginal Land Council
- Tocomwall
- Wailwan Aboriginal Group
- Widescope Indigenous Group
- Yulay Cultural Services
- Yurrandaali Cultural Services

A copy of the project notification is enclosed. If you have any questions, please do not hesitate to let me know.

Yours faithfully,

[redacted]

Fenella Atkinson

Senior Heritage Advisor | Extent Heritage

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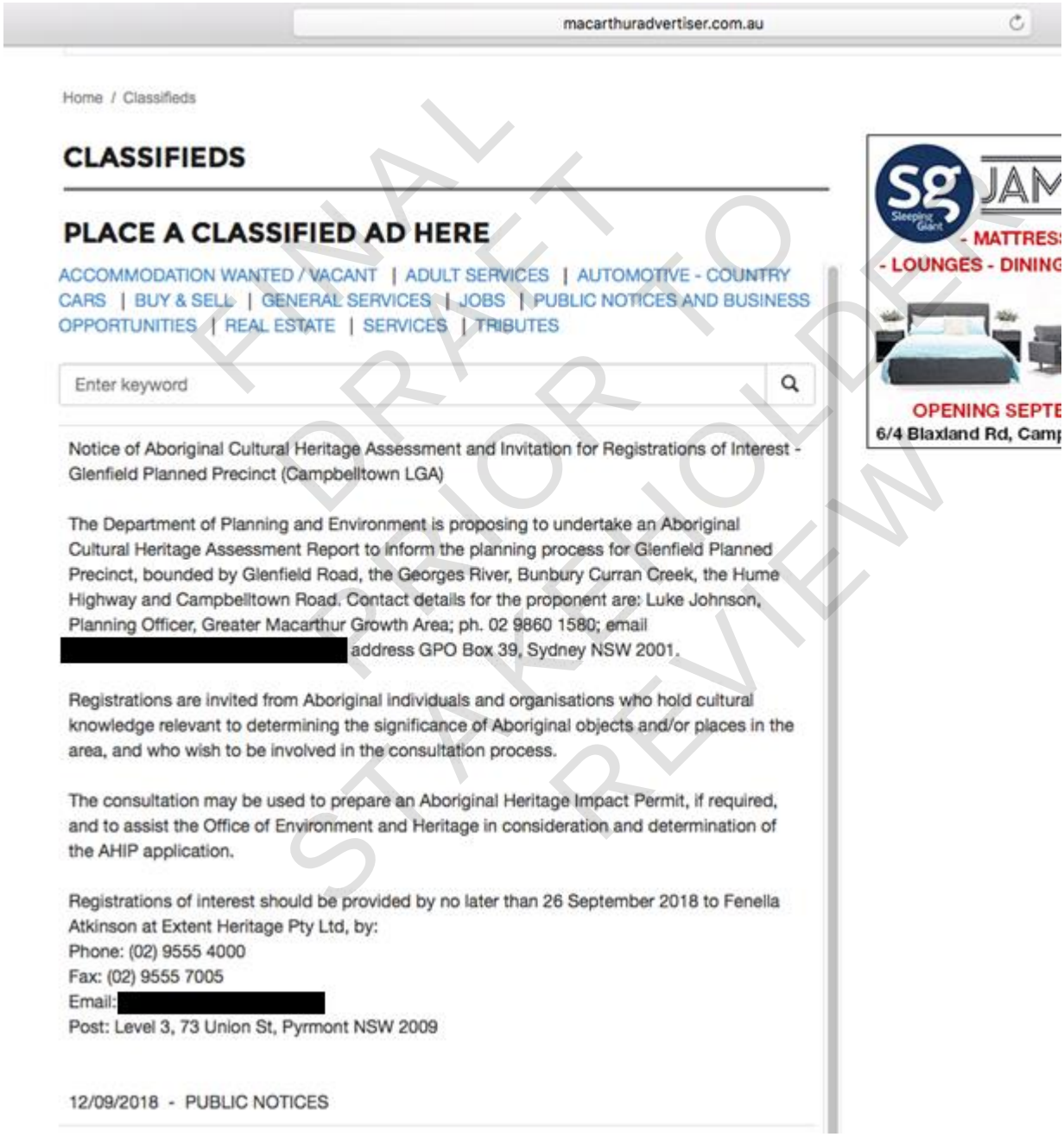
B.6. Notification documentation – newspaper advert

Campbelltown Macarthur Advertiser

12 September 2018



macarthuradvertiser.com.au

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Enter keyword

Notice of Aboriginal Cultural Heritage Assessment and Invitation for Registrations of Interest - Glenfield Planned Precinct (Campbelltown LGA)

The Department of Planning and Environment is proposing to undertake an Aboriginal Cultural Heritage Assessment Report to inform the planning process for Glenfield Planned Precinct, bounded by Glenfield Road, the Georges River, Bunbury Curran Creek, the Hume Highway and Campbelltown Road. Contact details for the proponent are: Luke Johnson, Planning Officer, Greater Macarthur Growth Area; ph. 02 9860 1580; email [redacted] address GPO Box 39, Sydney NSW 2001.

Registrations are invited from Aboriginal individuals and organisations who hold cultural knowledge relevant to determining the significance of Aboriginal objects and/or places in the area, and who wish to be involved in the consultation process.

The consultation may be used to prepare an Aboriginal Heritage Impact Permit, if required, and to assist the Office of Environment and Heritage in consideration and determination of the AHIP application.

Registrations of interest should be provided by no later than 26 September 2018 to Fenella Atkinson at Extent Heritage Pty Ltd, by:
Phone: (02) 9555 4000
Fax: (02) 9555 7005
Email: [redacted]
Post: Level 3, 73 Union St, Pyrmont NSW 2009

12/09/2018 - PUBLIC NOTICES

B.7. Presentation of information/assessment methodology sent and any feedback received

EXTENT
HERITAGE ADVISORS
TO AUSTRALIA AND
THE ASIA PACIFIC

3 October 2018

«Group»

«Address_line_1»
«Address_line_2»

«Email»

Attn: «First_name» «Last_name»

Re: Glenfield Planned Precinct (Campbelltown Local Government Area): Proposed Aboriginal Cultural Heritage Assessment Methodology

Dear «First_name»,

Thank you for your registration of interest in the Aboriginal Cultural Heritage Assessment Report (ACHAR) for the Glenfield Planned Precinct (**Figure 1**). Your interest in the project has been formally registered in accordance with the *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (DECCW 2010).

The proponent is the Department of Planning and Environment. The proponent's representative is Luke Johnson, Planning Officer, Greater Macarthur Growth Area, and his contact details are: [redacted] address GPO Box 39, Sydney NSW 2001.

Enclosed is the proposed methodology for the project, which includes archaeological survey. I would like to invite you to review the methodology and provide any comments you may have by **31 October 2018**.

If you have any questions, please do not hesitate to contact me on (02) 9555 4000, or by email at [redacted]

Yours sincerely,

[redacted]

Fenella Atkinson

Senior Heritage Advisor | Extent Heritage

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Background

The Department of Planning and Environment is engaged in planning for the future development of the Glenfield Planned Precinct, in the Campbelltown Local Government Area. The land in question comprises approximately 605 hectares, and is bounded by Glenfield Road to the north, the Georges River to the east, Bunbury Curran Creek to the south, and the Hume Highway and Campbelltown Road to the west (**Figure 1**).

A Heritage Impact Statement prepared by City Plan Heritage (2018) has identified potential Aboriginal heritage values within the study area. Preliminary advice prepared by Extent Heritage (2018) has identified three registered Aboriginal sites and areas of heritage sensitivity within the study area. Both of these documents recommended the completion of an Aboriginal Cultural Heritage Assessment Report (ACHAR) to inform preparation of the master plan and Aboriginal heritage management in future stages of the planning and development process.

Proposed Assessment Methodology

Extent Heritage proposes to develop an ACHAR in accordance with the following guidelines:

- *Guide to Investigating, Assessing and Reporting on Aboriginal Cultural Heritage in NSW* (OEH 2011);
- *Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales* (DECCW 2010);
- *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010* (DECCW 2010)

Development of the ACHAR will include the following tasks:

- Aboriginal community consultation.
- Desktop research.
- Archaeological survey (further detail is provided below). This component would be undertaken in conjunction with representatives of the Registered Aboriginal Parties (RAPs), based on selective commercial engagements determined by the proponent.
- Preparation of the ACHAR. This incorporates Aboriginal consultation and any cultural information provided, outlines the findings of the archaeological survey, assesses potential impacts to Aboriginal heritage, and makes recommendations on the management of any Aboriginal heritage sites and/or objects that may be present within the proposed study area.

Archaeological Survey Methodology

We propose to undertake an archaeological survey in accordance with the requirements of the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* (DECCW 2010). The survey will aim to identify any visible Aboriginal objects (material traces and evidence of Aboriginal occupation), as well as identify those areas where it can be inferred that, although not visible, material traces or evidence of Aboriginal land use have a likelihood of being present under the ground surface (potential archaeological deposits [PADs]).

The survey will be carried out by the archaeological team and RAP site officers and will include:

- Inspection of a sample of all landforms present within the study area, with a proportionate emphasis on those landforms considered to have archaeological potential;
- Pedestrian survey of transects;
- Taking representative photographs of survey transects and landforms where informative;
- Recording landform and general soil information for each survey unit;
- Recording the land surface and vegetation conditions encountered during the survey (accounting as appropriate for things like vegetation, rock outcrops, coarse fragments, etc.), and how these impact on the visibility of objects;
- Identification of previously recorded Aboriginal sites, and recording of any newly identified Aboriginal sites observed during the survey; and
- Recording of spatial information suitable for mapping according to *Code of Practice* requirements and the calculation of survey coverage.

The archaeological survey is designed to sample the study area in a systematic manner by targeting areas of ground surface visibility and including a representative sample of all landforms. Any areas of sandstone outcrop will be examined for evidence of Aboriginal engravings and grinding grooves, and any sandstone overhangs will be examined for the presence of pigmented art, or occupational deposits. Any areas of ground exposure will be examined for archaeological evidence such as stone artefacts, charcoal and shell. Ground surfaces and cut-and-fill features will also be examined to determine the degree of soil disturbance, erosion and potential for subsurface archaeological deposits.

Timeframes

Extent Heritage proposes the following indicative timeframes for the project:

- Distribution of this document to Registered Aboriginal Parties: 3 October 2018.
- End of review period for the proposed methodology: 31 October 2018.
- Archaeological survey to be undertaken: early / mid November 2018.
- Distribution of the draft report to Registered Aboriginal Parties for review: late November / early December 2018.

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Figure 1. Location of the subject area (source: DPE 2018).

From: Caza X [redacted]
Date: Thursday, 4 October 2018 at 5:21 pm
To: Fenella Atkinson [redacted]
Subject: Re: Glenfield Planned Precinct - invitation to register an interest

Hi Fenella,
I tried to call you to give my verbal agreement to the methodology, so no need to call back.
I just writing to say I support the methodology for the glenfield project.
Thank you
Carolyn Hickey

From: Amanda Hickey [redacted]
Date: Thursday, 4 October 2018 at 3:37 pm
To: Fenella Atkinson [redacted]
Subject: Re: Glenfield Planned Precinct, in Campbelltown Local Government Area

Hi Fenella

Thank you for your email
I have just quickly briefed over the methodology and AHCS is happy with the methodology
I'm so sorry for the late Registration I only received the email yesterday. I hope AHCS can still participate in this project.
If there's anything you need please don't hesitate to contact me..
[redacted]
Thank you for your time look forward to hearing from you
Amanda Hickey from AHCS

From: Barking Owl Aboriginal Corporation [redacted]
Date: Tuesday, 9 October 2018 at 2:03 pm
To: Fenella Atkinson [redacted]
Subject: Re: Glenfield Planned Precinct - assessment methodology for review please

Good afternoon Fenella,

I have read the methodology for the Glenfield Planned Precinct and I am happy to continue with no further comments or recommendations.

Kind regards

Jody Kulakowski
Barking Owl Aboriginal Corporation

From: lee field [redacted]
Date: Thursday, 4 October 2018 at 7:46 am
To: Fenella Atkinson [redacted]
Subject: Re: Glenfield Planned Precinct - assessment methodology for review please

Dear Fenella,

Barraby Cultural Services supports the methodology for this project.

Kind Regards
Lee Field

Cubbitch Barta Native Title Claimants
Aboriginal Corporation
[redacted]

23rd October, 2018.

Extent Heritage Advisors
3/73 Union Street,
PYRMONT. N.S.W.

Dear Fenella,

RE; GLENFIELD PRECINCT

Thank you for the proposed methodology for the Glenfield Precinct. The methodology for the project is suitable. However there are some things that I would like to mention.

There was recently test excavations carried out within this boundary at the Glenfield Special school by AMAC. There were no artefacts located during the testing. A huge part of this area, has been taken up with the new Leppington rail line, which included the salvage and destruction of sites through this area. There was many years ago a test carried out by Mary Dallas near the creek line. There is also a scarred tree, that is just the stump, with the scar, within the transmission line easement.

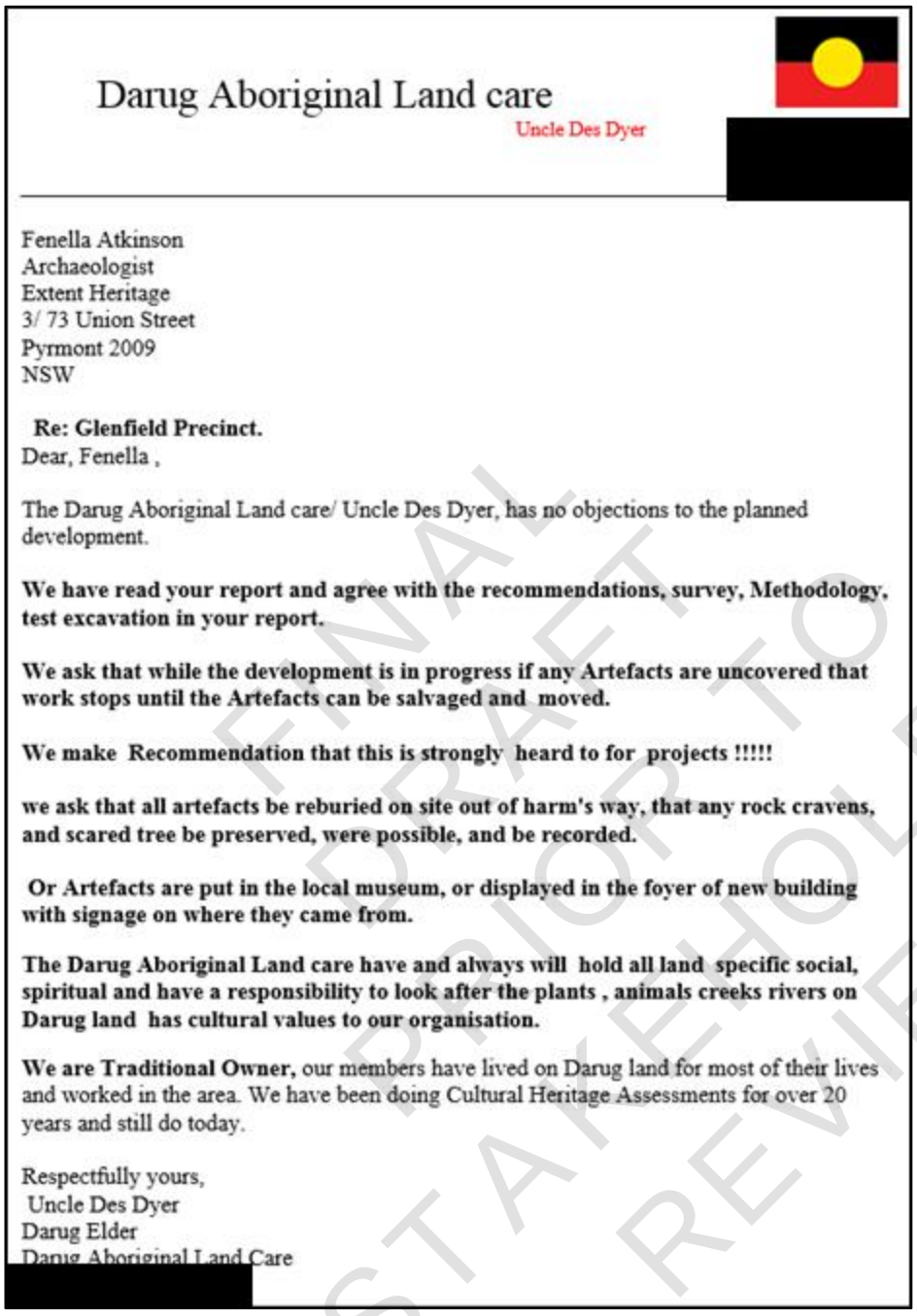
Looing forward to working with you on this project.

Yours faithfully,

[redacted]

Glenda Chalker

[redacted]



Darug Aboriginal Land care

Uncle Des Dyer

[redacted]

Fenella Atkinson
Archaeologist
Extent Heritage
3/ 73 Union Street
Pyrmont 2009
NSW

Re: Glenfield Precinct.
Dear, Fenella ,

The Darug Aboriginal Land care/ Uncle Des Dyer, has no objections to the planned development.

We have read your report and agree with the recommendations, survey, Methodology, test excavation in your report.

We ask that while the development is in progress if any Artefacts are uncovered that work stops until the Artefacts can be salvaged and moved.

We make Recommendation that this is strongly heard to for projects !!!!!

we ask that all artefacts be reburied on site out of harm's way, that any rock cravens, and scared tree be preserved, were possible, and be recorded.

Or Artefacts are put in the local museum, or displayed in the foyer of new building with signage on where they came from.

The Darug Aboriginal Land care have and always will hold all land specific social, spiritual and have a responsibility to look after the plants , animals creeks rivers on Darug land has cultural values to our organisation.

We are Traditional Owner, our members have lived on Darug land for most of their lives and worked in the area. We have been doing Cultural Heritage Assessments for over 20 years and still do today.

Respectfully yours,
Uncle Des Dyer
Darug Elder
Darug Aboriginal Land Care

[redacted]

From: Lynette Marlow [redacted]
Date: Friday, 5 October 2018 at 6:16 am
To: Fenella Atkinson [redacted]
Subject: Re: Glenfield Planned Precinct - assessment methodology for review please

Hi Fenella

Darug Boorooberongal Elders Aboriginal Corporation "DBEAC" has looked over your Aboriginal Archaeological Survey Methodology's for this site and as always you have covered everything perfectly and we hope to see you out in the field.

With Thank's
Uncle
Gordon Workman
Darug Elder

DARUG CUSTODIAN
ABORIGINAL CORPORATION

DARUG CUSTODIAN
ABORIGINAL
CORPORATION

PO BOX [redacted]
PHONE: [redacted]
MOBILE: [redacted] Leanne Watson
Justine Coplin
EMAIL: [redacted]

Attention: Extent

Subject: Glenfield Planned Precinct

Dear Fenella

Our group is a non- profit organisation that has been active for over forty years in Western Sydney, we are a Darug community group with over three hundred members. The main aim in our constitution is the care of Darug sites, places, wildlife and to promote our culture and provide education on the Darug history.

Our group promotes Darug Culture and works on numerous projects that are culturally based as a proud and diverse group. It has been discussed by our group and with many consultants and researches that our history is generic and is usually from an early colonists perspective or solely based on archaeology and sites. These histories are adequate but they lack the people's stories and parts of important events and connections of the Darug people and also other Aboriginal people that now call this area home and have done so for numerous generations.

This 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.

Landscapes and landforms are significant to us for the information that they hold and the connection to Darug people. Aboriginal people (Darug) had a complex lifestyle that was based on respect and belonging to the land, all aspects of life and survival did not impact on the land but helped to care for and conserve land and the sustenance that the land provided. As Darug people moved through the land there were no impacts left, although

there was evidence of movement and lifestyle, the people moved through areas with knowledge of their areas

and followed signs that were left in the landscape. Darug people knew which areas were not to be entered and respected the areas that were sacred.

Knowledge of culture, lifestyle and lore have been part of Darug people's lives for thousands of years, this was passed down to the next generations and this started with birth and continued for a lifetime. Darug people spent a lifetime learning and as people grew older they passed through stages of knowledge, elders became elders with the learning of stages of knowledge not by their age, being an elder is part of the kinship system this was a very complicated system based on respect.

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.

The *Aboriginal cultural heritage consultation requirements for proponents* Section 4.1.8 refers to "Aboriginal organisations representing Aboriginal people who hold cultural knowledge". Recent consultation meetings have revealed that many of these Aboriginal organisations and individuals do not hold cultural knowledge of the Western Sydney area. The increasing involvement of such parties in cultural heritage management means that genuine local Aboriginal organisations are unable to properly care for our cultural heritage.

Many Aboriginal organisations listed in the OEH response letter do not contribute to the Aboriginal community of Western Sydney. Individuals listed in the OEH response letter do not represent the community and while they may be consulted with, should not be employed for their own personal financial benefit.

Our organisation is committed to providing benefits back to our local Aboriginal community through such measures as funding the local Aboriginal juniors' touch football team, painting classes for the local children and donating money to various charities. Employment in cultural heritage activities is source of income that organisations such as ours can use to contribute to beneficial activities and support within the community.

Darug custodian Aboriginal Corporation's site officers have knowledge of Darug land, Darug Culture,Oral histories, landforms, sites, Darug history, wildlife, flora and legislative requirements. We have worked with consultants and developers for many years in Western Sydney (Darug Land) for conservation, site works, developments and interpretation/education strategie

Darug Custodian Aboriginal Corporation have received and reviewed the report for Glenfield Planned Precinct.

We support the recommendations set out in this report.

Please contact us with all further enquiries on the above contacts.

Regards

[redacted]

Justine Coplin

DARUG LAND
OBSERVATIONS PTY LTD
ABN [redacted]

Email [redacted]
PO BOX [redacted]

16th October, 2018

Fenella Atkinson
Extent Heritage Pty Ltd
3/73 Union Street
PYRMONT NSW 2009

Dear Fenella,

RE: GLENFIELD PLANNED PRECINCT

Aboriginal Cultural Heritage Assessment: Project Information & Proposed Assessment Methodology

Darug Land Observations Pty Ltd (DLO) has reviewed the project information and proposed assessment methodology, and supports the methodology for the proposed future developments of Glenfield Planned Precinct, in the Campbelltown Local Government Area.

In relation to the long-term storage of recovered artefacts, if any, we strongly believe that recovered artefacts should be re-buried on Country (the study area).

Furthermore, DLO would like to be involved in the archaeological survey, test excavations and/or any other forms of works to be carried out on the site.

Look forward to working with you on this project.

Yours sincerely,

[redacted]
Jamie Workman
Darug Land Observations Pty Ltd

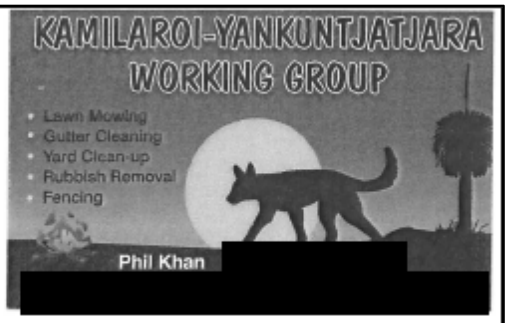
[redacted]
Uncle Gordon Workman
Darug Elder

From: lilly carroll [redacted]
Sent: Monday, 22 October 2018 8:36 PM
To: Fenella Atkinson [redacted]
Subject: Re: Glenfield Planned Precinct - assessment methodology for review please

Hi Fanella,

DNC has read through methodology and agrees with all proposals for Glenfield project

Kind regards
Paul Boyd & Lilly Carroll
Directors DNC



Pollowan Phillip Khan
[redacted]

Fenella Atkinson
Extent Heritage
3/73 Union Street
Pyrmont NSW 2009

9/10/2018

Dear Fenella

Thank you for your letter of Proposed Aboriginal Cultural Heritage Assessment Methodology for Glenfield Planned Precinct Campbelltown Local Government Area.
I have read your Proposed Assessment Methodology, and, Archaeological Survey Methodology and I am happy with it all. Regards Philip Khan [redacted]

As Senior Aboriginal person who has for the past forty or so years (40) actively participated in the Protection Aboriginal Cultural Heritage throughout the Sydney Basin , and particularly throughout Western Sydney, I, on behalf of the Kamilaroi Yankuntjatjara Working Group, wish to provide to you my organisations' registration of interest.

Information in my registration of Interest:

1. I am a Senior Aboriginal and Principal of the Kamilaroi -Yankuntjatjara Working Group, and all Aboriginal entity [redacted]

2. I prefer communicating by, Mail, Telephone, and; and I am, the Principal, person to contact, and;
   My contact details are:
   Phillip Khan
   [redacted]

3. I wish to be involved and participate in all levels of consultation/project involvement. I wish to attend all meetings, and, participate in available field work; and would receive a copy of the report.

4. I attach to this letter a copy of Kamilaroi- Yankuntjatjara Working Group's; GIO Public Liability Insurance; GIO Workers Compensation Certificate.

Should you wish me to provide further information, please do not hesitate to contact me on [redacted]

Yours Sincerely
[redacted]
Pollowan Phillip Khan

From: Scott Franks [redacted]
Sent: Wednesday, 3 October 2018 2:48 PM
To: Fenella Atkinson [redacted]
Subject: Re: Glenfield Planned Precinct - assessment methodology for review please

Fenella,

Thank you for the assessment methodology, I have read and understood the document and the clear proposal you intend to follow. Apart from Tocomwall knowing that the area in question did contain a continued camp site, I support your methodology and see know need to recommend any changes.

Regards
Scott Franks

Consultant
Tocomwall Pty Ltd
[redacted]

From: Phillip Boney [redacted]
Date: Wednesday, 3 October 2018 at 4:00 pm
To: Fenella Atkinson [redacted]
Subject: glenfield

Hi Fenella,

I have read the methodology report and i am happy with your view. thank you.

With regards, Phil Boney
Wailwan Aboriginal Group

From: "WIDESCOPE ." [redacted]
Date: Sunday, 7 October 2018 at 5:32 pm
To: Fenella Atkinson [redacted]
Subject: RE: Aboriginal Cultural Heritage Assessment of Glenfield Planned Precinct (Campbelltown Local Government Area):

Hi Fenella,

Widescope, have reviewed the Glenfield Planned Precinct assessment methodology and are in agreement with the recommendations provided.

Regards
Steven Hickey

From: arika jalomaki [redacted]
Date: Thursday, 4 October 2018 at 7:47 am
To: Fenella Atkinson [redacted]
Subject: Re: Glenfield Planned Precinct - assessment methodology for review please

Dear Fenella

Yulay Cultural Services supports the methodology for this project.

Kind Regards
Arika Jalomaki

From: Bo Field [redacted]
Date: Thursday, 4 October 2018 at 7:46 am
To: Fenella Atkinson [redacted]
Subject: Re: Glenfield Planned Precinct - assessment methodology for review please

Dear Fenella

Yurrandaali Cultural Services supports the methodology for this project.

Kind Regards
Bo Field

B.8. Report review

TBD FOLLOWING RAP REVIEW OF FINAL DRAFT REPORT

Appendix C. Archaeological Background

C.1. Site type information

Aboriginal Sites

Aboriginal sites are classified in a number of ways. At the most basic level, sites are recorded as 'closed sites' or 'open sites'. Closed sites are associated with rock shelters, and include other evidence of Aboriginal occupation that may be present, such as accumulated cultural deposit within the shelter ('potential archaeological deposit' or PAD), faunal remains (animal bone or shell), and rock art on the shelter walls (paintings or engravings). Open sites are broadly defined, and encompass all other types of Aboriginal sites identified where there is no rock shelter. The most common types of open sites found in NSW include artefacts, which can occur almost anywhere in the landscape, grinding grooves, rock art across formations, culturally modified trees, and shell deposits (middens) (OEH 2012:7). The presence or absence of stone artefacts is often a defining factor, although it is worth pointing out that almost any site is likely to have at least some associated artefacts, as discard or loss of this most ubiquitous and practically indestructible marker of Aboriginal archaeology is likely to have occurred anywhere that Aboriginal people stopped or gathered for any length of time.

Any one site (or close group of linked sites described as a 'site complex') can contain several different site features. For example, a shelter may have art on the walls, artefacts on the floor surface or outside the shelter, and be predicted to contain faunal remains and further artefacts in the accumulated deposit inside.

A description of terms used to describe different site features is provided in Table 19. Other features or types of Aboriginal cultural sites that do not necessarily leave physical evidence may exist or have once existed in the study area however such sites have not previously been recorded reflecting the archaeological focus of the past studies and the loss of traditional knowledge of such places in this area. Similarly there may be places of contemporary significance to Aboriginal people in the precincts and this will require consultation with the Aboriginal community to identify such places.

Table 19. Aboriginal site feature definitions (OEH 2012)

Site Feature	Definition
Artefact	Objects such as stone tools, and associated flaked material, spears, manuports, grindstones, discarded stone flakes, modified glass or shell demonstrating evidence of use of the area by Aboriginal people.
Potential Archaeological Deposit (PAD)	An area where Aboriginal objects may occur below the ground surface. The term 'potential archaeological deposit' was first applied in Sydney regional archaeology in the 1980s, and referred to rock shelters that were large enough and with enough accumulated deposit to allow archaeologists to presume that subsurface cultural material was highly likely to be present. Since then it has come to include open sites where the same prediction can be made.
Modified Tree (Carved or Scarred)	Trees which show the marks of modification as a result of cutting of bark from the trunk for use in the production of shields, canoes, boomerangs, burials shrouds, for medicinal purposes, foot holds etc., or alternately intentional carving of the heartwood of the tree to form a permanent marker to indicate ceremonial use/significance of a nearby area, again these carvings may also act as territorial or burial markers.
Stone Quarry	Usually a source of good quality stone which is quarried and used for the production of stone tools
Burial	A traditional or contemporary (post-contact) burial of an Aboriginal person, which may occur outside designated cemeteries and may not be marked, e.g., in caves, marked by stone cairns, in sand areas, along creek banks etc.

Stone Artefacts

Aboriginal stone artefacts are an important source of archaeological information because stone is preserved for long periods of time whereas organic materials such as bone, shell, wood and plant fibres often decay. Stone artefacts provide valuable information about technology, economy, cultural change through time and settlement patterning. Stone has also been used for 'relative' dating of sites where direct methods such as radiocarbon dating cannot be applied. A technological sequence for stone artefacts for the region was first described in the late 1940s by Fred McCarthy and has since been refined over time by Hiscock and Attenbrow (Hiscock and Attenbrow 1998, 2005) into the 'Eastern Regional Sequence':

- Capertian – is distinguished by large uniface pebble tools, core tools, horse-hoof cores, scrapers and hammerstones. Backed artefacts occasionally present. Generally dates to before 5,000 years BP.
- Early Bondaian – Aspects of the Capertian assemblage continue, but backed artefacts and ground-edged artefacts increase. Artefacts during this period were predominantly made from fine-grained siliceous stone such as silcrete and tuff. Generally dated from 5,000 BP to 2,800 BP.
- Middle Bondaian – Characterised by backed artefacts, particularly Bondi Points and ground-edged artefacts. Artefacts made from siliceous materials, however quartz becomes more frequent. Generally dated from 2,800 BP to 1,600 BP.

- Late Bondaian – characterised by bipolar technology, eloueras, ground-edged artefacts, and bone and shell artefacts. Bondi points are virtually absent and artefacts are predominantly made from Quartz. Generally dated from 1,600 BP to European contact.

Survivability of the Archaeological Record

The following observations can be made about the nature and survivability of the archaeological record across the Cumberland subregion:

- Archaeological material is often found in areas of sub-surface exposure, such as those caused by erosion.
- Surface evidence (or the absence of surface evidence) does not necessarily indicate the potential, nature or density of sub-surface material. Extensive excavations have shown that areas with no surface evidence often contain sub-surface deposits buried beneath current ground surfaces (JMCHM 2001; Kohen 1984).
- Due to the limitations of surface surveys, test excavation is often required to establish the nature and density of archaeological material.
- Aboriginal cultural material is more likely to survive in areas that contain remnant portions of the pre-European soil profile, in contrast to landforms that have been impacted by historical or recent disturbances.
- The potential for survival of any archaeological sites will largely depend on the degree of past disturbance.
- Past disturbance to the soil profile can be due to European activity such as clearing, ploughing, grazing, and urban development and/or due to environmental factors such as flooding events, erosion and colluvial movement. These activities may disturb, erode or remove the natural soil profile completely.
- Aboriginal stone artefacts are more likely to survive because stone is preserved for long periods of time whereas organic materials such as bone, shell, wood and plant fibres decay.
- A major impact of more than 200 years of post-contact settlement on Aboriginal sites would have been the destruction of carved and scarred trees, which would have been removed as part of clearing for agricultural activities and the construction of infrastructure such as buildings and roads. However, there is some potential for culturally modified trees to survive in areas where there are stands of remnant native vegetation.

C.2. AHIMS sites

A copy of the AHIMS search and Site Cards are provided in the subsequent pages.

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AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : SYD18043 GPP
Client Service ID : 545479

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
45-5-2725	PAD-OS-1	AGD	56	303720	6241200	Open site	Valid	Artefact : -		98369,98370,98371,98443,98739
Contact		Recorders	Mrs.Robynne Mills					Permits	1396	
45-5-2744	MLE1	AGD	56	303500	6238550	Open site	Valid	Artefact : -		98739
Contact		Recorders	Dominic Steele Archaeological Consulting					Permits	1989	
45-5-2875	PAD 6 Open Campsite	AGD	56	303610	6240840	Open site	Valid	Potential Archaeological Deposit (PAD) : -		
Contact		Recorders	Central West Archaeological and Heritage Services Pty Ltd					Permits	1737	
45-5-2919	H667	AGD	56	306990	6237370	Open site	Valid	Artefact : -		
Contact		Recorders						Permits		
45-5-2934	H414	AGD	56	307600	6237325	Open site	Valid	Potential Archaeological Deposit (PAD) : -		
Contact		Recorders	Navin Officer Heritage Consultants Pty Ltd					Permits		
45-5-2931	H581	AGD	56	306850	6237490	Open site	Valid	Artefact : -		
Contact		Recorders	Navin Officer Heritage Consultants Pty Ltd					Permits		
45-5-2963	Site H928	AGD	56	306840	6237510	Open site	Valid	Modified Tree (Carved or Scarred) : -		
Contact		Recorders	Bobbie Oakley					Permits		
45-5-2968	Site H1025	AGD	56	307280	6237500	Open site	Valid	Artefact : -		
Contact		Recorders	Navin Officer Heritage Consultants Pty Ltd					Permits		
45-5-2946	H363	AGD	56	307050	6237560	Open site	Valid	Artefact : -		
Contact		Recorders						Permits		
45-5-2947	H362	AGD	56	307130	6238300	Open site	Valid	Artefact : -		
Contact		Recorders						Permits		
45-5-3984	EPSW 1	GDA	56	302803	6238254	Open site	Destroyed	Artefact : 1		102184
Contact		Recorders	Australian Museum Consulting (AM Consulting),Kelleher Nightingale Consulting Pt					Permits	3849	
45-5-4643	2102CVW IF1	GDA	56	302979	6240675	Open site	Valid	Artefact : -		
Contact		Recorders	Ms.Fenella Atkinson					Permits	4344	
45-5-4644	2102CVW IF2	GDA	56	302947	6240669	Open site	Valid	Artefact : -		
Contact		Recorders	Ms.Fenella Atkinson					Permits	4343,4344	
45-5-4645	2102 CVW IF3	GDA	56	302946	6240653	Open site	Valid	Artefact : -		
Contact		Recorders	Ms.Fenella Atkinson					Permits	4344	

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AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : SYD18043 GPP
Client Service ID : 545479

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
45-5-5287	Tertiary terrace	GDA	56	307380	6241253	Open site	Valid	Potential Archaeological Deposit (PAD) : -		
	Contact	**Recorders**	Artefact - Cultural Heritage Management - Pyrmont,Mr.ryan taddeucci					**Permits**		
45-6-2428	Glenfield S.T.	AGD	56	306200	6239600	Open site	Not a Site	Modified Tree (Carved or Scarred) : -	Scarred Tree	103036
	Contact	**Recorders**	Anthony English					**Permits**		
45-5-0123	George's River;	AGD	56	307040	6236964	Closed site	Valid	Art (Pigment or Engraved) : -	Shelter with Art	
	Contact	**Recorders**	R Etheridge					**Permits**		
45-5-0124	Harris Creek;	AGD	56	307040	6236964	Closed site	Valid	Art (Pigment or Engraved) : -	Shelter with Art	
	Contact	**Recorders**	B Mclean					**Permits**		
45-5-0720	Kiawaka 3	AGD	56	305980	6240600	Open site	Valid	Modified Tree (Carved or Scarred) : -	Scarred Tree	1360
	Contact	**Recorders**	Mary Dallas Consulting Archaeologists (MDCA)					**Permits**	264	
45-5-0721	Kiawaka 4	AGD	56	306000	6240660	Open site	Valid	Modified Tree (Carved or Scarred) : -	Scarred Tree	1360
	Contact	**Recorders**	Mary Dallas Consulting Archaeologists (MDCA)					**Permits**		
45-5-0722	Kiawaka 5	AGD	56	306300	6240340	Open site	Valid	Modified Tree (Carved or Scarred) : -	Scarred Tree	1360
	Contact	**Recorders**	Mary Dallas Consulting Archaeologists (MDCA)					**Permits**	2521	
45-5-0723	Kiawaka 2	AGD	56	306250	6240150	Open site	Valid	Artefact : -	Open Camp Site	1360
	Contact	**Recorders**	Mary Dallas Consulting Archaeologists (MDCA)					**Permits**		
45-5-0724	Kiawaka 1	AGD	56	305950	6240270	Open site	Valid	Artefact : -	Open Camp Site	1360
	Contact	**Recorders**	Mary Dallas Consulting Archaeologists (MDCA)					**Permits**		
45-5-0780	MC-3 (Maxwells Creek)	AGD	56	303350	6239250	Open site	Valid	Artefact : -	Open Camp Site	1727,98369,98370,98371,98443,98739
	Contact	**Recorders**	Alice Gorman,Laura-Jane Smith					**Permits**		
45-5-0781	MC-4 (Maxwells Creek)	AGD	56	303400	6239350	Open site	Valid	Artefact : -	Open Camp Site	1727,98369,98370,98371,98443,98739
	Contact	**Recorders**	Alice Gorman,Laura-Jane Smith					**Permits**		

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AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : SYD18043 GPP
Client Service ID : 545479

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
45-5-0782	MC-5 (Maxwells Creek)	AGD	56	303530	6239640	Open site	Valid	Artefact : -	Open Camp Site	1727,98369,98370,98371,98443,98739
	Contact	Recorders	Alice Gorman,Laura-Jane Smith					Permits		
45-5-0783	MC-6;	AGD	56	303400	6239550	Open site	Valid	Artefact : -	Open Camp Site	1727,98369,98370,98371,98443,98739
	Contact	Recorders	Alice Gorman,Laura-Jane Smith					Permits		
45-5-0784	MC-7;	AGD	56	302900	6239240	Open site	Valid	Artefact : -	Open Camp Site	1727,98369,98370,98371,98443,98739
	Contact	Recorders	Alice Gorman,Laura-Jane Smith					Permits		
45-5-0785	MC-8;	AGD	56	303710	6240550	Open site	Valid	Artefact : -	Open Camp Site	1727,98369,98370,98371,98443,98739
	Contact	Recorders	Alice Gorman,Laura-Jane Smith					Permits		
45-5-2853	PAD 6 WSO	AGD	56	303510	6240920	Open site	Valid	Potential Archaeological Deposit (PAD) : -		
	Contact	Recorders	Helen Brayshaw					Permits	1638	
45-5-2964	Site H970	AGD	56	307130	6236550	Open site	Valid	Potential Archaeological Deposit (PAD) : -		
	Contact	Recorders	Bobbie Oakley					Permits		
45-5-3531	Glenfield 1	GDA	56	306252	6239702	Open site	Valid	Artefact : 1		103034
	Contact	Recorders	Australian Museum Consulting (AM Consulting)					Permits		
45-5-3639	BC1 (Liverpool)	GDA	56	305214	6237770	Open site	Valid	Artefact : 1		101368
	Contact	Recorders	Mr.Oliver Brown					Permits		
45-5-4274	MA3A	GDA	56	307456	6241375	Open site	Valid	Artefact : 1		
	Contact	Recorders	Navin Officer Heritage Consultants Pty Ltd					Permits		
45-5-4276	MA5A	GDA	56	307396	6241118	Open site	Valid	Artefact : 1		
	Contact	Recorders	Navin Officer Heritage Consultants Pty Ltd					Permits		
45-5-4278	MA8A	GDA	56	307162	6240648	Open site	Valid	Modified Tree (Carved or Scarred) : 1		
	Contact	Recorders	Navin Officer Heritage Consultants Pty Ltd					Permits		
45-5-4319	SD-AS-001	GDA	56	303202	6241144	Open site	Valid	Artefact : 1		
	Contact	Recorders	Kayandel Archaeological Services,Mr.Lance Syme,Niche Environment and Heritage					Permits		

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Extensive search - Site list report

Your Ref/PO Number : SYD18043 GPP
Client Service ID : 545479

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
45-5-4320	SD-IF-001	GDA	56	303293	6241030	Open site	Valid	Artefact : 1		
	Contact	Recorders	Kayandel Archaeological Services,Mr.Lance Syme,Niche Environment and Heritage					Permits		
45-5-4245	CRO 1	GDA	56	303158	6239199	Open site	Destroyed	Artefact : 1		
	Contact	Recorders	Kelleher Nightingale Consulting Pty Ltd,Doctor.Sandra Wallace,Miss.Kristen Taylor					Permits	3849	
45-5-4246	CR02	GDA	56	303254	6239271	Open site	Valid	Artefact : 1		
	Contact	Recorders	Doctor.Sandra Wallace					Permits	4015	
45-5-4247	CR03	GDA	56	303452	6239489	Open site	Valid	Artefact : 1		
	Contact	Recorders	Doctor.Sandra Wallace					Permits		
45-5-4248	CR04	GDA	56	303399	6239413	Open site	Valid	Artefact : 1		
	Contact	Recorders	Doctor.Sandra Wallace					Permits		
45-5-4249	CR05	GDA	56	303284	6239350	Open site	Valid	Artefact : 1		
	Contact	Recorders	Doctor.Sandra Wallace					Permits		
45-5-4250	CR06	GDA	56	303022	6239250	Open site	Valid	Artefact : 1		
	Contact	Recorders	Doctor.Sandra Wallace					Permits		
45-5-4251	CR07	GDA	56	302948	6239166	Open site	Valid	Artefact : 1		
	Contact	Recorders	Doctor.Sandra Wallace					Permits		
45-5-4283	MA1A	GDA	56	307309	6240020	Open site	Valid	Artefact : 1, Potential Archaeological Deposit (PAD) : 1		
	Contact	Recorders	Navin Officer Heritage Consultants Pty Ltd					Permits		
45-5-4316	CVWIF1	GDA	56	303303	6239666	Open site	Valid	Artefact : 1		
	Contact	Recorders	Mr.josh madden,Artefact - Cultural Heritage Management - Pyrmont					Permits		
45-5-4317	CVWIF2	GDA	56	303350	6239805	Open site	Valid	Artefact : 1		
	Contact	Recorders	Mr.josh madden,Artefact - Cultural Heritage Management - Pyrmont					Permits		
45-5-4253	SWRL 15	GDA	56	303584	6238681	Open site	Destroyed	Artefact : -		
	Contact	Recorders	Australian Museum Consulting (AM Consulting)					Permits		
45-5-4549	EPS ISF 2	GDA	56	302825	6238865	Open site	Valid	Artefact : -		
	Contact	Recorders	Ms.Mary Dallas					Permits		
45-5-5158	MA14	GDA	56	307312	6239795	Open site	Valid	Artefact : 1		
	Contact	Recorders	Doctor.Alan Williams					Permits		
45-5-2495	MFH 2	AGD	56	304300	6238300	Open site	Valid	Artefact : -	Open Camp Site	
	Contact	Recorders	Mary Dallas Consulting Archaeologists (MDCA)					Permits		
45-5-2482	Maxwells Creek 10 (MC10)	AGD	56	303490	6241050	Open site	Valid	Artefact : -	Open Camp Site	98369,98370,98371,98443,98739
	Contact	Recorders	Ms.Elizabeth White					Permits	1564	

Report generated by AHIMS Web Service on 27/10/2020 for Tom Sapienza for the following area at Datum :GDA, Zone : 56, Eastings : 302800 - 307800, Northings : 6236475 - 6241475 with a Buffer of 0 meters. Additional Info : Updating a previous extensive search in an existing ACHAR. Number of Aboriginal sites and Aboriginal objects found is 63

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AHIMS Web Services (AWS)

Extensive search - Site list report

Your Ref/PO Number : SYD18043 GPP
Client Service ID : 545479

SiteID	SiteName	Datum	Zone	Easting	Northing	Context	Site Status	SiteFeatures	SiteTypes	Reports
45-5-2483	Maxwells Creek 9 (MC9)	AGD	56	303050	6241080	Open site	Valid	Artefact : -	Open Camp Site	98369,98370,98371,98443,98739
	Contact	**Recorders**	Ms.Elizabeth White					**Permits**		
45-5-2469	IF1	AGD	56	303830	6241020	Open site	Valid	Artefact : -	Isolated Find	98369,98370,98371,98443
	Contact	**Recorders**	Helen Brayshaw					**Permits**	1398	
45-4-0936	Crossroad 1	AGD	56	303780	6240070	Open site	Valid	Artefact : -	Open Camp Site	98369,98370,98371,98443,98739
	Contact	**Recorders**	Kerry Navin,Mr.Kelvin Officer					**Permits**	987	
45-4-0937	Crossroad 2	AGD	56	303750	6240070	Open site	Valid	Artefact : -	Open Camp Site	98369,98370,98371,98443,98739
	Contact	**Recorders**	Kerry Navin,Mr.Kelvin Officer					**Permits**	986	
45-5-2455	DD1	AGD	56	302700	6238890	Open site	Valid	Artefact : -	Open Camp Site	98739
	Contact	**Recorders**	Mary Dallas Consulting Archaeologists (MDCA)					**Permits**		
45-5-2457	DD 3	GDA	56	302904	6238239	Open site	Destroyed	Artefact : 3	Open Camp Site	98739,102184
	Contact	**Recorders**	Mary Dallas Consulting Archaeologists (MDCA),Australian Museum Consulting (AM.					**Permits**		
45-5-2458	DD 4	GDA	56	302894	6238659	Open site	Destroyed	Artefact : 2	Open Camp Site	98739,102184
	Contact	**Recorders**	Mary Dallas Consulting Archaeologists (MDCA),Australian Museum Consulting (AM.					**Permits**		
45-5-0001	Macquarie Fields;Three Hand Alcove;	AGD	56	306685	6236409	Closed site	Valid	Art (Pigment or Engraved) : -	Shelter with Art	1976
	Contact	**Recorders**	ASRSYS					**Permits**		
45-5-4392	GWD3	GDA	56	306870	6239382	Open site	Valid	Artefact : -		
	Contact	**Recorders**	Doctor.Alan Williams					**Permits**		
45-5-4427	MA13	GDA	56	307602	6241186	Open site	Valid	Artefact : -, Potential Archaeological Deposit (PAD) : -		
	Contact	**Recorders**	Mrs.Nicola Hayes					**Permits**		

Report generated by AHIMS Web Service on 27/10/2020 for Tom Sapienza for the following area at Datum :GDA, Zone : 56, Eastings : 302800 - 307800, Northings : 6236475 - 6241475 with a Buffer of 0 meters. Additional Info : Updating a previous extensive search in an existing ACHAR. Number of Aboriginal sites and Aboriginal objects found is 63

Appendix D. Field Investigation

EXTENT
HERITAGE ADVISORS
TO AUSTRALIA AND
THE ASIA PACIFIC

D.1. Survey transect descriptions

Unit	Transect	Landform(s)	Survey unit area (m²)	Visibility (%)	Exposure (%)	Effective Coverage (%)	Effective coverage area (m²)	Description
1	1	Mid slope, flat	121,300	40	30	12	14,556	Landforms mostly occupied by sporting fields, sporting facilities and open paddocks. These areas and others (dams, vehicle access tracks and railway fence line) subject to significant disturbance. Visibility limited due to grass coverage across majority of landforms. One artefact site located along ground exposure next to tree line in cattle paddock.
1	2	Mid slope, flat	80,310	40	30	12	9,637	Landforms largely occupied by sporting fields and open paddocks. Some disturbance, although visibility is low. Two potential scarred trees (GPP-2 and GPP-3) located within flat.
1	3	Ridgeline, mid slope, flat	111,800	20	30	6	6,708	Ridgeline to south of Roy Watts Road is characterised by large stand of trees planted in rows; one potential culturally modified tree (GPP-4) is located along adjacent vehicle access track. Roy Watts Road runs along the top of the ridgeline. Open paddocks continue along mid slope until another stand of trees within flat. Ground has been significantly built up to accommodate a dam within the flat. Ground surface visibility is generally very poor. Moderate to heavy disturbance in all areas.
1	4	Ridgeline, mid slope, creek flat	70,806	40	30	12	8497	Ridgeline north of Roy Watts Road mostly occupied by agricultural buildings and open paddocks. A dam and artificial creek line occupy the northern portion of these paddocks. Significant disturbance indicated by spoil heaps. Some remnant trees with one potential culturally modified tree (GPP-6). One isolated find (GPP-7) consisting of a broken quartz pebble located along access track in the north western section of transect.
1	5	Ridgeline	70,568	30	80	24	16,936	Ridgeline to the south of Roy Watts Road, within the boundary of Ajuga School, Campbell House and Glenfield Park School. Largely occupied by buildings associated with the schools, cleared areas, sporting facilities, including

Unit	Transect	Landform(s)	Survey unit area (m²)	Visibility (%)	Exposure (%)	Effective Coverage (%)	Effective coverage area (m²)	Description
								swimming pool, basketball court and tennis court. Multiple rows of planted trees evident around boundary and within school grounds. In most areas localised high visibility indicated removal of topsoil with red clay apparent. Significant disturbance across the transect due to construction of buildings and facilities.
1	6	Ridgeline, mid slope, creek flats	359,100	20	70	14	50,274	Covered ridgeline to the east of Quarter Sessions road down to creek flats associated with Bunbury Curran Creek. View from the ridgeline is expansive down to Bunbury Curran Creek and further, at least 15 km to the south-east. Landform is characterised by mostly cleared paddocks, with high percentage of medium-tall grass cover. Several rows of planted trees in the western portion of the transect. Some significant disturbance evident with car tracks, two dams and buildings/facilities associated with agricultural activities. One isolated find (GPP-8) consisting of a complete yellow silcrete flake located on the inside of the dam embankment.
1	7	Ridgeline, mid slope	151,800	30	50	15	22,770	Transect located north of Roy Watts road and south of transmission line. Landforms largely occupied by cleared paddocks for agricultural use with medium-high grass. Ridgeline highest in the western portion of the transect, gently sloping to the east. Some significant disturbance through agricultural practices (such as trampling) and the construction of three dams. Some remnant vegetation within central portion, including one possible scarred tree (GPP-9).
2	8	Creek flats and creek gorge	147,600	30	50	15	22,140	Creek flats located to the south of Belmont road within the Georges River Nature Reserve. The flats are associated with the Georges River and Bunbury Curran Creek. Creek flats sloping gently towards the east, with steeply angled slopes directly adjacent to the river and creek. Mostly cleared with some remnant vegetation predominantly located in the southern portion adjacent to where the creek joins the river. Some sandstone exposures evident. Tall grass reduced exposure greatly across the flats. The creek was dominated by eroded sandstone exposures with no evidence of grinding

Unit	Transect	Landform(s)	Survey unit area (m²)	Visibility (%)	Exposure (%)	Effective Coverage (%)	Effective coverage area (m²)	Description
								grooves, engravings or rock shelters. Older trees were assessed for cultural modification. Some disturbance apparent, in particular within the south-west corner of the transect area where residential buildings and horse paddocks are located. Within the remainder of the transect area, apart from clearing, little disturbance evident with two main vehicle tracks and fence lines. Dumping and burning of rubbish has occurred in this area.
2	9	Creek flats	190,900	30	80	24	45,816	Creek flats north of Belmont road within the Georges River Nature Reserve. Landform is mostly flat with a slight slope down towards the river to the east. Mostly cleared in the eastern half with remnant vegetation along the steep banks for the Georges River. Within the western half of the transect, larger pockets of remnant vegetation exist. Within this area one possible scarred tree was identified (GPP-10). Some areas of significant disturbance, including localised depressions, artificial drainage line, disused road in the northern portion, concrete pad, old abandoned stables and vehicle tracks. Fine, light yellow/light red sand present in large patches parallel and within 50 m of the Georges river. These patches are interspersed with areas of duplex soils. Due to the similarities to the Moorebank deposit (Extent 2018), the area within 50 m of the Georges River has been designated as a PAD (GPP-11).
2	10	Lower slope, creek flats and creek gorge	60,510	50	80	40	24,204	Lower slope and creek flats south of Harrow road, Glenfield. Landform is sloping mid-slope down to creek flats adjacent to Bunbury Curran Creek. Higher visibility in localised vegetated areas due to recent burning. Creek banks not as steep here in comparison with that observed in Transect 8 closer to the confluence of Bunbury Curran Creek and the Georges River. Sandstone exposures and overhangs observed for evidence of Aboriginal habitation. The overhangs investigated displayed evidence of flooding with debris from flood events up to 3 m above the creek banks. Overhang floors revealed

Unit	Transect	Landform(s)	Survey unit area (m²)	Visibility (%)	Exposure (%)	Effective Coverage (%)	Effective coverage area (m²)	Description
								evidence of sediment deposition due to flooding, reducing the likelihood of cultural material.
2	11	Creek flats and creek bank	30,120	20	50	10	3,012	Creek flats observed around Canterbury road bridge over Bunbury Curran Creek. Densely vegetated area reducing visibility. Remnant vegetation covered with invasive vine weed. Major disturbance where Canterbury road crosses the creek line. Small drainage lines also evident running off from Canterbury road.
3	12	Creek flats	108,900	40	80	32	34,848	Transect area entirely within Seddon park. Landform dominated by creek flats to the north of Bunbury Curran Creek. Area is turfed and mostly cleared of vegetation. Some raised areas around the oval may indicate that cutting and levelling has occurred to create the oval. Some localised areas of higher visibility reveal clay, indicating removal of topsoil and subsoil. In the south-east corner of the transect some remnant vegetation may still remain around the previous Bunbury Curran Creek line before re-alignment.
2	13	Creek flats	20,190	30	50	15	3,029	Creek flats south of Aseki Avenue and north of re-aligned Bunbury Curran Creek. Major disturbance associated with re-aligning of the creek. Area is mostly cleared, with some possible remnant vegetation in the eastern portion of the transect. Dense grass cover reduces visibility.
3	14	Mid and lower slopes	51,620	30	80	24	12,389	Transect within the boundary of Glenfield park. Landforms characterised by mid to lower slopes, angling slightly towards the creek flats to the west. Parkland is mostly cleared with dense grass cover. Some localised areas of higher visibility indicate lack of topsoil, with grass cover sitting on clay. Some possible remnant vegetation and several larger trees. No trees displayed evidence of cultural marking.
3	15	Mid-slope	19,740	30	80	24	4,738	Transect within the boundary of Childs Reserve, largely cleared with few remaining trees. Landform undulates towards a possible drainage line in the middle of the reserve, aligned east-west. Dense grass cover reduces visibility, though localised areas of higher visibility (Plates). Trees were

Unit	Transect	Landform(s)	Survey unit area (m²)	Visibility (%)	Exposure (%)	Effective Coverage (%)	Effective coverage area (m²)	Description
								observed for evidence of cultural marking with none identified.
3	16	Mid and lower slopes and creek flats	71,460	30	80	24	17,150	This transect is within the confines of Blinman Oval and Trobriand Park. The landform is largely occupied by a sporting field and mostly cleared parkland. Likely that significant disturbance has occurred with levelling of the playing field at Blinman Oval, producing areas of erosion where slopes are steep. These exposures reveal the underlying shale and mudstone with topsoil from higher up the slope washed down. Exposures were observed for artefacts, though none were identified. Original drainage line runs through Blinman Oval and Trobriand park towards the Georges River and appears to have been slightly realigned with the addition of pipes to direct the water under the surrounding road. Some possible remnant vegetation within the northern and north-west section of Blinman Oval. No evidence of cultural marking was observed.
4	17	Mid and lower slopes	155,400	20	80	16	24,864	Bounded to the north by Atlantic Boulevard and to the south by the transmission line, this landform is largely occupied by regrowth and residential areas. Drainage lines have been constructed, causing significant disturbance. In the eastern section of the transect higher visibility along a path through an area of regrowth reveals made ground. This includes a mixture of clay and soil, reflecting the nature of the regrowth area construction and the extent of disturbance to the area.

Appendix E. Arboriculturist's Report

URBAN TREE
MANAGEMENT

CONSULTING
ARBORICULTURISTS
& HORTICULTURISTS

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INSTITUTE OF AUSTRALIAN
CONSULTING ARBORICULTURISTS
ACCREDITED MEMBER™

REPORT:

ARBORICULTURAL ASSESSMENT
OF
Scarred Tree/s

AT
Glenfield Planned Precinct
including
Hurlstone Agricultural School
Roy Watts Road, Glenfield NSW

FOR

Extent Heritage Advisors
Prepared 7 May 2019
Reference 21018

Contents

1.0 SUMMARY

Urban Tree Management Australia© (UTMA) has prepared this report for Extent Heritage Ltd, Extent Heritage Advisors, 3/73 Union Street, Pyrmont NSW 2009 on behalf of the NSW Government. The report examines 5 trees within the Glenfield Planned Precinct with the trees summarised in Table 1.0. Each tree was assessed for trunk wound causation.

Detailed Arboricultural assessment of the Tree 1 revealed: 1 wound (Wound 1), consistent with causation of Aboriginal Cultural origin; Trees 2, 3 and 4 wounded by Longicorn borers and Tree 5 by an abrasion impact event.

Table 1.0 Summary of each tree including likely age, wound/s, and cause.

Tree No. / Archaeological No.	Genus and species	Common name	1. Age range of tree in yrs. approx. / 2. Age range wound/s in yrs. approx.	Likely origin of wound/s
1 / GPPNT2	*Eucalyptus moluccana* Maiden	Grey Box	1. 250 - <300 2. Wound/s Wound 1 – 150 - <200	Wound 1 – Aboriginal Cultural origin.
Photograph/s of tree/s showing wound/s				

Table 1.0 Summary of each tree including likely age, wound/s and cause.

Tree No. / Archaeological No.	Genus and species	Common name	1. Age range of tree in yrs. approx. / 2. Age range wound/s in yrs. approx.	Likely origin of wound/s
2 / MT3	*Corymbia maculata* (Hook.) K.D. Hill & L.A.S. Johnson	Spotted Gum	1. 120 - <150 2. Wound/s (age when tree alive) Wound 1 – 25 - <50 Wound 2 – 25 - <50	Wound 1 – Mechanical by Longicorn Borers. Wound 2 – Mechanical by Longicorn Borers.

Photograph/s of tree/s showing wound/s

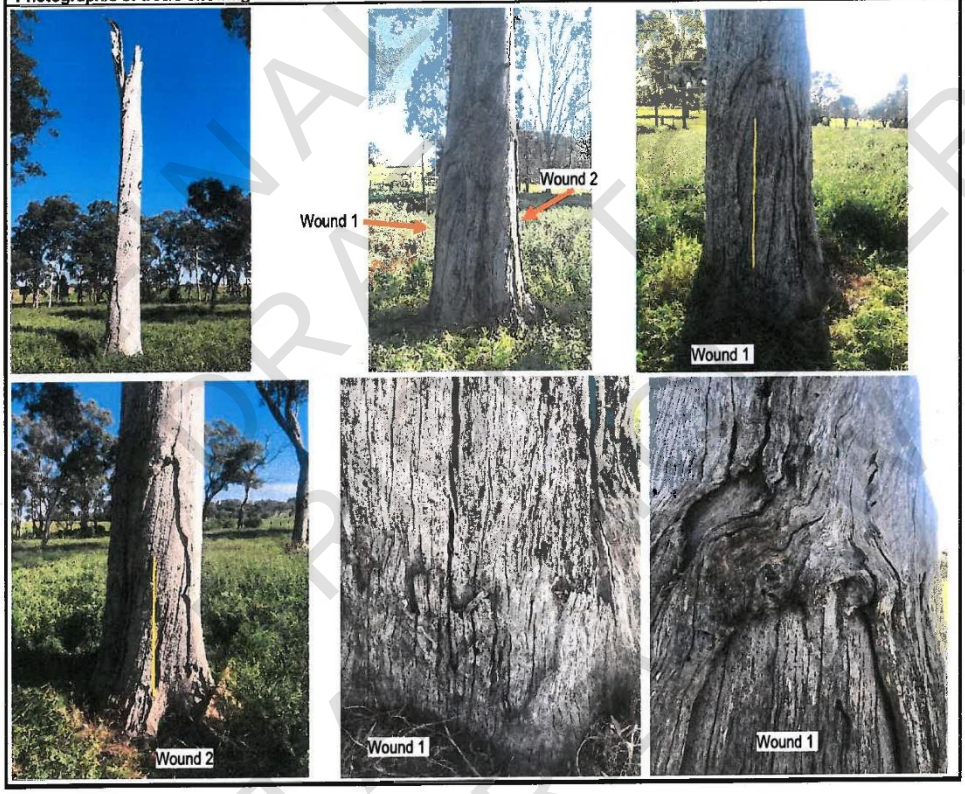
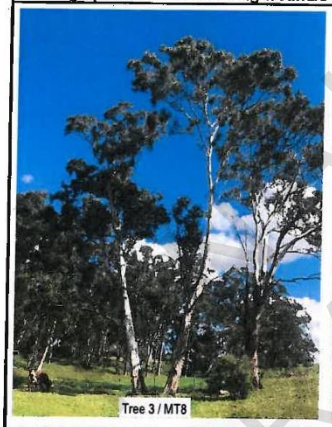


Table 1.0 Summary of each tree including likely age, wound/s and cause.

Tree No. / Archaeological No.	Genus and species	Common name	1. Age range of tree in yrs. approx. / 2. Age range wound/s in yrs. approx.	Likely origin of wound/s
3 / MT8	*Eucalyptus tereticornis* Smith	Forest Red Gum	1. 180 - <220 2. Wound/s Wound 1 – 25 - <40	Wound 1 – Mechanical by Longicorn Borers.

Photograph/s of tree/s showing wound/s



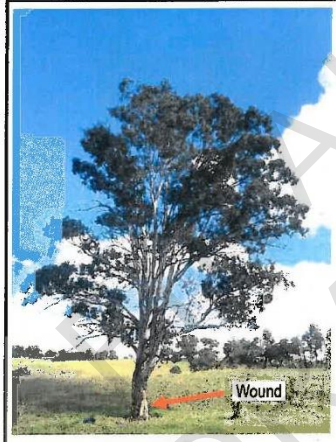
Wound 1 apex

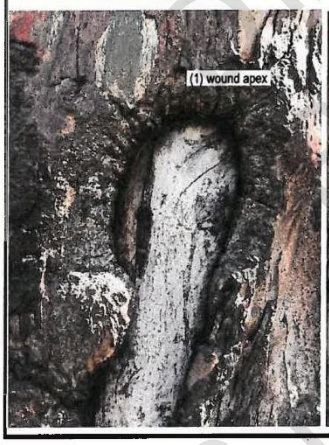
Wound 1 base

Table 1.0 Summary of each tree including likely age, wound/s and cause.

Tree No. / Archaeological No.	Genus and species	Common name	1. Age range of tree in yrs. approx. / 2. Age range wound/s in yrs. approx.	Likely origin of wound/s
4 / No Archaeological number	*Eucalyptus fereticornis* Smith	Forest Red Gum	1. 75 - <100 2. Wound/s Wound 1 – 25 - <40	Wound 1 – Mechanical by Longicorn Borers.

Photograph/s of tree/s showing wound/s





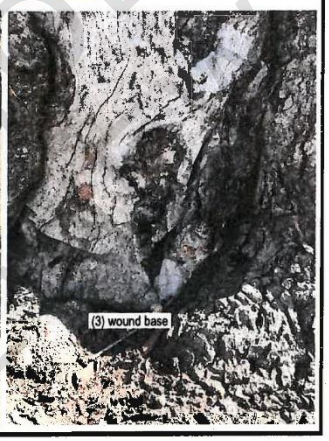


Table 1.0 Summary of each tree including likely age, wound/s and cause.

Tree No. / Archaeological No.	Genus and species	Common name	1. Age range of tree in yrs. approx. / 2. Age range wound/s in yrs. approx.	Likely origin of wound/s
5 / MT9	*Eucalyptus moluccana* Maiden	Grey Box	1. 30 - <50 2. Wound/s Wound 1 – 10 - <20	Wound 1 – Mechanical by abrasion impact event.

Photograph/s of tree/s showing wound/s

2.0 INTRODUCTION

Danny Draper *(the author)* attended *the site/s* on Wednesday 17 April 2019 and *the trees*, their wound/s and their growing environments were examined and assessed from the ground. This was undertaken to determine the likely cause and estimated age of scarring, the wounds' longevity, protection if shown to be of Aboriginal cultural origin, subject to proposed works nearby or removal and conservation, where appropriate.

The dimensions of the tree wound/s were recorded and the tree and wound/s photographed by the author. The age of each tree provided is an estimate only and offered within a range due to the uncertainty of such unsubstantiated field observations without the application of Dendrochronology or other records. Without such precise data the age of trees are usually considered in stages of life span against their biomass *in situ* as Young (0-20%), Mature (20-80%) and Over-mature (senescent) (80-100%).

3.0 METHODOLOGY

Each inspection was undertaken by a visual assessment conducted from the ground and considered as part of the assessment/s the remaining lifespan of a live tree or durability of the remains of a dead tree where the scarred section is to be preserved.

A glossary of terms is included as Appendix C covering the description of the tree/s.

Assessment of Trees

The following criteria were recorded to reflect the current status of the trees being: Age class, Condition class, Form class, Dimensions, Crown cover (live foliage as %), Crown density (density of live foliage evident as %), vigour class and Sustainable Retention Index Value (SRIV) version 4 (IACA, 2010) of each live tree (Appendix A), where appropriate.

The age of the trees was estimated from a sound professional knowledge or research of the individual tree taxa, growth of trees within the region based on habitat, rainfall, soil type and land use practices and considered against the dimensions of each tree encountered and the limitations of its growing environment *in situ*. A tree may be described in greater detail than others where it was considered appropriate to more accurately describe the location of the wound or the circumstances which may have led to its formation.

The height of the remains of the tree was recorded using a Nikon Forestry Pro laser guided clinometer.

Assessment of Wounds to Determine Arboricultural Status of Scarred Tree/s

As a tree grows vascular cambium as a thin layer of dynamic cells close to the surface produces xylem to form wood on the inner side, and phloem to form bark on the outer side. The cambium grows as a continuous ring and is laid down as fibres along the trunk, stems and roots when a new growth increment layer is developed. The vascular cambium translocates nutrients in solution through the fibres from the roots to the leaves through the xylem and sugars produced in the leaves as photosynthates through the phloem and ray cells and to the roots. Their structural importance allows for strength and flexibility as energy from loading forces from the trees mass and wind movement stimulates adaptive growth and reactive growth. The shape and form of a tree is affected as wind moves along stems from the distal to proximal end dissipating and diminishing through damping through the trunk and roots and out into the ground (James *et al* 2006, Mattheck & Breloer 1994, pp. 14-19).

When the vascular cambium is disrupted a wound occurs. If the vascular cambium is severed to a sufficient depth fibres above and below will become desiccated and die forming a wound with the extent of tissue dieback often unpredictable and extending beyond the initial point of wounding. The coating of live tissue allows for dispersal of energy through damping to be distributed over the entire tree, with additional or less wood produced locally on trunk, branches and roots depending on loading forces of compression, tension, shear and torsion. The stimulus of wounding usually changes the distribution of loading forces and the growth responses from the tree which can manifest as altered growth patterns as the load bearing capacity of the tree is modified and the crown and growing conditions alter over the life of the tree. Such changes may be caused by shedding branches, hollowing from termites, fungal decay or fire, clearing of nearby trees increasing exposure to winds, branch shedding, further wounding, and root damage from excavation, soil cultivation or erosion.

When wounding occurs the trees biomechanics predispose it to attempt to restore the alignment of its fibres and to protect it from pathogens by the growth of new wood and to isolate the wound through 4 walls of defence as provided by (CODIT) Compartmentalization of Decay In Trees (Shigo 1989, p. 45) by chemically altering surrounding wood and walling off the damage using barriers provided by existing cellular structures as Walls 1-3 and finally to conceal the wound separating it from the damage caused at the time of wounding beneath layers of new wood as Wall 4. At the time of wounding Wall 1 is formed by plugging xylem vessels vertically above and below the wound. Wall 2 is formed tangentially in growth rings by the concentration of lignin in the cells of late season's growth acting to prevent the inward spread of pathogens. Wall 3 forms at the sides of the wound from ray cells producing toxins which limits spread laterally. Wall 4 is the new wood separating the initial wound site from new growth and forms the *wound margin*.

The sides of the wound are *wound margin left* and *wound margin right* which slowly converge and usually form an oblong, circular or elliptic shape (Draper and Richards 2009). The distal and proximal ends of a wound are the *wound apex* and *wound base* respectively and may be irregular, jagged, obtuse, rounded, truncate to acute (<90^{O}) where the margins converge often forming a wound seam or partial occlusion (Draper and Richards 2009). The wood exposed by the removal of the bark is the *wound face* although this may be absent if a void is evident as a *cavity* or a larger void as a *hollow* (Draper and Richards 2009).

No matter what the shape of the wound the tree will ultimately attempt to align the fibres to grow over and conceal the wound to restore the cover of living wood around and along the stem and the growth of the wound margins are stimulated by loading forces and movement. Ultimately most margins converge and graft to conceal the *wound face* and it is then that the tree has achieved wound *occlusion* (Draper and Richards 2009). The living cambial tissue disrupted at the time of wounding will always die, remain damaged and continue to deteriorate even when a wound is occluded by successive growth rings because trees do not heal they can only conceal the damaged cells with consecutive layers formed by each seasons growth (Mattheck and Breloer 1994, pp. 12-16). However, occluded wood that is sealed from air and water may have deterioration slowed considerably or almost stopped.

Wound margins encroach over the wound face as new growth ring increments are added around the tree. The *wound margin depth* on the left and right sides usually deepens over time before the wound is occluded and can be measured perpendicular from the wound face to the outer edge of the trunk, or from the outer edge of the trunk to the inner edge of the void if the wound face is absent (Draper and Richards 2009). It is not uncommon for the depth of the *wound margin right* and *wound margin left* or the distances from the *initial wound margin* to the *wound margin* to be different because of reactive growth stimulated by differential loading along the stem in compression, tension, torsion or shear stimulating more wood to be laid down on the side bearing the greatest load (Mattheck and Breloer 1994, pp. 12-16). Where margins are of a similar width and depth they are usually equally loaded or may both be neutrally loaded (Mattheck 2004, p. 17).

As the wound wood margins grow across the wound face from the point of initial wounding a general differentiation in the colour of bark and its texture from surrounding unwounded tissue will sometimes be evident and can assist to indicate the extent of the width of the wound and the approximate location or extent of the *initial wound margin* (Draper and Richards 2009). However this may become less apparent over time with wounds that have been *occluded* for long periods due to the successive growth increments added sometimes concealing the wound entirely, or on trees with thick bark.

By measuring the width of the wound between the left and right *initial wound margin* the diameter of the trunk at the time of wounding and the approximate age of the tree can be estimated. The location of a wound on a trunk is static although the diameter of the stem is increased circumferentially by rings as growth increments, hence the wound margins and wound occlusion. The circumference of the trunk and stems of large old trees increases with age and the layers may be slightly thinner over a radial distance where such growth has slowed, than for younger trees or where they are not stimulated by loading.

Rainfall comparable with the site is an average annual rainfall of 654.1 mm recorded at the nearby Milperra Bridge (Georges River) Meteorology Site No. 066168, State: NSW, Opened: 1963, Status: Open, Latitude: 33.93°S, Longitude: 150.98°E, Elevation: unknown (Australian Government Bureau of Meteorology, 2019) approximately 5.9 km away.

To differentiate between *cultural scarring*, historical scarring, recent mechanical damage or natural causes, the following were considered:

1. Age class
2. Ease of access to the location of wounding
3. Tree and its dimensions at the time of wounding
4. Extent of wounding, its symmetry (symmetrical / asymmetrical)
5. Extent of growth around wound site since initial wounding whether tree alive/dead
6. Impact of that wounding on the tree since the wounding event
7. Land use history
8. Condition class
9. Vigour class
10. Influence of its growing environment and its constraints
11. Proximity to other trees, shape and growth habit
12. Crown form
13. Shading
14. Rainfall
15. Insect damage
16. Fire
17. Soil
18. Aspect
19. Slope
20. Drainage

This Arboricultural assessment will assist Archaeologists and Aboriginal community members determine the status of scarred trees and to manage the tree/s, by eliminating natural or mechanical causes of wounding and determining the estimated remaining safe life span or works to prolong a live tree *in situ* or to conserve and protect remaining dead tree/s or relevant section/s where required.

4.0 TREE ASSESSMENT

4.1 Assessment of Tree/s – Tree 1 / GPPNT2

Tree No. / Genus & species Common Name	1. **Age Class** Y = Young M = Mature O = Over-mature (Senescent) 2. **Age range of tree** in yrs. approx. 3. **Age range of wound/s,** in yrs. approx. 4. **Date range since tree died** in yrs. approx., e.g. died, cut down, ring-barked	**Condition** G = Good F = Fair P = Poor D = Dead	**Form** D = Dominant C = Co-dominant I = Intermediate S = Suppressed F = Forest E = Emergent	**Height** in metres approx. / **Crown spread** approx. length x breadth metres / **Crown spread orientation.**	**Trunk diameter** in mm @ 1.4m, or as stated / **Trunk diameter orientation**	**Crown cover / Crown density** approx. %	**SRIV** Age, Vigour, Condition / Index Rating App A. / Remaining life expectancy 1. Long 2. Medium 3. Short
1 / GPPNT2 *Eucalyptus moluccana* Maiden Grey Box	1. M 2. 250 - <300 3.1 150 - <200 4. N/A	F	D	24 / 22 R	800x1000, 900 mm Av. E/W	90 / 90	MGVF - 9 / 1

Description

Eucalyptus moluccana Maiden – Grey Box is a small to medium woodland and occasionally tall forest tree (Brooker and Kleinig, 1999, p. 220) and can attain a height of 15-25 m (Elliot and Jones, 1986, p. 149) to 30 m with a trunk diameter up to 0.6-1.2 m DBH, typically with the trunk straight and half of more of the tree height (Boland *et al*, 2006, p. 460) with a crown spread of 10-20 m (Elliot and Jones, 1986, p. 149).

E. moluccana heartwood has a green density of 1170 kg / m^3 approx. (Bootle 2005, p. 256) to 1000-1230 kg / m^3 (Boland *et al*, 2006, p. 460) and air dry density (ADD) 1120 kg / m^3 (Bootle 2005, p. 256). Heartwood resistant to Lyctid borers and heartwood is termite resistant (Boland *et al*, 2006, p. 460, and Bootle 2005, p. 256). The heartwood has a high durability in the ground and a high durability above ground (Bootle 2005, p. 256) which is indicated in the remaining wound face section of Wound 1 which has minimal weathering of tissue above ground. The wood is durable and used for heavy engineering construction, bridges, wharves, shipbuilding, piles, poles, housing, cross-arms and general outdoor use (Bootle 2005, p. 256, Boland *et al*, 2006, p. 460). The tree grows within a rainfall range of 670-1250 mm (Boland *et al*, 2006, p. 476) and *the site* has an estimated rainfall of approx. 654.1 mm (Australian Government Bureau of Meteorology, 2019), supporting trees like this specimen typical for the taxa described.

Tree 1 / GPPNT2 (Photograph 1.0) is growing in a moderate rainfall area, on fertile alluvial soil in a paddock likely supplemented with fertiliser and animal manures over a long time benefiting its growth and longevity. The tree is expected to be growing at a rate typical for the species with an estimated age of 250-<300 years old. However, this has not been confirmed by cross referencing with other research material such as early aerial photographs. The tree is of good vigour but of fair condition due to the wounding and the loss of approx. 5% of cambium from the trunk circumference. The tree has some decline in its upper crown and is developing a secondary crown consistent with approaching senescence.

Wound 1

Trunk wound, triangular, symmetrical, on south side (Photographs 2.0-4.0). Wound extending from 100 to 1250 mm and 220 mm at widest at 500 mm. Wound face extending from 100 to 750 mm and 220 mm at widest at 500 mm. Wound face entire to weathered heartwood with some delignification and wood borer holes ≥ 3 mm diameter (Lyctus sp.?), with vertical splits up to 4 mm wide from desiccated and shrunken Ray cells and evidence of ant or termite mud in the trunk behind the wound distally.

Wound margins entire, apex acute and base truncate. The right wound margin has a depth of 460 mm proximally and 470 mm distally. The left wound margin has a depth of 300 mm proximally and 400 mm distally. The initial left wound margin is approx. 240 mm wide and the initial right wound margin is approx. 200 mm wide from discoloration and texture differences in the bark.

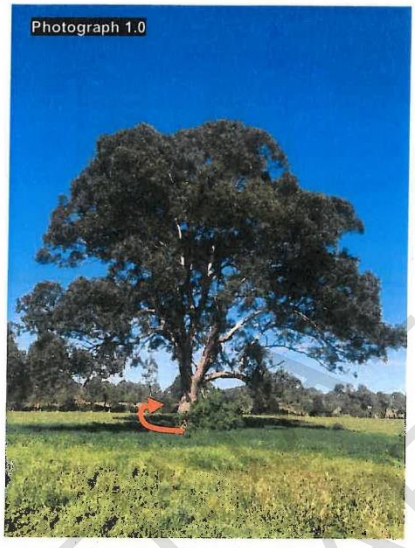
Conclusions

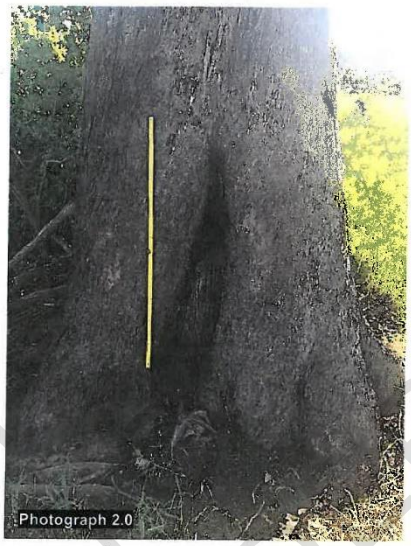
Wound 1 – From the large dimensions of *the tree* in a moderate rainfall area, it is estimated to be 250-300 years old. The exposed wood of this species has a high durability above ground (Bootle 2005, p. 256) and the weathering of the wound face to heartwood facing south, increasingly protected as the wound margins deepen is consistent with this quality. From the extent of wound margin growth in an area of moderate rainfall and minimal wound face weathering, the wound appears 150-<200 years old.

The wound affects approximately 10% of trunk circumference at the time of wounding. The wound is expected to be derived of Aboriginal Cultural origin on a Box species of tree commonly used by Aboriginal people to extract implements.

Risks to tree

The tree currently appears stable and viable, but is expected to become hollow from the wound over time from termites, and or decay and should be monitored for stability. For the tree to remain viable and stable it will require a radial Tree Protection Zone of 25 m from its center of trunk to allow for root growth and to safely account for branch growth and possible shedding in senescence. The tree should be protected in a park and fenced around its trunk at a 10 m radius from the center of trunk to protect the tree and its Cultural Scarring.



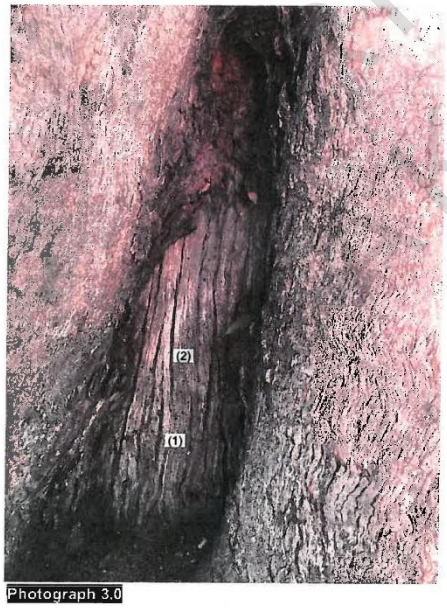


Photograph 1.0 Taken 17/4/2019 by Danny Draper. View to southwest of Tree 1 / GPPNT2, *Eucalyptus moluccana* Maiden – Grey Box. Wound 1 on south side of trunk indicated with an orange arrow and shown in detail in Photographs 2.0 - 4.0.

Photograph 2.0 Taken 17/4/2019 by Danny Draper. View to north of base of Tree 1 / GPPNT2, *Eucalyptus moluccana* Maiden – Grey Box. Wound 1 on south side of trunk shown with a 1 m yellow folding ruler.

Photograph 3.0 Taken 17/4/2019 by Danny Draper. View to north of base of Tree 1 / GPPNT2, *Eucalyptus moluccana* Maiden – Grey Box. Wound 1 on south side of trunk showing (1) Lyctid borer holes ≤3 mm diameter in wood post wounding and (2) vertical cracks up to 4 mm wide as drying Ray cells with minimal weathering of heartwood.

Photograph 4.0 Taken 174/2019 by Danny Draper. View to north of base of Tree 1 / GPPNT2, *Eucalyptus moluccana* Maiden – Grey Box. Wound 1 on south side of trunk shown with a 1 m yellow folding ruler extended to 500 mm.



Photograph 3.0


Photograph 4.0

4.0 TREE ASSESSMENT

4.1 Assessment of Tree/s – Tree 2 / MT3

Tree No. / Genus & species Common Name	1. **Age Class** Y = Young M = Mature O = Over-mature (Senescent) 2. **Age range of tree** in yrs. approx. 3. **Age range of wound/s,** in yrs. approx. 4. **Date range since tree died** in yrs. approx., e.g. died, cut down, ring-barked	**Condition** G = Good F = Fair P = Poor D = Dead	**Form** D = Dominant C = Co-dominant I = Intermediate S = Suppressed F = Forest E = Emergent	**Height** in metres approx.. / **Crown spread** approx. length x breadth metres / **Crown spread orientation.**	**Trunk diameter** in mm @ 1.4m, or as stated / **Trunk diameter orientation**	**Crown cover / Crown density** approx. %	**SRIV** Age, Vigour, Condition / Index Rating App A. / Remaining life expectancy 1. Long 2. Medium 3. Short
2 / MT3 *Corymbia maculata* (Hook.) K.D. Hill & L.A.S. Johnson Spotted Gum	1. M 2. 120 - <150 3.1 25 - <50 3.2 25 - <50 4. 10 – <15	D	F	Stump to 9 m / N/A	500, R	N/A	N/A

Description

Corymbia maculata (Hook.) K.D. Hill & L.A.S. Johnson – Spotted Gum, is a medium to very tall forest tree with a coastal distribution on heavy clays and other soils from the Manning Valley to Bega NSW (Brooker and Kleinig, 1999, p. 60) and can attain a height of 20-30 m (Elliot and Jones, 1986, p. 139) to 35-45 m on favourable sites (Boland *et al*, 2006, p. 260) with a trunk diameter up to 1-1.3 m DBH with exceptional specimens to 70 m high and >3 m DBH (Boland *et al*, 2006, p. 260) with a crown spread of 10-20 m (Elliot and Jones, 1986, p. 139). *C. maculata* heartwood has a green density of 745 – 1080 kg / m^3 (Boland *et al*, 2006, p. 260) to 1150 kg / m^3 (Bootle 2005, p. 283) and air dry density (ADD) of approx. 950 kg / m^3 (Bootle 2005, p. 257).

Sapwood is very susceptible to Lyctid borers (Boland *et al*, 2006, p. 260 and Bootle 2005, p. 284) and heartwood is termite resistant (Bootle 2005, p. 284) the wood is durable and used for heavy engineering construction and flooring (Bootle 2005, p. 284, Boland *et al*, 2006, p. 260). The wood has a medium durability in the ground and a high durability above ground (Bootle 2005, p. 284). The tree grows within a rainfall range of 680 - 1700 mm (Boland *et al*, 2006, p. 260) and the site has approx. 654.1 mm (Australian Government Bureau of Meteorology, 2019), supporting trees like this specimen typical of the taxa described. The tree is consistent in form to an adjacent live *C. maculata* of forest form.

Tree 2 / MT3 (Photograph 5.0) is the remains of a stump to 9 m, previously growing in a moderate rainfall area, on fertile alluvial soil. With a lower rainfall range for the species *in situ*, the growth of this tree is expected to have been slower and is estimated at 120-<150 years old when it died. However, this has not been confirmed by cross referencing with other research material such as early aerial photographs. The tree has 2 wounds, one each to south (Photographs 6.0-9.0) and southeast (Photographs 7.0 and 10.0), which appeared to have been caused by Longicorn borers (Order Cerambycidae) indicative of the tree declining before it died. The 2 wound are separated by an interbuttress zone as a vertical indent in the trunk between 2 buttress roots, one each at the base of each wound. The stub of an epicormic shoot with an approx. 20 mm diameter base is evident on the trunk at approx. 4 m to east (Photograph 5.0), indicative of the recent death of the tree, 10-<15 years.

Wound 1

Trunk wound, basal, broad oval to rectangular, symmetrical, on south side (Photographs 6.0-9.0). Wound face extending from ground to 1600 mm and 400 mm at widest at 1000 mm. Wound face entire to sapwood save for weathering to heartwood adjacent the right wound margin adjoining the base, and oval holes approx. 8-11 mm diameter, indicative of Longicorn Borers adjacent the wound apex and base (Photographs 6.0 and 9.0) with coarse frass remaining in the proximal holes.

Wound margins entire save for base where weathered at the basal flare and separated distally. Wound apex rounded to irregular and base truncate (Photographs 6.0 and 9.0). The right and left wound margins each have a depth of 20 mm. Initial wound margins not evident. Successive wounding adjacent the wound apex with oval holes approx. 8-11 mm diameter indicative of Longicorn Borers.

Wound 2

Trunk wound, basal, broad oval to irregular, symmetrical, on east side (Photographs 5.0, 7.0 and 10.0). Wound face extending from ground to 1900 mm and 420 mm at widest at 1100 mm. Wound face entire to sapwood save for weathering to heartwood adjacent the left wound margin from the base at the basal flare and a buttress root 140 mm diameter to 1400 mm, and oval holes approx. 8-11 mm diameter, indicative of Longicorn Borers adjacent the wound apex and base.

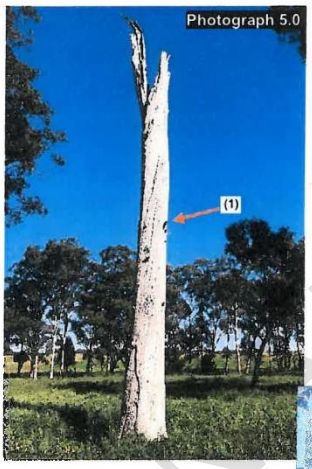
Wound margins entire save for base where weathered at the basal flare and a buttress root. and separated distally. Wound apex rounded to irregular and base truncate (Photographs 6.0 and 9.0). The right wound margin has a depth of 30 mm and the left wound margin a depth of 5 mm. Initial wound margins not evident. Successive wounding adjacent the wound apex with oval holes approx. 8-11 mm diameter indicative of Longicorn Borers.

Conclusions

The 2 wounds caused cambial dysfunction to approx. 50% of trunk circumference and the successional wound adjacent the apex of Wound 1 (Photograph 6.0) is evidence of continual predation contributing to the tree's decline. The presence of a stub of an epicormic shoot (Photograph 5.0) is indicative of the recent death of the tree, 10-<15 years. The wounds have most sapwood remaining save for the base where minimal weathering of the heartwood has occurred because the heartwood of this species has a high durability above ground (Bootle 2005, p. 284). The wound margins are shallow indicating recent wounding. The wound faces contained oval holes approx. 8-10 mm diameter and some contained coarse frass, indicative of the burrowing activity by Longicorn borers and the cause of the wounds.

Risks to tree

The tree stump currently appears stable but will succumb to termites, decay or fire.



Photograph 5.0 Taken 17/4/2019 by Danny Draper. View to northwest of Tree 2 / MT3, *Corymbia maculata* (Hook.) K.D. Hill & L.A.S. Johnson – Spotted Gum. Wound 1 on southwest side of trunk and Wound 2 on east side of trunk detailed in Photographs 6.0 – 10.0. The stub of an epicormic shoot with an approx. 20 mm diameter base is shown as (1) and its presence subject to weathering indicates the recent death of the tree.

Photograph 6.0 Taken 17/4/2019 by Danny Draper. View to north of Tree 2 / MT3, *Corymbia maculata* (Hook.) K.D. Hill & L.A.S. Johnson – Spotted Gum. Wound 1 on south side of trunk showing apex and holes by Longicorn borers (1) in wound face and (2) later growth before the tree died. Shown in Photograph 8.0.

Photograph 7.0 Taken 17/4/2019 by Danny Draper. View to northwest of Tree 2 / MT3, *Corymbia maculata* (Hook.) K.D. Hill & L.A.S. Johnson – Spotted Gum. Wound 1 on southwest side of trunk (W1) and Wound 2 on east side of trunk (W2) detailed in Photographs 6.0 and 8.0 – 10.0.

Photograph 8.0 Taken 17/4/2019 by Danny Draper. View to north of Tree 2 / MT3, *Corymbia maculata* (Hook.) K.D. Hill & L.A.S. Johnson – Spotted Gum. Wound 1 on south side of trunk shown with a 1 m yellow folding ruler. Longicorn borer holes adjacent the wound apex shown (1) and adjacent the wound base shown (2) and detailed in Photographs 6.0 and 9.0 respectively.

Photograph 9.0 Taken 17/4/2019 by Danny Draper. View to north of Tree 2 / MT3, *Corymbia maculata* (Hook.) K.D. Hill & L.A.S. Johnson – Spotted Gum. Wound 1 on south side of trunk. Longicorn borer holes adjacent the wound base shown (1). Shown in Photograph 8.0.

Photograph 10.0 Taken 17/4/2019 by Danny Draper. View to northwest of base of Tree 2 / MT3, *Corymbia maculata* (Hook.) K.D. Hill & L.A.S. Johnson – Spotted Gum. Wound 2 on southeast side of trunk shown with a 1 m yellow folding ruler. Wound caused by Longicorn borers.

4.0 TREE ASSESSMENT

4.1 Assessment of Tree/s – Tree 3 / MT8

Tree No. / Genus & species Common Name	1. **Age Class** Y = Young M = Mature O = Over-mature (Senescent) 2. **Age range of tree** in yrs. approx. 3. **Age range of wound/s,** in yrs. approx. 4. **Date range since tree died** in yrs. approx., e.g. died, cut down, ring-barked	**Condition** G = Good F = Fair P = Poor D = Dead	**Form** D = Dominant C = Co-dominant I = Intermediate S = Suppressed F = Forest E = Emergent	**Height** in metres approx. / **Crown spread** approx. length x breadth metres / **Crown spread orientation.**	**Trunk diameter** in mm @ 1.4m, or as stated / **Trunk diameter orientation**	**Crown cover / Crown density** approx. %	**SRIV** Age, Vigour, Condition / Index Rating App A. / Remaining life expectancy 1. Long 2. Medium 3. Short
3 / MT8 *Eucalyptus tereticornis* Smith Forest Red Gum	1. M 2. 120 - <150 3.1 25 - <40 4. N/A	F	F	18 / 15 R	Stem to north 600x550 mm, 575 average E/W, Stem to south (with wound), 750x500 mm, 625 mm average, E/W	90 / 90	MGVF - 9 / 1

Eucalyptus tereticornis Smith – Forest Red Gum, is medium sized to tall woodland or forest tree occasionally reaching 70 m to very tall forest tree with a coast and coastal distribution from Batemans Bay NSW through Queensland to New Guinea (Brooker and Kleinig, 1999, p. 101) and can attain a height of 20-30 m (Elliot and Jones, 1986, p. 222) up to 50 m, with a trunk diameter up to 2 m DBH (Boland *et al*, 2006, p. 322) with a crown spread up to 10-25 m 30 m (Elliot and Jones, 1986, p. 222). *E. tereticornis* heartwood has a green density of 800 – 1100 kg / m^3 (Boland *et al*, 2006, p. 322) to 1200 kg / m^3 (Bootle 2005, p. 280) and air dry density (ADD) of approx. 1050 kg / m^3 (Bootle 2005, p. 280).

Heartwood is resistant to Lyctid borers and to termites (Bootle 2005, p. 280) the wood is durable and used for heavy engineering construction and flooring (Bootle 2005, p. 284, Boland *et al*, 2006, p. 260). The heart wood has a high durability in the ground and a high durability above ground (Bootle 2005, p. 280). The timber is used for heavy engineering and construction, piles, poles, posts and floor boards (Boland *et al*, 2006, p. 322). The tree grows within a rainfall range of 600 - 2500 mm (Boland *et al*, 2006, p. 322) and the site has a rainfall of approx. 654.1 mm (Australian Government Bureau of Meteorology, 2019), supporting trees like this specimen typical of the taxa.

The current tree is comprised of 2 straight and divergent stems each exhibiting self-correcting growth to upright in the mid-upper crown (Photograph 11.0). The 2 stems initially appear to be 2 separate trees, but this is unlikely due to their close proximity and the inability of either stem to supress the other (Photographs 11.0 and 12.0). This is further evident by the oval dimensions of each stem when considered in section, shown by trunk diameter at breast height (DBH) measured accurately for each stem, where both stems are elongated in section, each with an east/west orientation opposing each other subject to loading in compression, and flattened in initial orientation likely from when growing hard against the edge of the primary trunk. The tree is expected to be growing at a rate typical for the species. However, this has not been confirmed by cross referencing with other research material such as early aerial photographs.

The tree is of good vigour overall, but the stem to south is in fair condition due to the wounding having caused cambial dysfunction to approx. 10% of trunk circumference. The tree has 1 wound, on the north side of the stem to south (Photographs 12.0-15.0), which appeared to have been caused by Longicorn borers (Order Cerambycidae).

Wound 1

Stem to south - Trunk wound, narrow oval, symmetrical, on north side (Photographs 13.0-15.0). Wound extending from 100 to 1540 mm and 250 mm at widest at 700 mm. Wound face extending from 100 to 1440 mm and 150 mm at widest at 700 mm. Wound face entire to heartwood save for some persistent sapwood protected by the wound apex (Photographs 13.0 and 14.0) and spiraling vertical splits up to 4 mm wide from desiccated and shrunken Ray cells. Oval holes approx. 8-11 mm diameter, indicative of Longicorn Borers adjacent the wound apex and base (Photographs 14.0 and 15.0). Negligible weathering of heart wood as delignification (Photograph 15.0).

Wound margins entire, apex and base rounded with humus and detritus accumulated at the wound base (Photograph 13.0). The right wound margin has a depth 100 mm and 150 mm proximal to distal, respectively. The left wound margin has a depth 75 mm and 130 mm proximal to distal, respectively. Initial right wound margins appears 160 mm wide and the initial left wound margin appears 150 mm wide.

Conclusions

Wound 1 caused cambial dysfunction to approx. 10% of trunk circumference of the stem to south (Photograph 13.0). The wound has minimal weathering of the exposed heartwood because the heartwood of this species has a high durability above ground (Bootle 2005, p. 280) showing the wound is recent. The wound face contains oval holes approx. 8-10 mm diameter, indicative of the burrowing activity by Longicorn borers and the cause of the wound.

Risks to tree

The tree and its 2 stems currently appears stable and viable, but the stem to south is expected to become hollow from the wound over time although it is likely to occlude within 40 years and should be monitored for stability.

Photograph 11.0 Taken 17/4/2019 by Danny Draper. View to west of Tree 3 / MT8, *Eucalyptus tereticornis* Smith – Forest Red Gum. Wound 1 on north side of stem to south, indicated with an orange arrow and shown in detail in Photographs 12.0 - 15.0. Tree comprised of 2 straight and divergent stems each exhibiting self-correcting growth to upright in the mid-upper crown.

Photograph 12.0 Taken 17/4/2019 by Danny Draper. View to west of Tree 3 / MT8, *Eucalyptus tereticornis* Smith – Forest Red Gum. Wound 1 on north side of stem to south, indicated with an orange arrow and shown in detail in Photographs 12.0 - 15.0.

Photograph 13.0 Taken 17/4/2019 by Danny Draper. View to south of Tree 3 / MT8, *Eucalyptus tereticornis* Smith – Forest Red Gum. Wound 1 on north side of stem to south, shown with a 1 m yellow folding ruler. Wound apex and base shown in detail in Photographs 14.0 and 15.0, respectively. The brown material at the wound base is accumulated humus and detritus.

Photograph 14.0 Taken 17/4/2019 by Danny Draper. View to south of Tree 3 / MT8, *Eucalyptus tereticornis* Smith – Forest Red Gum. Wound 1 on north side of stem to south, showing wound apex with oval holes approx. 8-10 mm diameter (1) consistent with Longicorn borer damage. Vertical spiral splits up to 4 mm wide from desiccated and shrunken Ray cells shown as (2).

Photograph 15.0 Taken 17/4/2019 by Danny Draper. View to south of Tree 3 / MT8, *Eucalyptus tereticornis* Smith – Forest Red Gum. Wound 1 on north side of stem to south, showing wound base with oval holes approx. 8-10 mm diameter (1) consistent with Longicorn borer damage. The brown material at the wound base is accumulated humus and detritus. Vertical spiral splits up to 4 mm wide on wound face derived from desiccated and shrunken Ray cells.

4.0 TREE ASSESSMENT

4.1 Assessment of Tree/s – Tree 4 / no Archaeological number

Tree No. / Genus & species Common Name	1. **Age Class** **Y** = Young **M** = Mature **O** = Over-mature (Senescent) 2. **Age range of tree** in yrs. approx. 3. **Age range of wound/s,** in yrs. approx. 4. **Date range since tree died** in yrs. approx., e.g. died, cut down, ring-barked	**Condition** **G** = Good **F** = Fair **P** = Poor **D** = Dead	**Form** **D** = Dominant **C** = Co-dominant **I** = Intermediate **S** = Suppressed **F** = Forest **E** = Emergent	**Height** in metres approx. / **Crown spread** approx. length x breadth metres / **Crown spread orientation.**	**Trunk diameter** in mm @ 1.4m, or as stated / **Trunk diameter orientation**	**Crown cover / Crown density** approx. %	**SRIV** Age, Vigour, Condition / Index Rating App A. / Remaining life expectancy 1. Long 2. Medium 3. Short
4 / no Archaeological number *Eucalyptus tereticornis* Smith Forest Red Gum	1. M 2. 75 - <100 3.1 25 - <40 4. N/A	F	D	18 / 15 R	950x600, 775 mm Av. E/W	95 / 95	MGVF - 9 / 1

Description

Eucalyptus tereticornis Smith – Forest Red Gum, is medium sized to tall woodland or forest tree occasionally reaching 70 m to very tall forest tree with a coast and coastal distribution from Batemans Bay NSW through Queensland to New Guinea (Brooker and Kleinig, 1999, p. 101) and can attain a height of 20-30 m (Elliot and Jones, 1986, p. 222) up to 50 m, with a trunk diameter up to 2 m DBH (Boland *et al*, 2006, p. 322) with a crown spread up to 10-25 m 30 m (Elliot and Jones, 1986, p. 222). *E. tereticornis* heartwood has a green density of 800 – 1100 kg / m^3 (Boland *et al*, 2006, p. 322) to 1200 kg / m^3 (Bootle 2005, p. 280) and air dry density (ADD) of approx. 1050 kg / m^3 (Bootle 2005, p. 280).

Heartwood is resistant to Lyctid borers and to termites (Bootle 2005, p. 280) the wood is durable and used for heavy engineering construction and flooring (Bootle 2005, p. 284, Boland *et al*, 2006, p. 260). The heart wood has a high durability in the ground and a high durability above ground (Bootle 2005, p. 280). The timber is used for heavy engineering and construction, piles, poles, posts and floor boards (Boland *et al*, 2006, p. 322). The tree grows within a rainfall range of 600 - 2500 mm (Boland *et al*, 2006, p. 322) and the site has a rainfall of approx. 654.1 mm (Australian Government Bureau of Meteorology, 2019), supporting trees like this specimen typical of the taxa.

The tree was located between 2 high voltage transmission easements. The tree was of good vigour overall, but the stem to south is in fair condition due to the wounding having caused cambial dysfunction to approx. 5% of trunk circumference. The tree has 1 wound, on the east side of the trunk (Photographs 17.0-20.0), which appeared to have been caused by Longicorn borers (Order Cerambycidae).

Wound 1

Trunk wound, oval to irregular, asymmetrical, on east side (Photographs 2.0-6.0). Wound extending from 40 to 1070 mm and 350 mm at widest at 550 mm. Wound face extending from 140 to 970 mm and 250 mm at widest at 550 mm. Wound face entire to sapwood (Photographs 13.0 and 14.0) and spiraling vertical splits up to 2 mm wide from desiccated and shrunken Ray cells. Oval holes approx. 8-11 mm diameter with coarse frass, indicative of Longicorn Borers adjacent the wound apex, base and right wound margin (Photographs 18.0 – 20.0). Negligible weathering of sapwood (Photograph 17.0 – 20.0).

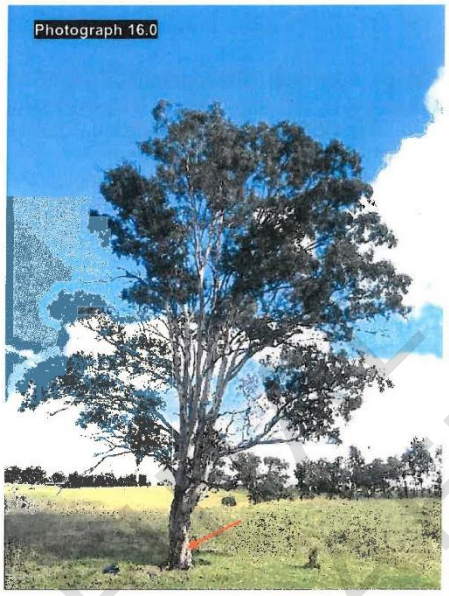
The right wound margin is irregular with successional wounding adjacent the apex (Photograph 17.0) extending from 450 to 650 mm and 100 mm at widest at center, caused by burrowing by Longicorn borers. The left wound margin is entire to irregular. Apex rounded (Photographs 17.0 and 18.0) and base irregular (Photograph 20.0). The right wound margin has a depth 130 mm and 35 mm proximal to distal, respectively. The left wound margin has a depth 125 mm and 35 mm proximal to distal, respectively. The right wound margins appears 50 mm wide and the left wound margin appears 50 mm wide. Initial wound margins not evident.

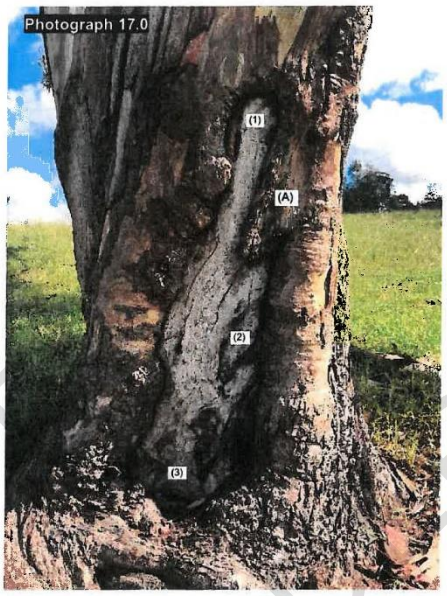
Conclusions

Wound 1 caused cambial dysfunction to approx. 5% of trunk circumference of the stem to east (Photograph 17.0). The wound has minimal weathering of the exposed sapwood showing the wound is recent. The wound face contains oval holes approx. 8-10 mm diameter with coarse frass, indicative of the burrowing activity by Longicorn borers and the cause of the wound.

Risks to tree

The tree currently appears stable and viable, but is expected to become hollow from the wound over time and should be monitored for stability. The wound is likely to occlude within 40 years and should be monitored for stability.





Photograph 16.0 Taken 17/4/2019 by Danny Draper. View to west of Tree 4 / no Archaeological number, *Eucalyptus tereticornis* Smith – Forest Red Gum. Wound 1 on east side of trunk, indicated with an orange arrow and shown in detail in Photographs 17.0 - 20.0.

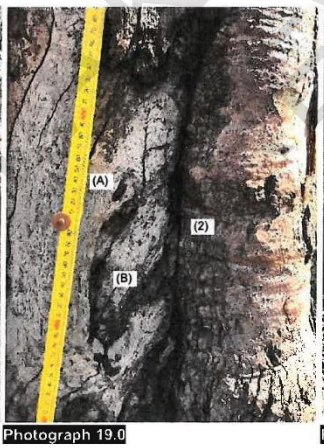
Photograph 17.0 Taken 17/4/2019 by Danny Draper. View to west of Tree 4, *Eucalyptus tereticornis* Smith – Forest Red Gum. Wound 1 on east side of trunk and shown in detail in Photographs 18.0 – 20.0. Successional wound adjacent the right wound margin marked (A)

Photograph 18.0 Taken 17/4/2019 by Danny Draper. View to west of Tree 4, *Eucalyptus tereticornis* Smith – Forest Red Gum. Wound 1 on east side of trunk and with wound apex shown (1) with oval holes approx. 8-10 mm diameter (B) consistent with Longicorn borer damage. Vertical spiral splits up to 2 mm wide on wound face derived from desiccated and shrunken Ray cells.

Photograph 19.0 Taken 17/4/2019 by Danny Draper. View to west of Tree 4, *Eucalyptus tereticornis* Smith – Forest Red Gum. Wound 1 on east side of trunk and with a section of the right wound margin shown (2), with a 1 m yellow folding ruler showing a 400 mm section. Oval holes approx. 8-10 mm diameter (B) consistent with Longicorn borer damage. Vertical spiral splits up to 2 mm wide on wound face derived from desiccated and shrunken Ray cells.

Photograph 20.0 Taken 17/4/2019 by Danny Draper. View to west of Tree 4, *Eucalyptus tereticornis* Smith – Forest Red Gum. Wound 1 on east side of trunk and with wound base shown (3) with oval holes approx. 8-10 mm diameter with coarse frass (B) consistent with Longicorn borer damage. Vertical spiral splits up to 2 mm wide on wound face derived from desiccated and shrunken Ray cells.

Photograph 18.0



Photograph 19.0

Photograph 20.0

4.0 TREE ASSESSMENT

4.1 Assessment of Tree/s – Tree 5 / MT9

Tree No. / Genus & species Common Name	1. **Age Class** Y = Young, M = Mature, O = Over-mature (Senescent) 2. **Age range of tree** in yrs. approx. 3. **Age range of wound/s,** in yrs. approx. 4. **Date range since tree died** in yrs. approx., e.g. died, cut down, ring-barked	**Condition** G = Good, F = Fair, P = Poor, D = Dead	**Form** D = Dominant, C = Co-dominant, I = Intermediate, S = Suppressed, F = Forest, E = Emergent	**Height** in metres approx. / **Crown spread** approx. length x breadth metres / **Crown spread orientation.**	**Trunk diameter** in mm @ 1.4m, or as stated / **Trunk diameter orientation**	**Crown cover / Crown density** approx. %	**SRIV** Age, Vigour, Condition / Index Rating App A. / Remaining life expectancy 1. Long 2. Medium 3. Short
5 / MT9 *Eucalyptus moluccana* Maiden Grey Box	1. M 2. 30 - <50 3.1 10 - <20 4. N/A	F	D	16 / 12 R	470, R E/W	90 / 90	MGVF - 9 / 1

Description

Eucalyptus moluccana Maiden – Grey Box is a small to medium woodland and occasionally tall forest tree (Brooker and Kleinig, 1999, p. 220) and can attain a height of 15-25 m (Elliot and Jones, 1986, p. 149) to 30 m with a trunk diameter up to 0.6-1.2 m DBH, typically with the trunk straight and half of more of the tree height (Boland *et al*, 2006, p. 460) with a crown spread of 10-20 m (Elliot and Jones, 1986, p. 149).

E. moluccana heartwood has a green density of 1170 kg / m^3 approx. (Bootle 2005, p. 256) to 1000-1230 kg / m^3 (Boland *et al*, 2006, p. 460) and air dry density (ADD) 1120 kg / m^3 (Bootle 2005, p. 256). Heartwood resistant to Lyctid borers and heartwood is termite resistant (Boland *et al*, 2006, p. 460, and Bootle 2005, p. 256). The heartwood has a high durability in the ground and a high durability above ground (Bootle 2005, p. 256) which is indicated in the remaining wound face section of the oldest wound, Wound 3 which has minimal weathering of tissue above and below ground from partial burial. The wood is durable and used for heavy engineering construction, bridges, wharves, shipbuilding, piles, poles, housing, cross-arms and general outdoor use (Bootle 2005, p. 256, Boland *et al*, 2006, p. 460). The tree grows within a rainfall range of 670-1250 mm (Boland *et al*, 2006, p. 476) and *the site* has a rainfall of approx. 654.1 mm (Australian Government Bureau of Meteorology, 2019), supporting trees like this specimen typical for the taxa described.

The tree is of good vigour overall, but in fair condition due to the wounding having caused cambial dysfunction to approx. 15% of trunk circumference. The tree has 1 wound, on the southwest side of the trunk (Photographs 21.0-23.0), which appeared to have been caused by mechanical wounding by an abrasion impact event.

Wound 1

Trunk wound, elliptical, asymmetrical, on southwest side (Photographs 22.0 and 23.0). Wound extending from 550 to 1780 mm and 215 mm at widest at 1500 mm. Wound face extending from 850 mm to 1580 mm and 145 mm at widest at 1500 mm. Wound face entire to sapwood, save for 1 deeper near horizontal furrowed striation at 1480 mm approx. and approx. 3 mm deep in the sapwood (Photograph 23.0). The striation is consistent with an abrasion impact event moving from left to right.

Wound margins entire, apex acute and base acute. The right wound margin has a depth of 150 mm at center. The left wound margin has a depth of 90 mm at center. The left wound margin is almost vertical and the right wound margin is curved with a convex protuberance 150 mm deep at center, consistent with the direction of the source of the abrasion having caused a partial delamination as it exited the tree (Photographs 22.0 and 23.0). This is further evident by the presence of jagged broken bark fibres on the outer trunk adjacent the abrasion wound proximally and distally occurring at 1260 mm and 1700 mm (Photograph 23.0). The initial right wound margin is 150 mm wide but the initial right wound margin was not present. However a shallow concave depression approx. 50-100 mm wide and 10 mm deep is evident 1480 mm in the right wound margin consistent with a furrow made in the trunk (Photograph 22.0).

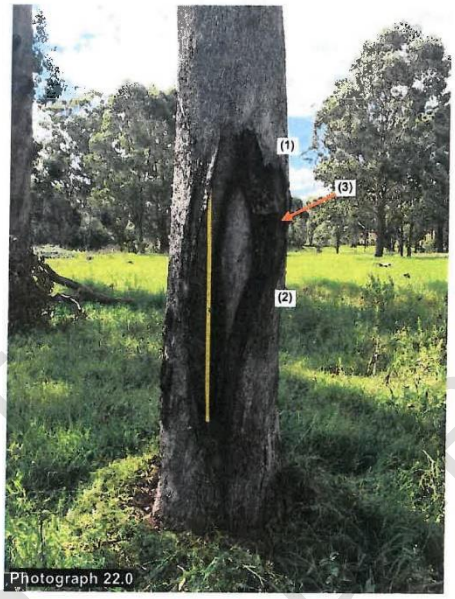
Conclusions

Wound 1 – From the extent of the furrowed striation and its depth into the sapwood, the tree was partly ring barked by an abrasion impact event. The exposed wood of this species has a high durability above ground (Bootle 2005, p. 265) but the minimal weathering of the sapwood wound face indicated that the wounding was a recent event 10-<20 years. The wound was caused by an abrasive collision with a truck or plant equipment causing a shallow wound and partially delaminating the tree along its right wound margin and for extensive cambial disfunction causing a large wound.

The wound affects approximately 15% of trunk circumference. The wound was formed mechanically by a shallow furrowed striation from an abrasion impact event, most likely with plant equipment.

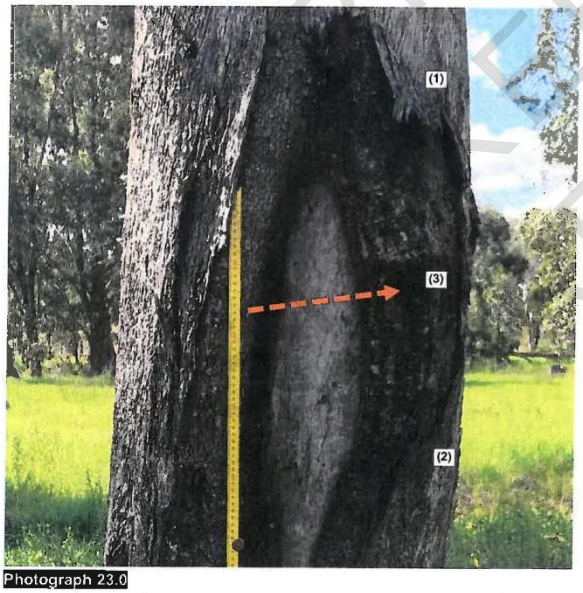
Risks to tree

The tree currently appears stable and viable, but is expected to become hollow from the wound over time and should be monitored for stability. The wound is likely to occlude within 40 years and should be monitored for stability.



Photograph 21.0 Taken 17/4/2019 by Danny Draper. View to east of Tree 5 / MT9, *Eucalyptus moluccana* Maiden – Grey Box. Wound 1 on southwest side of trunk, indicated with an orange arrow and shown in detail in Photographs 22.0 and 23.0.

Photograph 22.0 Taken 17/4/2019 by Danny Draper. View to northeast of Tree 5 / MT9, *Eucalyptus moluccana* Maiden – Grey Box. Wound 1 on southwest side of trunk, shown with a 1 m folding yellow ruler. Jagged broken bark fibres on the outer trunk adjacent the abrasion wound proximally (1) and distally (2) at 1260 mm and 1700 mm. A shallow concave depression (3) approx. 50-100 mm wide and 10 mm deep is evident 1480 mm in the right wound margin consistent with a furrow made in the trunk.



Photograph 23.0 Taken 17/4/2019 by Danny Draper. View to northeast of Tree 5 / MT9, *Eucalyptus moluccana* Maiden – Grey Box. Wound 1 on southwest side of trunk, shown with a 1 m folding yellow ruler. Jagged broken bark fibres on the outer trunk adjacent the abrasion wound proximally (1) and distally (2) at 1260 mm and 1700 mm. A shallow concave depression (3) approx. 50-100 mm wide and 10 mm deep is evident 1480 mm in the right wound margin consistent with a furrow made in the trunk. The orange dotted arrow indicates the location and direction of the abrasion impact wound.

5.0 CONCLUSION

This is provided in tabular form and summarizes the key information

Tree No. / Archaeological reference	Age of Tree **Age range of tree** in yrs. approx.	Age of Scar **Age range wound/s** in yrs. approx.	Likely origin of Scar/s
1 / GPPNT2	250 - <300	**Wound 1** – 150 - <200	**Wound 1** – Aboriginal Cultural origin.
2 / MT3	120 - <150	**Wound 1** – 25 - <50 **Wound 2** – 25 - <50	**Wound 1** – Mechanical wounding by Longicorn Borers. **Wound 2** – Mechanical wounding by Longicorn Borers.
3 / MT8	180 - <220	**Wound 1** – 25 - <40	**Wound 1** – Mechanical wounding by Longicorn Borers.
4 / no Archaeological number	75 - <100	**Wound 1** – 25 - <40	**Wound 1** – Mechanical wounding by Longicorn Borers.
5 / MT9	30 - <50	**Wound 1** – 10 - <20	**Wound 1** – Mechanical by abrasion impact event.

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TRAQ (ISA) Tree Risk Assessment

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DISCLAIMER

The author and Urban Tree Management take no responsibility for actions taken and their consequences, contrary to those expert and professional instructions given as recommendations pertaining to safety by way of exercising our responsibility to our client and the public as our duty of care commitment, to mitigate or prevent hazards from arising, from a failure moment in full or part, from a structurally deficient or unsound tree or a tree likely to be rendered thus by its retention and subsequent deterioration from modification/s to its growing environment either existing or proposed, either above or below ground, contrary to our advice.

Appendix A

Matrix - Sustainable Retention Index Value (SRIV) ©

Version 4, 2010
Developed by IACA – Institute of Australian Consulting Arboriculturists www.iaca.org.au

The matrix is to be used with the value classes defined in the Glossary for Age / Vigour / Condition.
An index value is given to each category where ten (10) is the highest value.

Age Class	Vigour Class and Condition Class					
	Good Vigour & Good Condition (GVG)	Good Vigour & Fair Condition (GVF)	Good Vigour & Poor Condition (GVP)	Low Vigour & Good Condition (LVG)	Low Vigour & Fair Condition (LVF)	Low Vigour & Poor Condition (LVP)
	Able to be retained if sufficient space available above and below ground for future growth. No remedial work or improvement to growing environment required. May be subject to high vigour. Retention potential - Medium – Long Term.	Able to be retained if sufficient space available above and below ground for future growth. Remedial work may be required or improvement to growing environment may assist. Retention potential - Medium Term. Potential for longer with remediation or favourable environmental conditions.	Able to be retained if sufficient space available above and below ground for future growth. Remedial work unlikely to assist condition, improvement to growing environment may assist. Retention potential - Short Term. Potential for longer with remediation or favourable environmental conditions.	May be able to be retained if sufficient space available above and below ground for future growth. No remedial work required, but improvement to growing environment may assist vigour. Retention potential - Short Term. Potential for longer with remediation or favourable environmental conditions.	May be able to be retained if sufficient space available above and below ground for future growth. Remedial work or improvement to growing environment may assist condition and vigour. Retention potential - Short Term. Potential for longer with remediation or favourable environmental conditions.	Unlikely to be able to be retained if sufficient space available above and below ground for future growth. Remedial work or improvement to growing environment unlikely to assist condition or vigour. Retention potential - Likely to be removed immediately or retained for Short Term. Potential for longer with remediation or favourable environmental conditions.
(Y) Young	**YGVG - 9** **Index Value 9** Retention potential - Long Term. Likely to provide minimal contribution to local amenity if height <5 m. High potential for future growth and adaptability. Retain, move or replace.	**YGVF - 8** **Index Value 8** Retention potential - Short – Medium Term. Potential for longer with improved growing conditions. Likely to provide minimal contribution to local amenity if height <5 m. Medium-high potential for future growth and adaptability. Retain, move or replace.	**YGVP - 5** **Index Value 5** Retention potential - Short Term. Potential for longer with improved growing conditions. Likely to provide minimal contribution to local amenity if height <5 m. Low-medium potential for future growth and adaptability. Retain, move or replace.	**YLVG - 4** **Index Value 4** Retention potential - Short Term. Potential for longer with improved growing conditions. Likely to provide minimal contribution to local amenity if height <5 m. Medium potential for future growth and adaptability. Retain, move or replace.	**YLVF - 3** **Index Value 3** Retention potential - Short Term. Potential for longer with improved growing conditions. Likely to provide minimal contribution to local amenity if height <5m. Low-medium potential for future growth and adaptability. Retain, move or replace.	**YLVP - 1** **Index Value 1** Retention potential - Likely to be removed immediately or retained for Short Term. Likely to provide minimal contribution to local amenity if height <5 m. Low potential for future growth and adaptability.
(M) Mature	**MGVG - 10** **Index Value 10** Retention potential - Medium - Long Term.	**MGVF - 9** **Index Value 9** Retention potential - Medium Term. Potential for longer with improved growing conditions.	**MGVP - 6** **Index Value 6** Retention potential - Short Term. Potential for longer with improved growing conditions.	**MLVG - 5** **Index Value 5** Retention potential - Short Term. Potential for longer with improved growing conditions.	**MLVF - 4** **Index Value 4** Retention potential - Short Term. Potential for longer with improved growing conditions.	**MLVP - 2** **Index Value 2** Retention potential - Likely to be removed immediately or retained for Short Term.
(O) Over-mature	**OGVG - 6** **Index Value 6** Retention potential - Medium - Long Term.	**OGVF - 5** **Index Value 5** Retention potential - Medium Term.	**OGVP - 4** **Index Value 4** Retention potential - Short Term.	**OLVG - 3** **Index Value 3** Retention potential - Short Term. Potential for longer with improved growing conditions.	**OLVF - 2** **Index Value 2** Retention potential - Short Term.	**OLVP - 0** **Index Value 0** Retention potential - Likely to be removed immediately or retained for Short Term.

Appendix B

Glossary

From
Dictionary for Managing Trees in Urban Environments
Institute of Australian Consulting Arboriculturists (IACA) 2009, CSIRO Publishing.

Wounds

Abrasion Wound *Mechanical wound* causing *laceration* of tissue by an abrasive impact *episode* e.g. grazed by a motor vehicle or the continuous action of the rubbing of *crossed branches* or stems where no graft has formed.

Basal Trunk Wound A wound on the trunk extending to the *root crown* where the base of the wound is open at the ground and usually truncated. Dependent upon the width of its base such a wound may not become *occluded*.

Blaze A wound cut into a tree usually to the sapwood and sometimes extending to heartwood to create a marker point e.g. by a surveyor, the *wound face* may be further incised or painted to denote additional information.

Branch Core After a branch fails or is removed, this is the remaining branch section within the connecting branch or trunk walled off by compartmentalisation.

Branch Tear *See Branch Tear Out.*

Branch Tear Out Dislodging of a branch from its point of attachment where it is torn away from the *branch collar* snapping the *branch tail* causing a *laceration*, usually to the underside of the *branch union* of the branch or trunk to which it was attached forming a *tear out wound*.

Branch Tear Wound *See Tear Out Wound.*

Callus Wood Undifferentiated and unlignified wood that forms initially after wounding around the margins of a wound separating damaged existing wood from the later forming lignified wood or *wound wood*.

Canker A *wound* created by repeated localised killing of the *vascular cambium* and bark by wood *decay* fungi and bacterium usually marked by concentric disfiguration. The wound may appear as a depression as each successive *growth increment* develops around the *lesion* forming a *wound margin* (Shigo 1991, p. 140, Keane *et al* 2000, p. 332).

Cavity A usually shallow void often localized initiated by a *wound* and subsequent *decay* within the trunk, branches or roots, or beneath bark, and may be enclosed or have one or more opening.

Decay Process of degradation of wood by microorganisms (Australian Standard 2007, p. 6) and fungus.

Delaminate A *mechanical wound* caused when the bark is stripped from a tree, usually from the trunk as a continuous sheet back to the vascular cambium. This may occur from an impact or abrasion *episode* such as a collision with a motor vehicle and the tree may become *ringbarked*. See also *Partially Delaminated*.

Delamination The separation of fibres often evident as longitudinal splitting of wood (Lonsdale 1999, p. 313).

Delignification The decomposition of *lignin* from *wood* by chemical deterioration, resulting in loss of strength, evident by separation of fibres into hair like strands. See also *Lignification*.

Depth of Margin Distance from outer trunk perpendicular to the *wound face*. This may assist in determining the age of a wound.

Dieback Wound Wounding where *dieback* extends beyond a branch collar as with *natural pruning* and extends to other branches, trunk or roots. See also *Secondary Crown* and *Stag-headed*.

Enclosed Wound Wound with a perimeter of *wound wood* with a well-defined apex, base and margins and often evident on an older wound. On a pruned branch that is rounded the enclosing wound wood from the branch collar may be circular with no definite apex or base evident. However, on a pruned branch where the *wound face* is oval in shape due to *reaction wood*, the enclosing *wound wood* from the branch collar may form a definite apex, base or margins.

Environmental Wounding/Damage Wounding inflicted by environmental factors or modifications to the growing *environment* of a tree, e.g. sun-scald, drought, fire, water logging, wind damage to leaves, branches, bark or roots, phytotoxic damage from chemicals, or air, soil or water pollution.

Fire Wound Wounding caused by fire. Such wounds may cause initial damage or may be secondary from a previous wounding *episode/s*. Some fire damage may be superficial or may destroy a tree in full or part rendering it potentially vulnerable to failure. Note: fire damaged trees can be potentially hazardous and should be assessed carefully.

Hollow A large void initiated by a *wound* forming a *cavity* in the trunk, branches or roots and usually increased over time by *decay* or other contributing factors, e.g. fire, or fauna such as birds or insects e.g. ants or termites. A hollow can be categorized as an *Ascending Hollow* or a *Descending Hollow*.

Horizontal Wound Usually superficial horizontal wounding from insects burrowing between bark layers and revealed by decorticating bark. Often evident on smooth bark Eucalypts.

Impact Wound *Mechanical wound* caused by an impact *episode* e.g. collision by a motor vehicle.

Incision Wound caused by cutting or engraving. See also *Laceration*.

Increment strip A linear, usually narrow, *fluted* section of *adaptive wood*, forming in a place of high *stress* indicating the pattern of *force flow* (Mattheck 2004, p. 140). Evident as lighter coloured bark usually occurring around the edges of a *notch* or *branch stub*, along a *buttress*, or along a *sharp-edged rib*.

Initial Wound Margin The site of initial wounding often evident as a faint line of discoloured bark or bark of a different texture to adjacent undamaged trunk. This may assist in determining the age of a wound.

Insect Wound Wounding to any part of a tree caused by insect activity, e.g. borers and termites.

Laceration Wound caused by tearing. See also *Incision*.

Lightning Strike Wound A wound from a lightning strike. Such a wound may kill a tree outright or cause it to catch fire, or may destroy the tree in full or part, or no injury may be evident and a tree gradually declines through resulting *stress*. Bark may be exploded from the tree by pressure radiating from the core of the lightning path resulting in further compounded damage through water heating and steam explosions in the tissues and the electrical disruption of living cells (Coder 2004, pp. 35-44).

Mechanical Wound Wounding inflicted by abrasion e.g. by motor vehicles, grass mowing equipment, grazing by horses, cows or birds (parrots); impact e.g. by motor vehicle collisions; drilling e.g. with increment cores, resistographs, cable bracing, hanging pots, hammocks etc.; branch tearing e.g. from wind damage, collision from falling branches, vandalism; and root severance e.g. root pruning for excavation for building or utility services or for agricultural cultivation.

Open Wound Wound with poor to non-existent perimeter or *callus wood* or *wound wood* on an older wound without well-defined apex, base or margins and often this will be associated with a recent wounding *episode* or an older episode on a senescent tree or a tree in *poor condition* or of *low vigour*, or where repeated wounding episodes such as inflicted by ongoing borer activity damages and continually alters wound perimeters, or repeated scalping of exposed roots by lawn mowing equipment.

Occlusion Growth processes where *wound wood* develops to enclose the *wound face* by the merging of *wound margins* concealing the *wound* and restoring the growing surface of the structure with each *growth increment* gradually realigning *fibres* in the wood longitudinally along the stem to maximise uniform stress loading.

Partial Occlusion *Wound wood* growth that encloses some of the *wound face* by the merging and *grafting* of some sections of the *wound margins*. Usually evident by reduced *wound face* width and indicated where an *apex* or *base* is *acute* with the vertical extent often indicated by the length of an *occlusion seam*.

Partially Bridged Occlusion *Wound wood* partly forming an *occlusion* by joining areas of the *wound margins* across the *wound face* at point/s other than the base or apex and may form an *occlusion seam*.

Pruning Wound A wound created by the act of *pruning*.

Ram's Horning *Wound wood* that becomes curled inward and can wrap around itself as it crosses a void such as a *cavity* and may succumb to cracking with those wounds susceptible to further infestation by *decay* pathogens.

Scarred Tree A tree containing a wound of cultural or scientific interest, inflicted initially for a specific purpose, e.g. by indigenous people to extract implements or carved as a marker or with a pattern for ceremonial purposes, or as a marker and *blaze* by a surveyor or explorer, or from an accidental *wound* that has not *occluded*.

Stepped Incision A localised area of deeper wounding often extending to the heartwood, usually proximally within a *blaze*, removing a vertical semi-circular wedge like section from the *wound face* with a horizontal bench like structure formed by deep cuts as its base. Such wound sections usually taper distally and may be cut around the outer edges to assist removal of the semi-circular wedge, and likely undertaken to inhibit regrowth.

Structural Wound Any wound occurring on a tree as a result of a structural failure e.g. branch splitting or *hazard beam*, diminishing its stability in full or part.

Succession Wound Preceding layers of failed wound margin/s forming a step like sequence away from the *wound face*, where present, to the current wound margin/s indicating repeated cycles of formation and failure of *CODIT Wall 4*.

Sun Scald Wounding Wounding usually on the upper side of branches after sudden exposure to sunlight especially in summer e.g. after excessive pruning of the upper crown, or following storm damage stripping foliage or branches e.g. *Ficus spp.*

Survey Marker Wound *See Blaze.*

Tear Out *See Branch Tear Out.*

Tear Out Wound A wound of usually concave shape created by a *branch tear out*.

Wound Damage inflicted upon a tree through injury to its living cells, from biotic or abiotic causes, e.g. where *vascular cambium* has been damaged by branch breakage, impact or insect attack. Some wounds *decay* and cause *structural deterioration* or *defects*. Trees of *normal vigour* are able to resist and contain infection by walling off areas within the wood by *compartmentalization*. See *Compartmentalization Of Decay In Trees (CODIT)*. An *occlusion* may eventually conceal a wound but the enclosed *defect* remains internally and *decay* may continue to develop further weakening the *heartwood* and *sapwood* compromising the tree's *structural integrity*. The cause of a wound may be accidental e.g. *branch tear out* or deliberate e.g. *carved tree*.

Wound Apex The distal end of a wound. The shape may be acute, irregular, jagged, obtuse, rounded, or truncate.

Wound Apex Acute Apex of a wound that is tapering and the *occlusion* interface angle is less than <90°.

Wound Apex Irregular The *wound wood* growth at the apex mostly interrupted forming an edge that is not uniform or jagged. Often this may be influenced by a *successional wound* resulting in disproportionate development of *callous wood* and *wound wood*.

Wound Apex Jagged The *wound wood* growth or tissue damaged initially at the apex that is uneven and likely to have been caused by laceration.

Wound Apex Obtuse Apex of a wound that is tapering and the *occlusion* interface angle is greater than >90°.

Wound Apex Rounded The *wound wood* growth at the apex that is curved.

Wound Apex Truncate The *wound wood* growth or tissue damaged initially at the apex that is even and likely to have been caused by incision.

Wound Base The proximal end of a wound. The shape may be acute, irregular, jagged, obtuse, rounded, or truncate.

Wound Base Acute Base of wound that is tapering and the *occlusion* interface angle is less than <90°.

Wound Base Irregular The *wound wood* growth at the base mostly interrupted forming an edge that is not uniform or jagged. Often this may be influenced by a *successional wound* resulting in disproportionate development of *callous wood* and *wound wood*.

Wound Base Jagged The *wound wood* growth or tissue damaged initially at the base that is uneven and likely to have been caused by laceration.

Wound Base Obtuse Base of wound that is tapering and the *occlusion* interface angle is greater than >90°.

Wound Base Rounded The *wound wood* growth at the base that is curved.

Wound Base Truncate The *wound wood* growth or tissue damaged initially at the base that is even and likely to have been caused by incision.

Wound Face Surface area of tissue exposed by injury, e.g. bark, sapwood, heartwood.

Wound Face Cracks Horizontal Transverse cracks in a *wound face* indicative of failure from *tension* force (Mattheck & Breloer 1994, p. 183).

Wound Face Cracks Vertical Longitudinal cracks in a *wound face* indicative of failure from *compression* force (Mattheck & Breloer 1994, p. 183).

Wound Face Entire Surface of exposed tissue is uniform without damage extending to a different layer or unaffected by borers or decay, e.g. possibly described as *wound face* entire to dead sapwood.

Wound Face Incomplete Surface of exposed tissue is not uniform with damage extending to different layers or affected by borers or decay, e.g. possibly described as *wound face incomplete* with cavity at apex. See also *Wound face entire*.

Wound Face Exposed Heartwood Wound extending to reveal the *heartwood*, or has deteriorated through *decay* to reveal this layer of wood.

Wound Face Exposed Sapwood Wound extending to reveal the sapwood, or has deteriorated through *decay* to reveal this layer of wood.

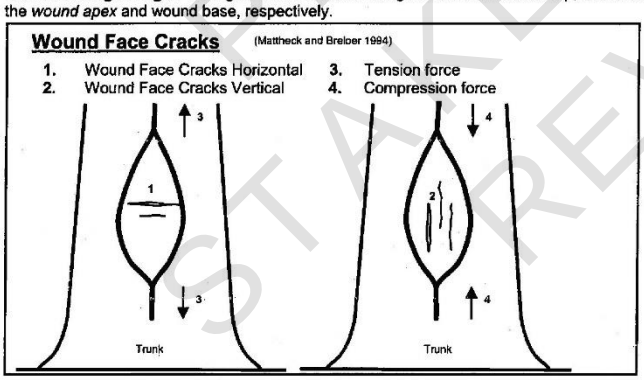
Wound Margin The left and right sides of a *wound* as bound by the alignment of fibres along a stem or root longitudinally, being either the remaining undamaged living cells and new *callus wood* and *wound wood* on older wounds. Here the fibres are usually formed from *meristematic* cells. A wound margin may be circular on a *pruning wound* or form around the perimeter of a *canker*.

Wound Margin Entire The *wound wood* growth in the margin is mostly uninterrupted forming a uniform edge.

Wound Margin Irregular The *wound wood* growth in the margin is mostly interrupted and forms an edge that is not uniform e.g. where repeated wounding *episodes* such as inflicted by ongoing borer activity damages and continually alters the *wound perimeter* with *callus wood* and *wound wood*. See also *Successional Wound*.

Wound Margin Left The left side of a wound margin when the distal and proximal ends of the wound is known, to determine the *wound apex* and *wound base*, respectively.

Wound Margin Right The right side of a wound margin when the distal and proximal end of the wound is known, to determine the *wound apex* and wound base, respectively.



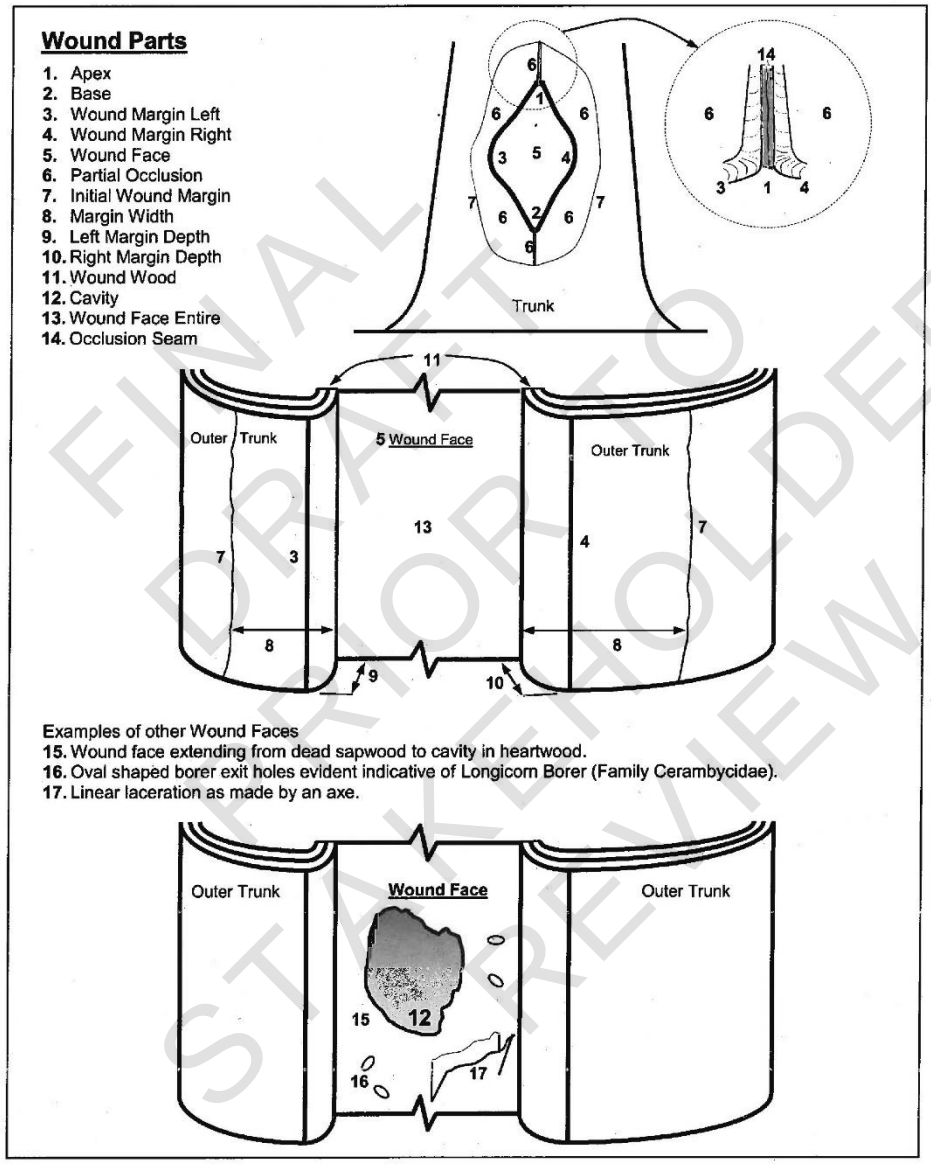
Wound Margin Width Distance from *wound margin* to the site of initial wounding. Where evident the *initial wound margin* may be identified by discoloured bark or bark of a different texture to adjacent undamaged trunk. This may also assist in determining the age of a wound.

Wound Wood Aged *callus wood* around the margins of a wound that becomes differentiated to form *CODIT Wall 4* producing new lignified wood. This wood may grow to surround a wound and may eventually develop to enclose the wound by *occlusion*.

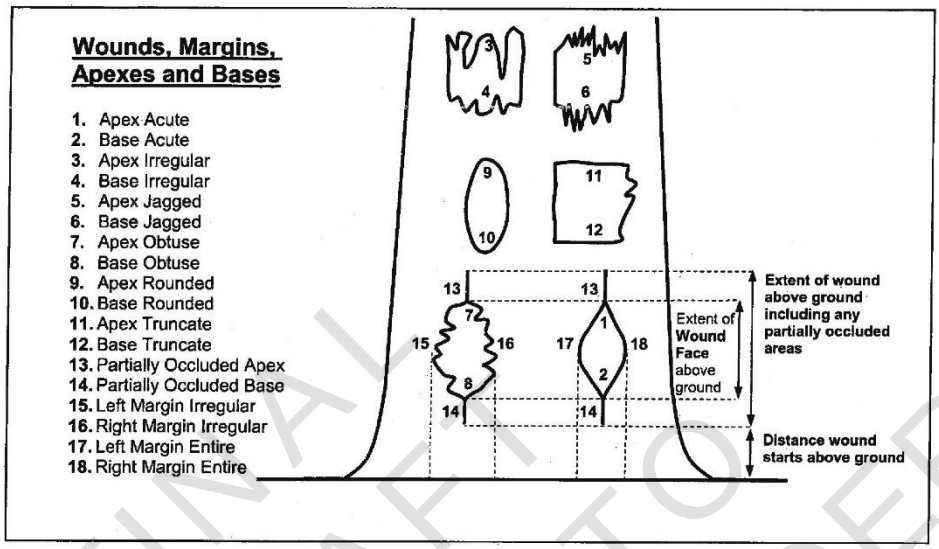
Wound Diagrams

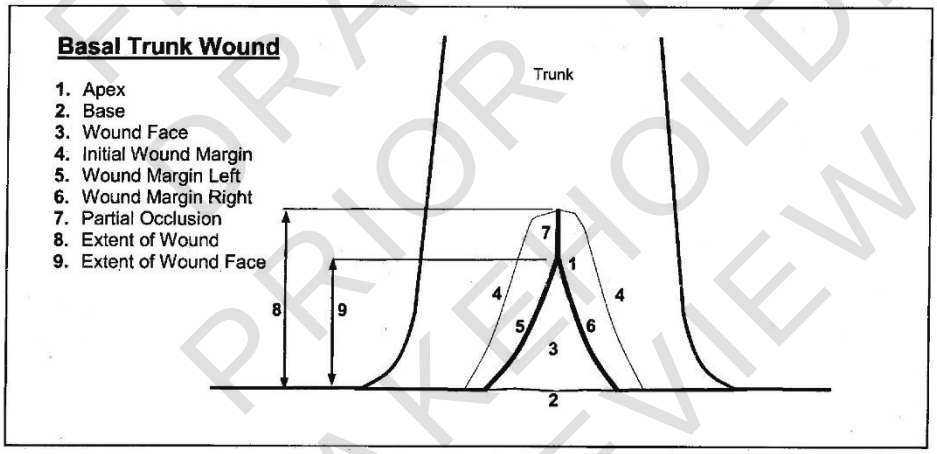
Wound Parts

1. Apex
2. Base
3. Wound Margin Left
4. Wound Margin Right
5. Wound Face
6. Partial Occlusion
7. Initial Wound Margin
8. Margin Width
9. Left Margin Depth
10. Right Margin Depth
11. Wound Wood
12. Cavity
13. Wound Face Entire
14. Occlusion Seam



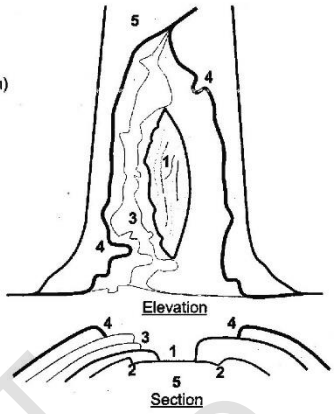
Examples of other Wound Faces
15. Wound face extending from dead sapwood to cavity in heartwood.
16. Oval shaped borer exit holes evident indicative of Longicorn Borer (Family Cerambycidae).
17. Linear laceration as made by an axe.

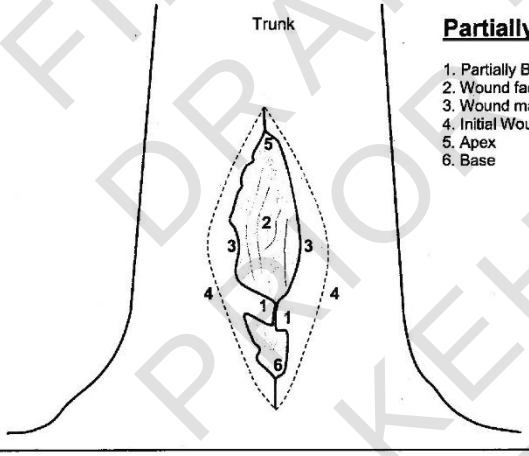




Successional Wound

1. Initial wound face
2. Initial wound margins (concealed when viewed in Elevation)
3. Successive wound margins
4. Wound margins (current)
5. Trunk





Partially Bridged Occlusion

1. Partially Bridged Occlusion
2. Wound face
3. Wound margins
4. Initial Wound Margins
5. Apex
6. Base

Condition of Trees

Condition A tree's *crown form* and growth habit, as modified by its *environment* (aspect, suppression by other trees, soils), the *stability* and *viability* of the *root plate*, trunk and structural branches (first (1st) and possibly second (2nd) order branches), including structural defects such as wounds, cavities or hollows, *crooked* trunk or weak trunk/branch junctions and the effects of predation by pests and diseases. These may not be directly connected with *vigour* and it is possible for a tree to be of *normal vigour* but in *poor condition*. Condition can be categorized as *Good Condition*, *Fair Condition*, *Poor Condition* and *Dead*.

Good Condition Tree is of good habit, with *crown form* not severely restricted for space and light, physically free from the adverse effects of *predation* by pests and diseases, obvious instability or structural weaknesses, fungal, bacterial or insect infestation and is expected to continue to live in much the same condition as at the time of inspection provided conditions around it for its basic survival do not alter greatly. This may be independent from, or contributed to by vigour. See also *Condition*, *Fair Condition* and *Poor Condition*.

Fair Condition Tree is of good habit or *misshapen*, a form not severely restricted for space and light, has some physical indication of *decline* due to the early effects of *predation* by pests and diseases, fungal, bacterial, or insect infestation, or has suffered physical injury to itself that may be contributing to instability or structural weaknesses, or is faltering due to the modification of the *environment* essential for its basic survival. Such a tree may recover with remedial works where appropriate, or without intervention may stabilise or improve over time, or in response to the implementation of beneficial changes to its local environment. This may be independent from, or contributed to by vigour. See also *Condition*, *Good Condition* and *Poor Condition*.

Poor Condition Tree is of good habit or *misshapen*, a form that may be severely restricted for space and light, exhibits symptoms of advanced and *irreversible decline* such as fungal, or bacterial infestation, major die-back in the branch and *foliage crown*, *structural deterioration* from insect damage e.g. termite infestation, or storm damage or lightning strike, ring barking from borer activity in the trunk, root damage or instability of the tree, or damage from physical wounding impacts or abrasion, or from altered local environmental conditions and has been unable to adapt to such changes and may decline further to death regardless of remedial works or other modifications to the local *environment* that would normally be sufficient to provide for its basic survival if in *good* to *fair* condition. Deterioration physically, often characterised by a gradual and continuous reduction in vigour but may be independent of a change in vigour, but characterised by a proportionate increase in susceptibility to, and *predation* by pests and diseases against which the tree cannot be sustained. Such conditions may also be evident in trees of advanced senescence due to normal phenological processes, without modifications to the growing environment or physical damage having been inflicted upon the tree. This may be independent from, or contributed to by vigour. See also *Condition*, *Good Condition* and *Fair Condition*.

Moribund Advanced state of decline, dying or nearly dead.

Dead Tree is no longer capable of performing any of the following processes or is exhibiting any of the following symptoms;
Processes
Photosynthesis via its foliage crown (as indicated by the presence of moist, green or other coloured leaves);
Osmosis (the ability of the root system to take up water);
Turgidity (the ability of the plant to sustain moisture pressure in its cells);
Epicormic shoots or *epicormic strands* in Eucalypts (the production of new shoots as a response to stress, generated from latent or adventitious buds or from a *lignotuber*);
Symptoms
Permanent leaf loss;
Permanent wilting (the loss of turgidity which is marked by desiccation of stems leaves and roots);
Abscission of the *epidermis* (bark desiccates and peels off to the beginning of the sapwood).

Removed No longer present, or tree not able to be located or having been cut down and retained on a site, or having been taken away from a site prior to site inspection.

Periods of Time

Periods of Time The life span of a tree in the urban environment may often be reduced by the influences of encroachment and the dynamics of the environment and can be categorized as *Immediate*, *Short Term*, *Medium Term* and *Long Term*.

Immediate An *episode* or occurrence, likely to happen within a twenty-four (24) hour period, e.g. tree failure or collapse in full or part posing an imminent danger. See also *Short Term*, *Medium Term* and *Long Term*.

Short Term A period of time less than <1 – 15 years. See also *Periods of Time*, *Immediate*, *Medium Term* and *Long Term*.

Medium Term A period of time 15 – 40 years. See also *Periods of Time*, *Immediate*, *Short Term* and *Long Term*.

Long Term A period of time greater than >40 years. See also *Periods of Time*, *Immediate*, *Medium Term* and *Short Term*.

Vigour

Vigour Ability of a tree to sustain its life processes. This is independent of the *condition* of a tree but may impact upon it. Vigour can appear to alter rapidly with change of seasons (seasonality) e.g. dormant, deciduous or semi-deciduous trees. Vigour can be categorized as *Normal Vigour, High Vigour, Low Vigour* and *Dormant Tree Vigour*.

Normal Vigour Ability of a tree to maintain and sustain its life processes. This may be evident by the *typical* growth of leaves, *crown cover* and *crown density*, branches, roots and trunk and *resistance* to *predation*. This is independent of the *condition* of a tree but may impact upon it, and especially the ability of a tree to sustain itself against predation. See also *Vigour*, *Low Vigour* and *High Vigour*.

High Vigour *Accelerated growth* of a tree due to incidental or deliberate artificial changes to its growing *environment* that are seemingly beneficial, but may result in *premature aging* or failure if the favourable conditions cease, or promote *prolonged senescence* if the favourable conditions remain, e.g. water from a leaking pipe; water and nutrients from a leaking or disrupted sewer pipe; nutrients from animal waste, a tree growing next to a chicken coop, or a stock feed lot, or a regularly used stockyard; a tree subject to a stringent watering and fertilising program; or some trees may achieve an extended lifespan from continuous *pollarding* practices over the life of the tree.

Low Vigour Reduced ability of a tree to sustain its life processes. This may be evident by the *atypical* growth of leaves, reduced *crown cover* and reduced *crown density*, branches, roots and trunk, and a deterioration of their functions with reduced *resistance* to *predation*. This is independent of the *condition* of a tree but may impact upon it, and especially the ability of a tree to sustain itself against predation. See also *Vigour*, *Normal Vigour* and *High Vigour*.

Dormant Tree Vigour Determined by existing turgidity in lowest order branches in the outer extremity of the crown, with good bud set and formation, and where the last *extension growth* is distinct from those most recently preceding it, evident by bud scale scars. Normal vigour during dormancy is achieved when such growth is evident on a majority of branches throughout the crown.

Good Vigour See *Normal Vigour*.

Poor Vigour See *Low Vigour*.

Health A tree's *vigour* as exhibited by *crown density*, *crown cover*, leaf colour, presence of epicormic shoots ability to withstand *predation* by pests and diseases, *resistance* and the degree of *dieback*.

Age of Trees

Age Most trees have a stable biomass for the major proportion of their life. The estimation of the age of a tree is based on the Knowledge of the expected lifespan of the taxa in situ divided into three distinct stages of measurable biomass, when the exact age of the tree from its date of cultivation or planting is unknown and can be categorized as *Young*, *Mature* and *Over-mature* (British Standards 1991, p. 13, Harris *et al*, 2004, p. 262).

Young Tree aged less than <20% of life expectancy, *in situ*. See also *Age*, *Mature* and *Over-mature*.

Mature Tree aged 20-80% of life expectancy, *in situ*. See also *Age*, *Young* and *Over-mature*.

Over-mature Tree aged greater than >80% of life expectancy, *in situ*, or *senescent* with or without reduced *vigour*, and declining gradually or rapidly but irreversibly to death. See also *Age*, *Young* and *Mature*.

Premature Aging Apparent hastened aging and deterioration of a tree where it has been subject to conditions or practices adverse to expected normal growth, resulting in a *spiral of decline*. The following are examples of processes that may start such cycles:

- Top lopping of a mature tree
- In a new car park, the excavation of soil severing the roots of a tree close to its trunk and then sealing the soil surface with asphalt or concrete up to the trunk
- Open trenching alongside a street tree severing all roots in the trench, then top lopping it for power line clearance, and then extensive damage to bark by abrasion by trucks and excavation equipment as tree is adjacent to a construction site
- Root damage from *soil compaction* to substantial areas of the root plate.

Prolonged Senescence A phenomenon in an *over-mature* tree or tree with *structural deterioration* in its *condition* and often *vigour* as *abnormal vigour* as a result of modifications to the tree or the growing environment essential for its survival where it is sustained beyond the *typical* extent of its life cycle, or prevented from failing in full or part from *structural deterioration* by a beneficial artificial modification to its growing environment either by deliberate or incidental intervention, e.g. water from a leaking tap, water and nutrients from a leaking sewer pipe creating a *hydroponic* environment, or by physically propping up a tree with *structural deterioration* as with a *veteran tree*, or by it *leaning* or growing against another tree or structure for support.

Visual Tree Assessment (VTA) A visual inspection of a tree from the ground based on the principle that, when a tree exhibits apparently superfluous material in its shape, this represents repair structures to rectify *defects* or to reinforce weak areas subject to additional loading forces of compression, tension, torsion and shear. Such assessments should only be undertaken by suitably competent practitioners.

Drop Zone The distance away from a tree that may be physically influenced by a falling branch.

Fall Zone The distance away from a tree that may be physically influenced if it was cut down or subject to *collapse*.

Leaning Trees

Leaning A tree where the *trunk* grows or moves away from upright. A lean may occur anywhere along the *trunk* influenced by a number of contributing factors e.g. genetically predetermined characteristics, competition for space or light, prevailing winds, aspect, slope, or other factors. A *leaning* tree may maintain a *static lean* or display an increasingly *progressive lean* over time and may be hazardous and prone to *failure* and *collapse*. The degrees of leaning can be categorized as *Slightly Leaning*, *Moderately Leaning*, *Severely Leaning* and *Critically Leaning*.

Slightly Leaning A leaning tree where the trunk is growing at an angle within 0°-15° from upright.

Moderately Leaning A leaning tree where the trunk is growing at an angle within 15°-30° from upright.

Severely Leaning A leaning tree where the trunk is growing at an angle within 30°-45° from upright.

Critically Leaning A leaning tree where the trunk is growing at an angle greater than >45° from upright.

Progressively Leaning A tree where the degree of *leaning* appears to be increasing over time.

Static Leaning A leaning tree whose lean appears to have stabilized over time.

Windthrow Tree failure and collapse when a *force* exerted by wind against the *crown* and *trunk* overcomes resistance to that force in the *root plate*, such that the *root plate* is lifted from the soil on one side as the tree tips over.

Symmetry

Symmetry Balance within a *crown*, or *root plate*, above or below the *axis* of the trunk of branch and foliage, and root distribution respectively and can be categorized as *Asymmetrical* and *Symmetrical*.

Asymmetrical Imbalance within a crown, where there is an uneven distribution of branches and the foliage *crown* or *root plate* around the vertical *axis* of the trunk. This may be due to *Crown Form Codominant* or *Crown From Suppressed* as a result of natural restrictions e.g. from buildings, or from competition for space and light with other trees, or from exposure to wind, or artificially caused by pruning for clearance of roads, buildings or power lines. An example of an expression of this may be, crown asymmetrical, bias to west. See also *Symmetrical* and *Symmetry*.

Symmetrical Balance within a crown, where there is an even distribution of branches and the *foliage crown* around the vertical *axis* of the trunk. This usually applies to trees of *Crown Form Dominant* or *Crown Form Forest*. An example of an expression of this may be crown symmetrical. See also *Symmetry* and *Asymmetrical*.

Crown Spread Orientation Direction of the *axis* of *crown spread* which can be categorized as *Orientation Radial* and *Orientation Non-radial*.

Crown Spread Orientation Non-radial Where the crown extent is longer than it is wide, e.g. east/west or E/W. Further examples, north/south or N/S, and may be *Crown Form Codominant*, e.g. **A** or **B**, *Crown Form Intermediate* e.g. **A**, or *Crown Form Suppressed* e.g. **B**, *and* crown symmetry is *symmetrical* e.g. **A**, or *asymmetrical* e.g. **B**.

Crown Spread Orientation Radial Where the *crown spread* is generally an even distance in all directions from the trunk and often where a tree has *Crown Form Dominant* and is *symmetrical*.

Diameter at Breast Height (DBH) Measurement of trunk width calculated at a given distance above ground from the base of the tree often measured at 1.4 m. The trunk of a tree is usually not a circle when viewed in cross section, due to the presence of *reaction wood* or *adaptive wood*, therefore an average diameter is determined with a *diameter tape* or by recording the trunk along its narrowest and widest axes, adding the two dimensions together and dividing them by 2 to record an average and allowing the orientation of the longest axis of the trunk to also be recorded. Where a tree is growing on a lean the distance along the top of the trunk is measured to 1.4m and the diameter then recorded from that point perpendicular to the edge of the trunk. Where a *leaning* trunk is *crooked* a vertical distance of 1.4m is measured from the ground. Where a tree branches from a trunk that is less than 1.4m above ground, the trunk diameter is recorded perpendicular to the length of the *trunk* from the point immediately below the base of the flange of the *branch collar* extending the furthest down the trunk, and the distance of this point above ground recorded as *trunk* length. Where a tree is located on sloping ground the DBH should be measured at half way along the side of the tree to average out the angle of slope. Where a tree is *acaulescent* or *trunkless* branching at or near ground an average diameter is determined by recording the radial extent of the trunk at or near ground and noting where the measurement was recorded e.g. at ground.

Significant Important, weighty or more than ordinary.

Significant Tree A tree considered important, weighty or more than ordinary. Example: due to prominence of location, or *in situ*, or contribution as a component of the overall landscape for *amenity* or aesthetic qualities, or *curtilage* to structures, or importance due to uniqueness of taxa for species, subspecies, variety, *crown form*, or as an historical or cultural planting, or for age, or substantial dimensions, or habit, or as *remnant vegetation*, or habitat potential, or a rare or threatened species, or uncommon in cultivation, or of aboriginal cultural importance, or is a commemorative planting.

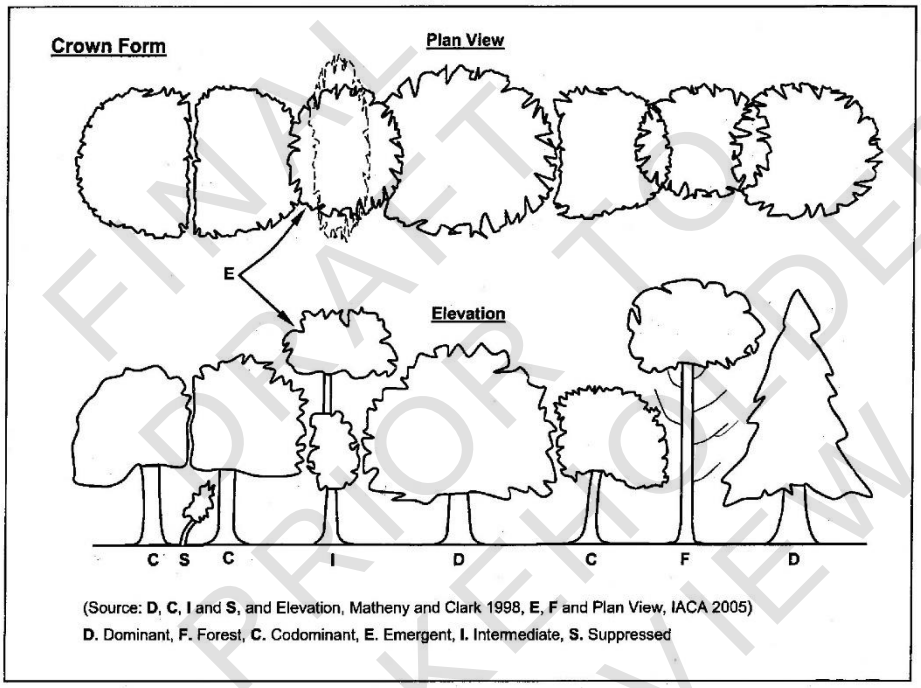
Sustainable Retention Index Value (SRIV) A visual tree assessment method to determine a qualitative and numerical rating for the viability of urban trees for development sites and management purposes, based on general tree and landscape assessment criteria using classes of *age*, *condition* and *vigour*. SRIV is for the professional manager of urban trees to consider the tree *in situ* with an assumed knowledge of the *taxon* and its growing environment. It is based on the physical attributes of the tree and its response to its environment considering its position in a matrix for age class, vigour class, condition class and its sustainable retention with regard to the safety of people or damage to property. This also factors the ability to retain the tree with remedial work or beneficial modifications to its growing environment or removal and replacement. SRIV is supplementary to the decision made by a tree management professional as to whether a tree is retained or removed (IACA - Institute of Australian Consulting Arboriculturists 2005).

Form of Trees

Crown Form The shape of the crown of a tree as influenced by the availability or restriction of space and light, or other contributing factors within its growing environment. Crown Form may be determined for tree shape and habit generally as *Dominant*, *Codominant*, *Intermediate*, *Emergent*, *Forest* and *Suppressed*. The habit and shape of a *crown* may also be considered qualitatively and can be categorized as *Good Form* or *Poor Form*. See also *Forest Grown* and *Open Grown*.

Good Form Tree of *typical* crown shape and habit with proportions representative of the taxa considering constraints such as origin e.g. indigenous or exotic, but does not appear to have been adversely influenced in its development by environmental factors in situ such as *soil water* availability, prevailing wind, or cultural practices such as lopping and competition for space and light. See also *Poor Form*.

Poor Form Tree of *atypical* crown shape and habit with proportions not representative of the species considering constraints and appears to have been adversely influenced in its development by environmental factors in situ such as *soil water* availability, prevailing wind, cultural practices such as lopping and competition for space and light; causing it to be *misshapen* or disfigured by disease or vandalism. See also *Good Form*.



(Source: **D**, **C**, **I** and **S**, and Elevation, Matheny and Clark 1998, **E**, **F** and Plan View, IACA 2005)

D. Dominant, **F.** Forest, **C.** Codominant, **E.** Emergent, **I.** Intermediate, **S.** Suppressed

Crown Form Codominant Crowns of trees restricted for space and light on one or more sides and receiving light primarily from above e.g. constrained by another tree/s or a building.

Crown Form Dominant Crowns of trees generally not restricted for space and light receiving light from above and all sides. See also *Crown Form Emergent* and *Open Grown*.

Crown Form Emergent Crowns of trees restricted for space on most sides receiving most light from above until the *upper crown* grows to protrude above the canopy in a stand or forest environment. Such trees may be *crown form dominant* or transitional from *crown form intermediate* to *crown form forest* asserting both *apical dominance* and *axillary dominance* once free of constraints for space and light.

Crown Form Forest Crowns of trees restricted for space and light except from above forming tall trees with narrow spreading crowns with foliage restricted generally to the top of the tree. The trunk is usually erect, straight and continuous, tapering gradually, crown often excurrent, with first order branches becoming structural, supporting the live crown concentrated towards the top of the tree, and below this point other first order branches arising radially with each *inferior* and usually temporary, divergent and ranging from horizontal to ascending, often with internodes exaggerated due to competition for space and light in the *lower crown*.

Crown Form Intermediate Crowns of trees restricted for space on most sides with light primarily from above and on some sides only.

Crown Form Suppressed Crowns of trees generally not restricted for space but restricted for light by being *overtopped* by other trees and occupying an understorey position in the canopy and growing slowly.

Forest Grown A tree with *crown form forest* grown in a group with competition for space and light protected from wind, often resulting in a taller tree with a narrow spreading crown that is concentrated towards the top of the tree (Matheny & Clark 1998, p. 18).

Open Grown A tree with *crown form dominant*, grown singly without competition for space and light, exposed to wind, often resulting in a shorter tree with a broad spreading crown that extends towards the ground (Matheny & Clark 1998, p. 18).

Deadwood

Deadwood Dead branches within a tree's crown and considered quantitatively as separate to *crown cover* and can be categorised as *Small Deadwood* and *Large Deadwood* according to diameter, length and subsequent *risk* potential. The amount of dead branches on a tree can be categorized as *Low Volume Deadwood*, *Medium Volume Deadwood* and *High Volume Deadwood*. See also *Dieback*.

Deadwooding Removing of dead branches by *pruning*. Such pruning may assist in the prevention of the spread of *decay* from *dieback* or for reasons of safety near an identifiable target.

Small Deadwood A dead branch up to 10mm diameter and usually <2 metres long, generally considered of low *risk* potential.

Large Deadwood A dead branch >10mm diameter and usually >2 metres long, generally considered of high *risk* potential.

Low Volume Deadwood Where <5 dead branches occur that may require *removal*.

Medium Volume Deadwood Where 5-10 dead branches occur that may require *removal*.

High Volume Deadwood High Volume Deadwood Where >10 dead branches occur that may require *removal*.

Dieback

Dieback The death of some areas of the *crown*. Symptoms are leaf drop, bare twigs, dead branches and tree death, respectively. This can be caused by root damage, root disease, bacterial or fungal canker, severe bark damage, intensive grazing by insects, *abrupt changes* in growth conditions, drought, water-logging or over-maturity. Dieback often implies reduced *resistance*, *stress* or *decline* which may be temporary. Dieback can be categorized as *Low Volume Dieback*, *Medium Volume Dieback* and *High Volume Dieback*.

Low Volume Dieback Where <10% of the *crown cover* has died. See also *Dieback*, *High Volume Dieback* and *Medium Volume Dieback*.

Medium Volume Dieback Where 10-50% of the *crown cover* has died.

High Volume Dieback Where >50% of the *crown cover* has died.

Epicormic Shoots

Epicormic Shoots Juvenile shoots produced at branches or trunk from *epicormic strands* in some Eucalypts (Burrows 2002, pp. 111-131) or sprouts produced from dormant or latent buds concealed beneath the bark in some trees. Production can be triggered by fire, pruning, wounding, or root damage but may also be as a result of *stress* or *decline*. Epicormic shoots can be categorized as *Low Volume Epicormic Shoots*, *Medium Volume Epicormic Shoots* and *High Volume Epicormic Shoots*.

Low Volume Epicormic Shoots Where <10% of the *crown cover* is comprised of live *epicormic shoots*.

Medium Volume Epicormic Shoots Where 10-50% of the *crown cover* is comprised of live *epicormic shoots*.

High Volume Epicormic Shoots Where >50% of the *crown cover* is comprised of live *epicormic shoots*.

Epicormic Strands In some taxa of the Myrtaceae family narrow bands of meristematic tissue radiate in stems from pith extending to the outer bark containing bud primordia evident as small prickle or dimple structures up to 10 mm diameter, that after the stimulus of a trauma event such as fire or defoliation develop to form new buds allowing *crown regeneration* (Burrows 2001, Pp. 111-131).

Trunk

Acaulescent A *trunkless* tree or tree growth forming a very short *trunk*. See also *Caulescent*.

Caulescent Tree grows to form a *trunk*. See also *Acaulescent*.

Trunk A single stem extending from the *root crown* to support or elevate the *crown*, terminating where it divides into separate *stems* forming *first order branches*. A trunk may be evident at or near ground or be absent in *acaulescent* trees of *deliquescent* habit, or may be continuous in trees of *excurrent* habit. The trunk of any *caulescent* tree can be divided vertically into three (3) sections and can be categorized as *Lower Trunk*, *Mid Trunk* and *Upper Trunk*. For a *leaning* tree these may be divided evenly into sections of one third along the trunk.

Appendix F. How Significance was Assessed

General

While all Aboriginal objects in NSW are protected under NSW legislation, the NPW Act, 1974 recognises that the destruction of sites may be necessary to allow other activities or developments to proceed. In order for the State regulator to make informed decisions on such matters, a consideration of the significance of cultural heritage places and objects is an important element of the cultural heritage assessment process. The heritage significance of Aboriginal archaeological sites can be assessed using the four criteria outlined in the Burra Charter; aesthetic, historic, scientific, and social or spiritual (Australia ICOMOS, 2013).

Significance Levels and Thresholds

Most cultural places and objects are of cultural value to at least some individuals or community groups. The assessment process requires the analysis and ranking of significance. Australia has a four tiered system of heritage protection that has been implemented across all levels of government i.e., Commonwealth, State and Local governments (see **Appendix A** for details on legislation). While heritage in NSW is managed under NSW legislation it is compliant with this four tiered system. Under this system, cultural heritage places and objects once identified are assessed according to their significance at World, National, State and Local levels and whether they are above or below threshold for listing or protection. For ease of discussion here we can set aside discussion of world heritage places as such places must meet a threshold of 'Outstanding Universal Value' (OUV) and such places are unlikely to occur in the study area. It is a requirement of this process that the higher levels will meet and exceed the thresholds for the level below. In other words a place or object of World Heritage Significance will also be of National significance and so on. This process can be visualised as shown in Figure 28 where each of the protected categories of Local, State and National are subset of each other and indeed a broader inventory of places that have been assessed and considered. It can be seen that places that meet the threshold for a particular level of significance will have met the thresholds for the levels below: e.g., nationally significant places will as a prerequisite have satisfied the thresholds for State significance and Local significance.

In NSW 'State heritage significance', in relation to a place, building, work, relic, moveable object or precinct, means significance to the State in relation to the historical, scientific, cultural, social, archaeological, architectural, natural or aesthetic value of the item, and 'Local heritage significance', in relation to a place, building, work, relic, moveable object or precinct, means significance to an area in relation to the historical, scientific, cultural, social, archaeological, architectural, natural or aesthetic value of the item (S 4A, NSW Heritage Act 1977).

In assessing the significance of sites aspects such as rarity and representativeness and the integrity (sometimes referred to as the intactness of the site) must be considered. Generally speaking a site or object that is rare will have a heightened significance although a site that is suitable of conservation as 'representative' of its type will also be significant. Conversely an extremely rare site may no longer be significant if its integrity has been sufficiently compromised. For example a rare Pleistocene era site that would normally be considered of high scientific significance may be below threshold if the site has suffered substantial subsurface damage.

A summary of these values is presented below.

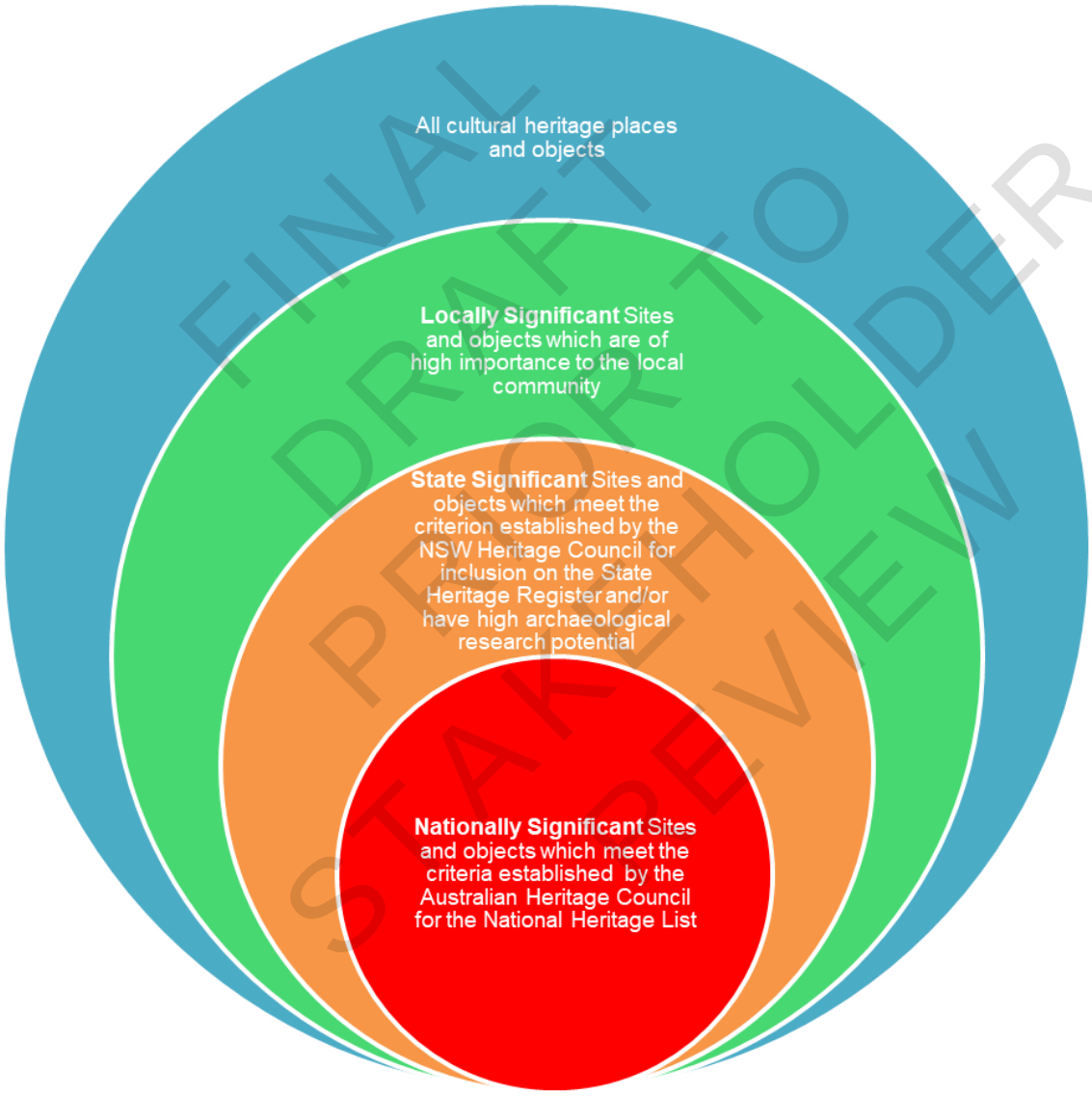


Figure 28. A4-1. The tiered heritage system operating in Australia

Aesthetic Significance

This criterion refers to aspects of sensory perception and the ability of the site to elicit emotional responses referred to as sensory or sensori-emotional values. The guidelines to the Burra Charter note that assessment may include consideration of the form, scale, colour, texture and material of the item or place, as well as sounds and smells. With regard to pre-contact Aboriginal cultural heritage sites, the placement within the landscape would be considered under this criterion as would memory-scapes and the ability of the site to transmit such memories. It is important to consider that sensori-emotional values are not always equated with “beauty”; for example massacre sites or sites of incarceration may have value under this criterion. Individual artefacts, sites and site features may also have aesthetic significance.

Table 20. A4-1. A summary of criteria and rankings used to determine a site's significance

Criterion	Threshold indicators State	Threshold indicator local	Below threshold for significance
Aesthetic	The site or object elicits a strong emotional response and is part of a state or national narrative. Is set within a landscape that inspires awe.	The site is known or suspected of eliciting strong responses from the local community. While similar sites may exist elsewhere, they are rare in the local area.	The site or object does not elicit a relevant sensori-emotional response; or The site has been disturbed to the extent that it can no longer elicit a relevant sensori-emotional response.
Historic	The site or object is important in representing an aspect of history important to the State or National as reflected in the Australian (and State) Historical Thematic Framework	The site or object is rare in the local area; and Would provide strong opportunities for interpretation to the public. The site illustrates elements of the history of the local area	The site is common in the local area, does not provide opportunities for interpretation to the public and does not contribute substantially to an understanding the historic themes relevant to the local area and/or the State. (Note – individuals may still feel attachment for sites below threshold)
Cultural and or spiritual	The site or object is important to an understanding of pre or post contact Aboriginal cultural life in NSW. The site or object is part of a Dreaming story or track. The site or object is part of ongoing ceremony or ritual. Substantial cultural knowledge about this site exists within the relevant Aboriginal community or custodians for this site or has been previously documented.	The site is important to local Aboriginal community, or subset of the community, and this importance can be articulated.	There is little or no knowledge in the Aboriginal community about this site or object. The knowledge that does exist falls into the category of family history and is not generally relevant to the broader Aboriginal community, and/or Aboriginal historical narrative. (Note – individuals may still feel attachment for sites below threshold)
Scientific (archaeological)	The site or object has potential to answer key questions about Aboriginal culture and society in NSW or Australia as a whole pre or post contact. The site or object is unique and/or rare and intact; or The site is the best representative (and intact) example of a type of site that may be common, but not conserved elsewhere.	The site or object is rare in the local area; and It provides potential to learn more about a little understood aspect of Aboriginal cultural or society in the local area. The site has a high artefact density, and is large enough in size to be used to interpret larger scale questions about technology and occupation in the local area.	The site or object is common in the local area and/or the state. The site does not have excavation /research potential or the site is common but has some potential information to be salvaged.

Historic Significance

The guidelines to the Burra Charter include the following discussion of historic significance:

A place may have historic value because it has influenced, or has been influenced by, an historic figure, event, phase or activity. It may also have historic value as the site of an important event. For any given place the significance will be greater where evidence of the association or event survives in situ, or where the settings are substantially intact, than where it has been changed or evidence does not survive. However, some events or associations may be so important that the place retains significance regardless of subsequent treatment.

In relation to Aboriginal cultural heritage, many post-contact places and sites would have historic value. Pre-contact places and items may also be significant according to this criterion, although the association with historic figures, events, phases or activities may be more difficult to establish. Places of historic significance may include sacred or ceremonial sites, sites of resistance battles and massacres, and archaeological sites with evidence of technological developments.

Social and Spiritual Significance

In Aboriginal heritage this criterion concerns the relationship and importance of sites to the contemporary Aboriginal community. Aspects of social and spiritual significance include people's traditional and contemporary links with a place or object as well as an overall concern by Aboriginal people for sites and their continued protection. Aboriginal cultural values may partially reflect or follow on from archaeological values, historic values, aesthetic values or be tied to values associated with the natural environment. This criterion requires the active participation of Aboriginal people in the assessment process as it is their knowledge and values that must be articulated.

Scientific Significance

Scientific value is associated with the research potential of a site. Rarity and representativeness are also related concepts that are taken into account. Research potential or demonstrated research importance, is considered according to the contribution that a heritage site can make to present understanding of human society and the human past. Heritage sites, objects or places of high scientific significance are those which provide an uncommon opportunity to provide information about the specific antiquity of people in an area, or a rare glimpse of artistic endeavour or a chronological record of cultural change of continuity through deep archaeological stratigraphy.

The comparative rarity of a site is a consideration in assessing scientific significance. A certain site type may be "one of a kind" in one region, but very common in another. Artefacts of a particular type may be common in one region, but outside the known distribution in another.

The integrity of a site is also a consideration in determining scientific significance. While disturbance of a topsoil deposit with artefacts does not entirely diminish research value, it may limit the types of questions that may be addressed. A heavily cultivated paddock may be unsuited to addressing research questions of small-scale site structure, but it may still be suitable for answering more general questions of implement distribution in a region and raw material logistics.

The capacity of a site to address research questions is predicated on a definition of what the key research issues are for a region. In the region including the study area, the key research issues revolve around the chronology of Aboriginal occupation and variability in stone artefact manufacturing technology. Sites with certain backed implements from the Holocene are very common, but sites with Pleistocene evidence are extremely rare, and hence of extremely high significance if found.