Indigenous Heritage Assessment Project: Austral & Leppington North Precincts, South West Growth Centres

Prepared by Australian Museum Business Services
for NSW Department of Planning and Infrastructure

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Executive Summary

Australian Museum Business Services (AMBS) has been commissioned by NSW Department of Planning and Infrastructure (DP&I), to prepare an Aboriginal (Indigenous) heritage assessment for the Austral and Leppington North Precincts of the South West Growth Centres (SWGC). This report will inform the Urban Form Analysis, and development of the project footprint.

Approximately 28% of the study area was surveyed; however, there was an extreme lack of visibility owing to higher than average rainfall throughout the region in the months prior to survey. The location of one previously recorded Aboriginal site was identified during the survey, and six new Aboriginal heritage sites were recorded. Thirty-four other sites that had been previously recorded in the study area were not able to be located. Areas of archaeological sensitivity were identified along creeklines and ridges, and in an area with the least disturbance in the study area. The effects of previous disturbance on these areas of sensitivity were also broadly estimated.

The following recommendations are made for the management of Aboriginal heritage for the project:

- Areas of moderate and high archaeological sensitivity should be incorporated into conservation zones where possible, particularly areas outside of Sydney Water's proposed pipelines. Where this is not possible, detailed Aboriginal heritage impact assessment of specific proposed development should be undertaken, and archaeological test excavations under the Code of Practice may be required, to determine the artefactual assemblages that are present and the nature of Aboriginal activities in these areas.
- Areas for conservation of Aboriginal cultural heritage must be considered as part of the future development of the Precinct. Conservation areas should be within areas of high and moderate sensitivity, preferably within the less disturbed parts of these areas. Impacts to these conservation areas (e.g. drainage infrastructure, sporting fields, footpaths and other facilities/landscaping) should be avoided.
- Where impacts will occur in areas of moderate and high archaeological sensitivity that are to be included within riparian corridors/open space, detailed Aboriginal heritage impact assessment of specific proposed development should be undertaken, and archaeological test excavations under the Code of Practice may be required to determine the artefactual assemblages that are present and the nature of Aboriginal activities in these areas.
- For any specific proposed development to areas without an ascribed archaeological sensitivity, assessment of Aboriginal heritage should be undertaken in accordance with the *National Parks & Wildlife Act* 1974 (Amended 2010) and *National Parks & Wildlife Amendment Regulation* 2010, as per the OEH guidelines.
- Impact should be avoided to sites ALN-IF-01, ALN-IF-05–ALN-IF-06, SWRL Sites 3–4, SWRL Sites 11–12, LP-3, TLC1 and GLC2. Where this is not possible, detailed Aboriginal heritage impact assessment, in accordance with the Code of Practice, should be undertaken for any specific proposed development in the vicinity of these sites, and an AHIP may be required.
- Where impacts are likely to occur to sites ALN-IF-01, ALN-IF-05–ALN-IF-06, SWRL Sites 3–4, SWRL Sites 11–12, LP-3, TLC1 and GLC2, detailed Aboriginal heritage impact assessment of specific proposed development should be undertaken, and AHIPs may be required.
- Should sites 2016-5, 2021-5, BRP-IF-06 – BRP-IF-09, BRP-S-11 – BRP-S-13, BRP-S-19, SWRL Site 7, SWRL Site 10, SWRL Site 13, LP-4 and LIF-1 not have been destroyed by other developments, impacts to these sites should be avoided. Where this is not possible, detailed Aboriginal heritage impact assessment, in accordance with the Code of

Practice, should be undertaken for any specific proposed development in the vicinity of these sites, and an AHIP may be required for those sites that have not yet been destroyed by other development.

- Where impacts are likely to occur to sites 2016-5, 2021-5, BRP-IF-06 – BRP-IF-09, BRP-S-11 – BRP-S-13, BRP-S-19, SWRL Site 7, SWRL Site 10, SWRL Site 13, SW1, LP-4 and LIF-1, detailed Aboriginal heritage impact assessment of specific proposed development should be undertaken, and AHIPs may be required.
- Impact should be avoided to sites ALN-IF-03 and SWRL Site 9. Where this is not possible, detailed Aboriginal heritage impact assessment, in accordance with the Code of Practice, should be undertaken for any specific proposed development in the vicinity of these sites, and archaeological test excavations under the Code of Practice may be required, to determine the artefactual assemblages that are present and the nature of Aboriginal activities in these areas.
- Where impacts are likely to occur to sites ALN-IF-03 and SWRL Site 9, detailed Aboriginal heritage impact assessment of specific proposed development should be undertaken, and AHIPs may be required.
- Should sites 2014-46, 2015-46, 2017-6, 2018-6, 2019-6, 2020-6, 2024-46, 2032-6, 2063-6, BRP-S-10/BRP-S-10 PAD/BRP-PAD-01 and TP25 not have been destroyed or excavated by other developments, impacts to these sites should be avoided. Where this is not possible, detailed Aboriginal heritage impact assessment, in accordance with the Code of Practice, should be undertaken for any specific proposed development in the vicinity of these sites, and archaeological test excavations under the Code of Practice may be required, to determine the artefactual assemblages that are present and the nature of Aboriginal activities in these areas.
- Where impacts are likely to occur to sites 2014-46, 2015-46, 2017-6, 2018-6, 2019-6, 2020-6, 2024-46, 2032-6, 2063-6, BRP-S-10/BRP-S-10 PAD/BRP-PAD-01 and TP25, detailed Aboriginal heritage impact assessment of specific proposed development should be undertaken, and AHIPs may be required.
- Impact to site 2005-846 should be avoided. Where this is not possible, detailed Aboriginal heritage impact assessment, in accordance with the Code of Practice, should be undertaken for any specific proposed development in the vicinity of this site, and appropriate mitigation strategies will need to be determined in consultation with the relevant local Aboriginal community groups.
- There should be no impact to sites ALN-IF-02 and ALN-IF-04 as a result of the Precinct Planning.

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1 Introduction

1.1 Preamble

Australian Museum Business Services (AMBS) has been commissioned by NSW Department of Planning and Infrastructure (DP&I), to prepare an Aboriginal (Indigenous) heritage assessment for the Austral and Leppington North Precincts of the South West Growth Centres (SWGC). This report will inform the Urban Form Analysis, and development of the project footprint.

1.2 Study Area

The Austral and Leppington North Precincts (the study area) comprise part of the NSW Government's SWGC land release. DP&I is currently undertaking Precinct Planning for these precincts. The Austral and Leppington North Precincts are second release precincts in the SWGC. The precincts fall within the boundaries of the Camden and Liverpool Local Government Areas (LGAs) and are located in the central eastern portions of the SWGC.

The study area is located approximately 50km west of Sydney, and the precincts comprise a total area of approximately 2,025 hectares, with a target population of 50,000 people. The Austral Precinct covers an area of approximately 930 hectares and is expected to contain around 8,000 dwellings. The Leppington North Precinct covers an area of approximately 1090 hectares (including land recently added as a result of the Boundary Review process and investigation areas as described below) and is expected to contain approximately 12,000 dwellings. The Leppington North Precinct also contains the proposed Leppington Town Centre, identified as a major centre under the Sydney Metropolitan Strategy as providing for commercial, retail, employment, government and high density residential uses.

During the Boundary Review process, two investigation areas (additional lands that may be included in the Precincts) were identified. The first has an area of approximately 100 hectares and is located to the east of the Leppington North Precinct. This land was previously included within the Western Sydney Parklands. However, access to and use of the land will be impacted by the extension of the South West Rail Line to Leppington and major upgrades to Bringelly Road and Camden Valley Way. As such, alternative suitable uses of the land are to be investigated through the Precinct Planning process. The second investigation area is located at the south east corner of the Austral Precinct and is approximately 4.5 hectares.

This Aboriginal Heritage Assessment addresses all lands in the Austral and Leppington North Precincts, and the two investigation areas (see Figure 1.1).

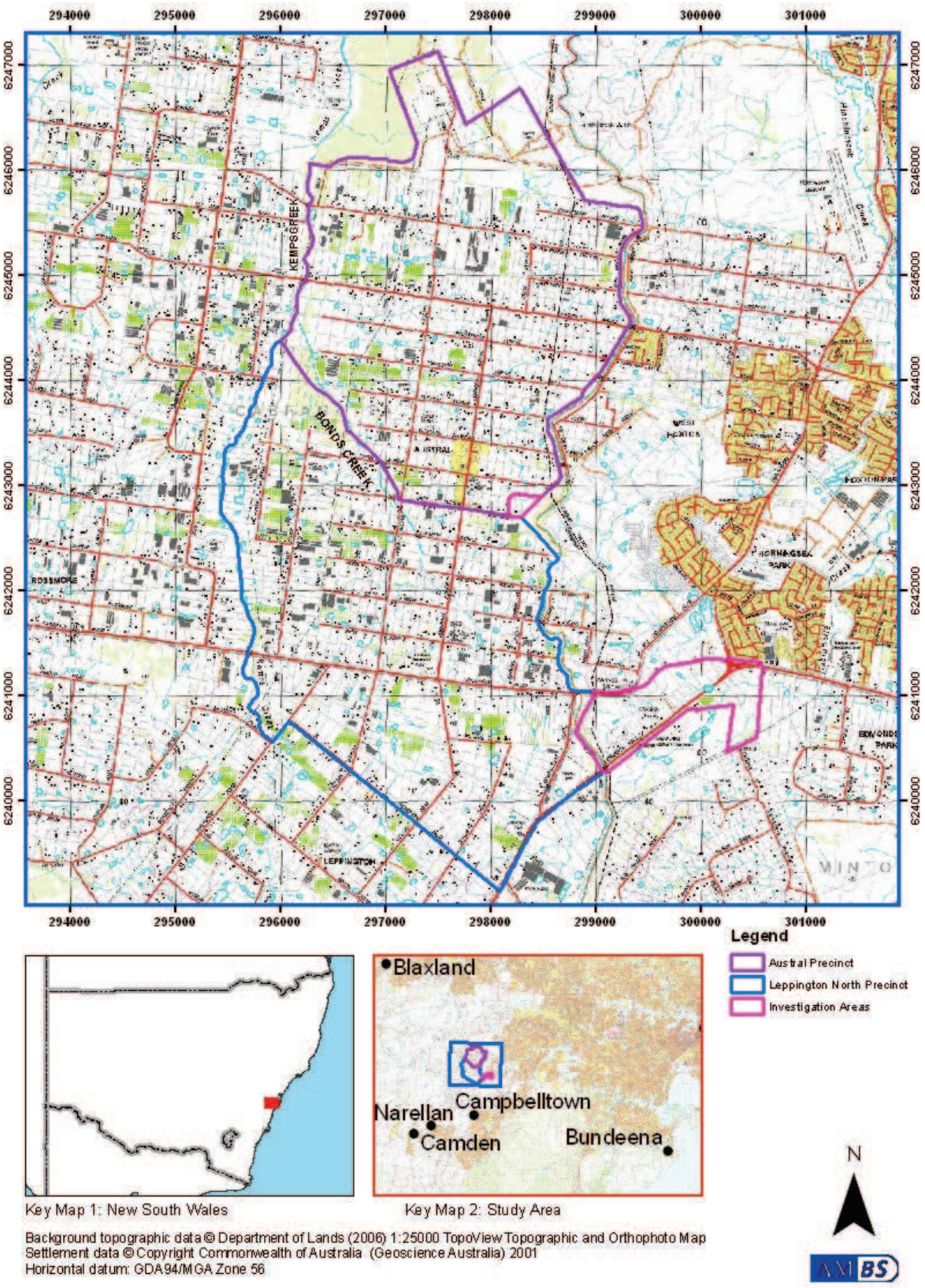

Figure 1.1 Location of the study area.

1.3 Methodology

This Heritage Assessment is broadly consistent with the processes and principles set out in the Australia ICOMOS Burra Charter (*The Australia ICOMOS charter for the conservation of places of cultural significance*).

This assessment follows the methodologies and protocols for heritage assessment developed by the former NSW Growth Centres Commission (now the Strategies and Land Release Office of the NSW Department of Planning and Infrastructure) and the Department of Environment and Climate Change (now the Office of Environment and Heritage [OEH]; formerly Department of Environment, Climate Change and Water [DECCW]); *The Consultants Brief for Identifying and Assessing Aboriginal Cultural Heritage in the Sydney Growth Centres* (Context 2006) and its two Appendices:

- *Appendix A: Protocol for Aboriginal Stakeholder involvement in the assessment of Aboriginal Cultural Heritage in the Sydney Growth Centres*; and
- *Appendix B: Precinct Assessment Method for Aboriginal Cultural Heritage in the Sydney Growth Centres*.

The Precinct Assessment Method outlines the following steps to be undertaken:

- Step 1 – gather and analyse existing information;
- Step 2 – identify and assess Aboriginal cultural heritage and values;
  - 2a – undertake investigations;
  - 2b – assess significance;
- Step 3 – develop land use and management options; and
- Step 4 – input into Precinct Planning.

This report has been prepared to fulfil Step 1 of the Method, which involves collating, reviewing and synthesising available relevant information, including social/cultural, landscape and environmental, historical and ethno-historical and archaeological information and data. The aim of this step is to identify any information gaps that need to be addressed to adequately undertake the Aboriginal cultural heritage values identification and assessment in later steps of the Precinct Assessment Method.

The primary tasks in Step 1 are:

- Scope and gather existing information and knowledge from previous studies, reports, academic work, and knowledge holders. Preliminary overview field survey might be also be undertaken where appropriate.
- Stakeholder Aboriginal Communities invited to identify known sources of information and information gaps.
- Summarise existing information and collate data in a usable form as a basis for the subsequent steps (and to inform other Precinct studies).
- Identify data gaps and prioritise further research to be undertaken in order to adequately identify and assess the Aboriginal cultural heritage values present within the Precinct. This may include development of a preliminary sensitivity map that will identify areas with potential Aboriginal cultural heritage value and significance.
- Prepare a Step 1 report which details and justifies the proposed fieldwork and investigations in Step 2.
- Invite Stakeholder Aboriginal Communities to review and comment on Step 1 Report.

Steps 2-4 are to be undertaken at a later stage. This report will inform those Steps.

1.3.1 Aboriginal Community Consultation

Aboriginal community consultation is an integral part of the assessment of Aboriginal cultural heritage significance. Consultation was undertaken in accordance with the Growth Centres consultation guidelines and its two Appendices, particularly Appendix A (see above).

The aims of this consultation process were to:

- ensure that places of importance to the stakeholder Aboriginal communities are identified and taken into consideration during project development;
- ensure that values and places and importance to Aboriginal culture and community identity are clearly identified and articulated;
- identify and document those cultural values held by the Aboriginal groups and people which may not have been identified during the archaeological investigation or historical research; and
- provide an understanding of the cultural values of information obtained during archaeological investigation or historical research and other investigations.

An advertisement advising of the commencement of Aboriginal heritage assessments for the Austral and Leppington North Precincts was placed in the South Western Rural Advertiser (SWRA) on 8 and 15 September 2010. The stakeholder Aboriginal communities identified in Appendix A were contacted, as was DECCW (now OEH), the Registrar of Aboriginal Owners (RAO), the National Native Title Tribunal (NNTT) and the local councils (Liverpool and Camden). Stakeholders were invited to identify whether they were interested in having primary involvement (that is, active involvement in heritage identification, assessment, and management) or general involvement (that is, only to be kept informed about the process and outcomes).

The stakeholder Aboriginal communities identified for this project are:

- Aboriginal Elder's Group at Hoxton Park (AEGHP);
- Cubbitch Barta Native Title Claimants Aboriginal Corporation (CBNTCAC);
- Darug Aboriginal Cultural Heritage Assessments (DACHA);
- Darug Aboriginal Land Care Inc (DALCI);
- Darug Custodian Aboriginal Corporation (DCAC);
- Darug Land Observations (DLO);
- Darug Tribal Aboriginal Corporation (DTAC);
- Gandangara Local Aboriginal Land Council (GLALC);
- Liverpool Aboriginal Consultative Committee (LACC; Liverpool City Council [LCC]);
- Northern Illawarra Aboriginal Collective (NIAC);
- Tharawal Local Aboriginal Land Council (TLALC); and
- Yarrawalk (a division of Tocomwall Pty Ltd).

The Aboriginal heritage assessment was undertaken in consultation with all identified Aboriginal community groups. An initial consultation meeting, to discuss the project and the proposed survey methodology, was undertaken on 26 November 2010, to which all Aboriginal parties were invited. Representatives from CBNTCAC, DACHA, DALCI and DCAC attended the meeting. Those groups which had identified an interest to have primary involvement were then invited to participate in the preliminary field assessment. Aboriginal community groups who participated in the fieldwork are listed in Table 1.1.

Table 1.1 Aboriginal community fieldwork participants.

Aboriginal community organisation	Field representative	Sections of study area surveyed
CBNTCAC	Glenda Chalker	South of Bringelly Road
DACHA	Gordon Morton	All
DALCI	Ken Adolfson	All
DCAC	Leanne Watson, Rhiannon Wright	All
DLO	Ron Workman	All
DTAC	John Reilly	All
GLALC	Steve Randall	North of Bringelly Road
Yarrawalk	Brian Grant	All

Information provided by the Aboriginal community groups during consultation and field survey, has been integrated into the assessment where appropriate.

This draft Aboriginal heritage assessment report has been provided to each group for review and comment, and feedback received is attached in Appendix A. A meeting was also arranged to discuss further Aboriginal social/cultural values, and these have also been integrated into the report.

A concern raised during the consultation process was that Aboriginal sites should be protected so that they could not be identified in the public exhibition report by using site coordinates or showing sites on maps. As such, site coordinates and maps showing Aboriginal sites have been removed to a second volume, Volume 2, of the report, which should not be put on public exhibition.

1.4 Limitations

The survey was undertaken after several months of higher than average rainfall. As such, the majority of the properties within the study area were covered in long grass; in addition to trees, market gardens, dams and buildings, resulting in limited ground surface being visible for inspection.

1.5 Authorship & Acknowledgements

This report has been prepared by AMBS Project Officer Jenna Weston. AMBS Project Manager, Chris Langeluddecke, provided technical advice and reviewed the report. AMBS Senior Project Manager, Jennie Lindbergh, reviewed the report for consistency and quality.

2 Statutory Context

2.1 Preamble

The conservation and management of heritage items takes place in accordance with relevant Commonwealth, State or local government legislation. Non-statutory heritage lists, ethical charters, conservation policies, organisational policies, and community attitudes and expectations can also have an impact on the management, use, and development of heritage assets. Listings relevant to the study area are summarised below.

2.2 *Environment Protection & Biodiversity Conservation Act* 1999

The Australian Government Department of Sustainability, Environment, Water, Population and Communities (DSEWPC, formerly the Department of Environment, Water, Heritage and the Arts) is responsible for the implementation of national policy, programs and legislation to protect and conserve Australia's environment and heritage. Under the provisions of the *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act) the National Heritage List (NHL) was established to protect places that have outstanding value to the nation, and the Commonwealth Heritage List (CHL) has been established to protect items and places owned or managed by Commonwealth agencies. Approval from the Minister is required for controlled actions which will have a significant impact on items and places included on the NHL or CHL.

The Register of the National Estate (RNE) was originally established under the *Australian Heritage Commission Act 1975*. Since the establishment of the NHL and CHL, there is now a significant level of overlap between the RNE and heritage lists at the national, state and territory, and local government levels. To address this situation, the Register has been frozen since February 2007, meaning that no places can be added or removed. The RNE should be understood as an information resource only. Where an action has been referred to the Minister, in accordance with the EPBC Act, concerning World Heritage, National Heritage, Wetlands, endangered communities, or Commonwealth lands, the RNE may be used as a reference, where appropriate.

There are no Aboriginal heritage sites or places within the study area included on the NHL, CHL or RNE.

2.3 *National Parks & Wildlife Act* 1974 (Amended 2010) and *National Parks & Wildlife Amendment Regulation* 2010

Under the provisions of the *National Parks & Wildlife Act* 1974 (NPW Act), the Director-General of DECCW (now Chief Executive of OEH) is responsible for the care, control and management of all national parks, historic sites, nature reserves, state conservation areas, karst conservation reserves and regional parks. The Director-General is also responsible, under this legislation, for the protection and care of native fauna and flora, and Aboriginal places and objects throughout NSW.

All Aboriginal Objects are protected regardless of their significance or land tenure under the NPW Act. Aboriginal Objects can include pre-contact features such as scarred trees, middens and open campsites, as well as physical evidence of post-contact use of the area such as Aboriginal built fencing and fringe camps. The NPW Act also protects Aboriginal Places, which are defined as 'is or was of special significance with respect to Aboriginal culture'. Aboriginal Places can only be declared by the Minister administering the NPW Act.

Under Section 90 of the Act, it is an offence for a person to destroy, deface, damage or desecrate an Aboriginal Object or Aboriginal Place without the prior issue of an Aboriginal Heritage Impact Permit (AHIP). The Act requires a person to take reasonable precautions and due diligence to avoid impacts

on Aboriginal Objects. AHIPs may only be obtained from the Environmental Protection and Regulation Division (EPRD) of OEH.

The National Parks and Wildlife Amendment Regulation 2010 commenced on 1 October 2010. This Regulation excludes activities carried out in accordance with the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW* from the definition of harm in the Act. That is, test excavations may be carried out in accordance with this Code of Practice, without requiring an AHIP. The Regulation also specifies Aboriginal community consultation requirements (*Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010*). In addition, the Regulation adopts a Due Diligence Code of Practice which specifies activities that are low impact, providing a defence to the strict liability offence of harming an Aboriginal object.

Part of the regulatory framework for the implementation of the NPW Act is the Aboriginal Heritage Information Management System (AHIMS), maintained by OEH. AHIMS includes a database of Aboriginal heritage sites, items, places and other objects that have been reported to the OEH. Also available through AHIMS are site cards, which describe Aboriginal sites registered in the database, as well as Aboriginal heritage assessment reports, which contribute to assessments of scientific significance for Aboriginal sites. The AHIMS is not a comprehensive list of all Aboriginal heritage in NSW, rather it reflects information which has been reported to OEH. As such, site co-ordinates in the database vary in accuracy depending on the method used to record their location. Heritage consultants are obliged to report Aboriginal sites identified during field investigations to OEH, regardless of land tenure, or whether such sites are likely to be impacted by a proposed development. The results of a site search for the local area are presented in Section 4.2.2.

2.4 *Environmental Planning & Assessment Act* 1979

The *Environmental Planning and Assessment Act* 1979 (EP&A Act) is the principal act regulating land use planning and development in NSW, and requires consideration to be given to the environment as part of the land use planning process. Projects are considered under different parts of the Act, including:

- Major projects, requiring the approval of the Minister for Planning and which are regional or State significant are undertaken under Part 3A of the Act.
- Minor or routine development projects, requiring local council consent are usually undertaken under Part 4. In limited circumstances, projects may require the Minister's consent.
- Projects which do not fall under Part 4 or Part 3A are undertaken under Part 5. These are often infrastructure projects approved by local councils or the State agency undertaking the project.

The EP&A Act also controls the making of environmental planning instruments (EPIs). Two types of EPIs can be made: Local Environmental Plans (LEPs), covering local government areas; and State Environment Planning Policies (SEPPs), covering areas of State or regional environmental planning significance. LEPs commonly identify, and have provisions for the protection of, local heritage items and heritage conservation areas. The study area is located in the Liverpool and Camden LGAs.

2.4.1 State Environmental Planning Policy (Western Sydney Parklands) 2009

Part 2, Clause 15 'Heritage Conservation' of the State Environmental Planning Policy (Western Sydney Parklands) 2009 provides for the protection of Aboriginal items, places and archaeological sites within the Western Sydney Parklands area. There are no Aboriginal items or places listed on Schedule 1 'Heritage items', within the study area, or its vicinity.

2.4.2 Liverpool LEP 2008

Part 5.10 'Heritage conservation' of the Liverpool LEP is consistent with current heritage best practice guidelines, providing for the protection of heritage items, places and archaeological sites.

Schedule 5, Part 1 'Heritage items' does not include any Aboriginal items or places within the study area, or its vicinity.

2.4.3 Camden LEP 2010

Part 5.10 'Heritage conservation' of the Camden LEP is consistent with current heritage best practice guidelines, providing for the protection of heritage items, places and archaeological sites.

Schedule 5, Part 1 'Heritage items' does not include any Aboriginal items or places within the study area, or its vicinity.

2.5 Heritage Act 1977

In NSW the Heritage Act provides protection for heritage places, buildings, works, relics, moveable objects or precincts that are important to the people of NSW. These include items of Aboriginal and non-Aboriginal heritage significance. Where these items or places have particular importance to the State of NSW, they are listed on the State Heritage Register (SHR).

No Aboriginal items or places within the study area are listed on the SHR or the subject of an Interim Heritage Order.

Under Section 170A(2) the government instrumentalities are required to maintain a register of heritage assets; a Heritage and Conservation Register, also known as a Section 170 Register. Items and places entered on a Section 170 Register are to be managed in accordance with State Owned Heritage Management Principles.

2.5.1 NSW Roads & Traffic Authority Heritage & Conservation Register (RTA Section 170 Register)

There are no identified Aboriginal items or places within the study area or its vicinity.

2.5.2 The National Trust of Australia (NSW)

The National Trust of Australia has no statutory authority; however, it does have a role in raising public awareness of heritage issues. No Aboriginal heritage items are listed by the National Trust within the study area, or its vicinity.

3 Environmental Context

An understanding of environmental factors within the local landscape provides a context for past human occupation and history of an area. The analysis of environmental factors contributes to the development of the predictive modelling of archaeological sites, but it also is required to contextualise archaeological material and to interpret patterns of past human behaviour. In particular, the nature of the local landscape including topography, geology, soils, hydrology and vegetation are factors which affect patterns of past human occupation. Current land use practices have the potential to affect the visibility of archaeological material; they may obscure, or expose archaeological sites. In addition, previous disturbances may have also exposed archaeological material, such as excavation for dams or other ground disturbance. It is important that such factors are also considered in making assessments of archaeological resources in an area and understanding the distribution of observed sites.

3.1 Geology & Soils

The study area comprises a gently undulating landscape. There is a narrow, north-trending main ridgeline following the eastern study area boundary, with the Sydney Water Supply Upper Canal generally following the crest of this ridgeline. Slopes within the study area are generally less than 6 degrees, with localised steep slopes (> 6 degrees). The south-westerly facing slopes are generally steeper than the north-eastern facing slopes, and steep terrain (> 12 degrees) is present on the eastern side of the Sydney Water Supply Upper Canal at the south-eastern corner of the study area, which is 92m above sea level (asl). There is generally a drop, in a north-western direction, to 78m asl at the south western corner, and to 61m asl at the north-western corner of the study area (GeoEnviro Consultancy 2011:3). A map of the topography and areas subject to 1 in 100 year flood events is provided in Figure 3.1.

Within the study area, three soil landscapes are present (see Figure 3.2). The Luddenham soil landscape and is present on the eastern side of the Sydney Water Supply Upper Canal at the south eastern steeper corner of the study area. The soil generally comprises dark podsolic soil or earthy clays on the crest, and yellow podsolic and prairie soils on the lower slopes. This erosional soil is generally characterised as having high erosion hazards, impermeable soil, high plasticity and moderate reactivity. The Blacktown soil landscape occurs on the upper slopes away from the creeks, and genereally consists of low permeability, highly plastic and moderately reactive soil of residual origin. The South Creek landscape is present at the lower slopes and along the creeks and drainage lines, and generally consists of red and yellow podsolic soils and yellow solodic soils of alluvial origin (GeoEnviro Consultancy 2011:3). The potential for stratified or *in situ* archaeological deposits is most likely in the fluvial South Creek soils which underlie Kemps and Bonds Creeks.

The underlying geology of the study area comprises fluvial deposits consisting of sands, silts and clays beneath the South Creek soil landscape, and underlying bedrock of Bringelly Shale of the Winamatta Group (consisting of Shale, carbonaceous claystone, claystone, laminite, fine to medium grained lithic sandstone, rare coal and tuff) beneath the Blacktown and Luddenham soil landscapes (GeoEnviro Consultancy 2011:4).

3.2 Hydrology & Drainage

The study area is within the upper catchment area of the Hawkesbury River system. Surface runoff and groundwater in the area generally flows to the north west into Kemps and Bonds Creeks, thence flowing to South Wianamatta Creek (approximately 7km away), and eventually flowing into the Hawkesbury River (10-15km away; GeoEnviro Consultancy 2011:4). Kemps Creek forms the western boundary of the study area, and several tributaries of this creek extend throughout the study area, of varying stream order. Although minor tributaries are unlikely to have provided permanent water, they would have been seasonal water sources for Aboriginal people in the past. Bonds Creek,

which is to the east of Kemps Creek, also flows diagonally through roughly the middle of the study area. There is therefore, a high likelihood that Aboriginal sites may be present throughout the area.

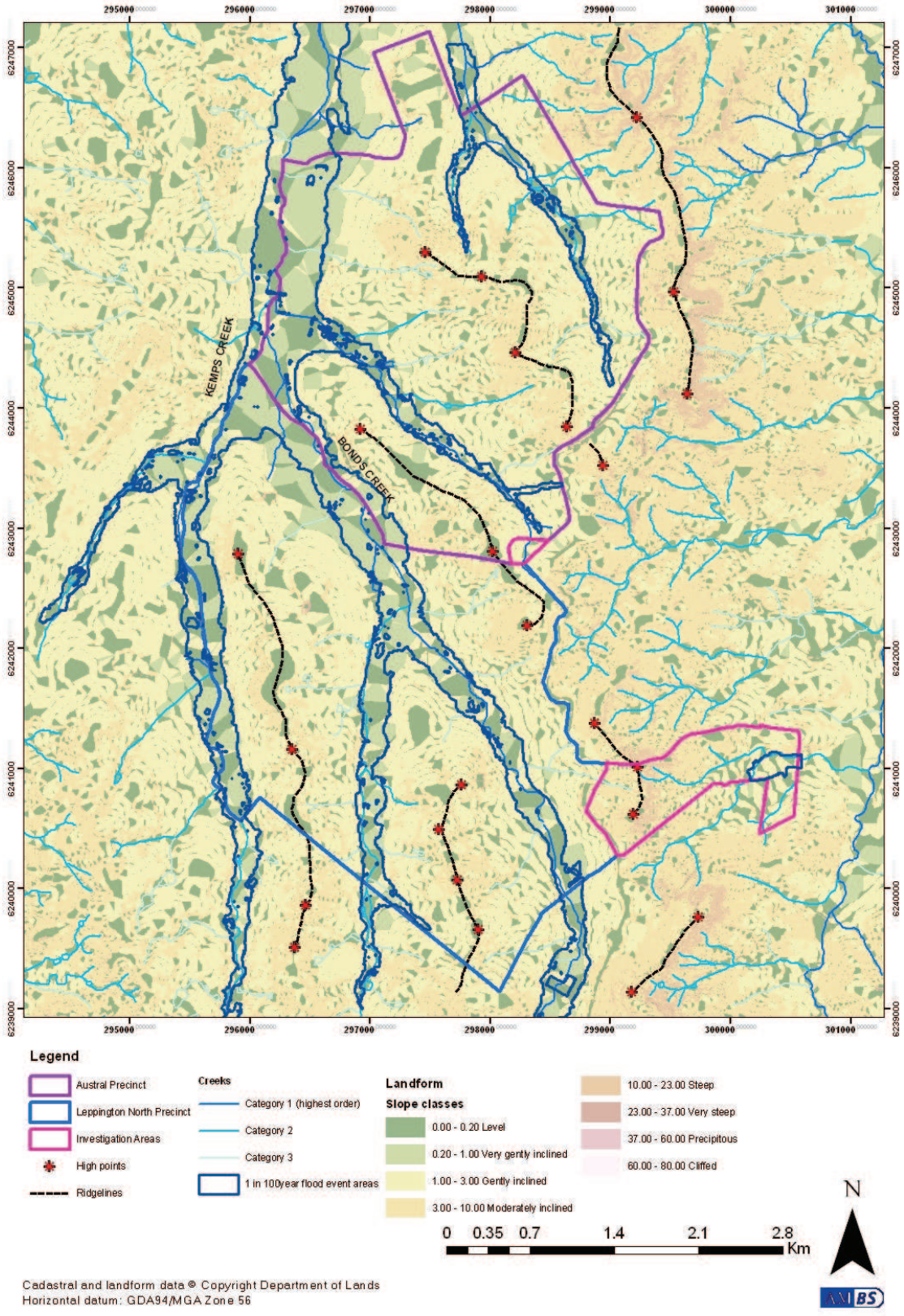

Figure 3.1 Topographic details of the study area, including areas prone to 1 in 100 year flood events.

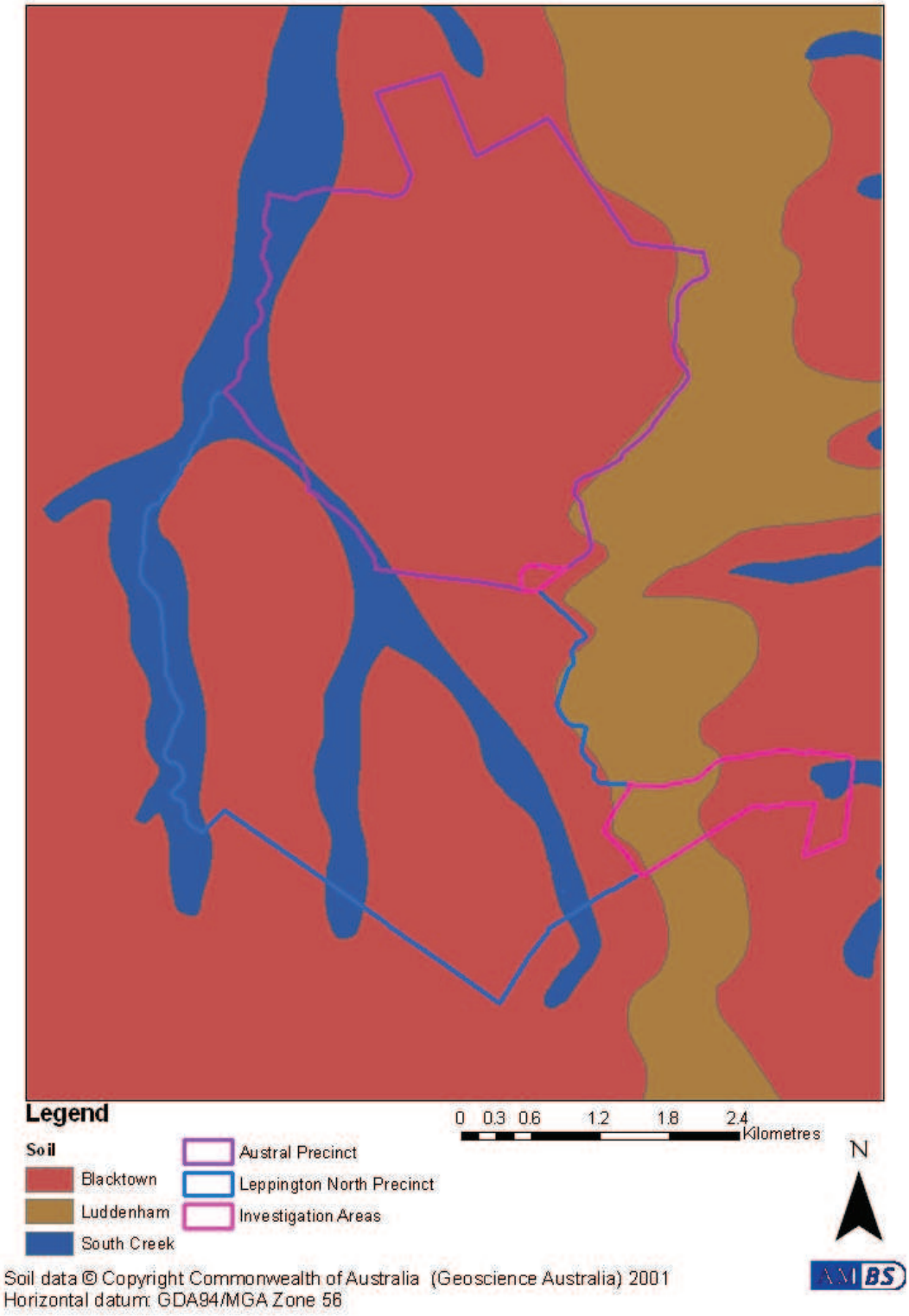

Figure 3.2 Soils within the study area.

3.3 Vegetation

According to Cardno (2011:12-13, 26), the vegetation communities within the study area include Shale-Gravel Transitional Forest (dominated by Broad-leaved ironbark [*Eucalyptus fibrosa*] and associated with Grey box [*E. moluccana*] and Forest red gum [*E. tereticornis*], Sydney Coastal River Flat Forest – Alluvial Woodland (Cabbage gum [*E. amplifolia*], *E. tereticornis* and Swamp oak

[*Casuarina glauca*]) and Cumberland Plain Woodland – Shale Plains Woodland (*E. moluccana*, *E. tereticornis*, Spotted gum [*Corymbia maculate*] and Thin-leaved stringybark [*E. eugenioides*]). Native vegetation communities in the vicinity of the study area are predominantly regrowth, as the area has been extensively cleared since European settlement. It has been noted by Cardno that "several areas of vegetative regrowth have been heavily recolonised by *Casuarina glauca* following clearing, to the extent that the previous habitat (typically more diverse) has been unable to, and is unlikely to, establish itself without revegetation and management) (2001:73). Such clearing also impacts the integrity of archaeological deposits, and will have removed trees modified (scarred or carved) by Aboriginal people in the past; although it is possible that some such trees may remain in the study area from pre-European times.

3.4 Land Use & Disturbance

Land use within the study area is dominated by pastoralism, agriculture, horticulture and residential developments. A small township is located on Edmondson Avenue, between Ninth and Eleventh Avenues, and there are some small industrial areas in the precincts (Figure 3.3).

The various land use activities have resulted in the majority of the study area having been extensively cleared of its original vegetation, particularly mature trees. Further disturbance has resulted from the development of infrastructure associated with the construction of roads, electricity and telecommunications transmission lines, and water/sewage pipelines. Road carriageways within the study area are provided in Table 3.1.

Table 3.1 Road easements within the study area.

Ingleburn Road	Fifth Avenue
Bringelly Road	Sixth Avenue
Eastwood Road	Seventh Avenue
Dickson Road	Eighth Avenue
Rickard Road	Ninth Avenue
Byron Road	Tenth Avenue
Cowpasture Road	Eleventh Avenue
Camden Valley Way	Twelfth Avenue
Boyd Street	Thirteenth Avenue
Little Street	Fourteenth Avenue
Kelly Street	Fifteenth Avenue
Fourth Avenue	Sixteenth Avenue
Edmondson Avenue	Seventeenth Avenue
Browns Road	Eighteenth Avenue
Twenty-Seventh Avenue	Gurner Avenue

The construction of residential areas and road networks are likely to have affected the integrity of the archaeological resource, particularly subsurface deposits in the above-mentioned areas, as well as intact *in situ* archaeological deposits (see also Figure 5.22 for an estimate of previous disturbance). A number of large infrastructure developments are currently proposed in the study area and surrounds, such as the Bringelly Road and Camden Valley Way upgrades, the South West Rail Link, and water infrastructure for the South West Growth Centres and Edmondson Park precinct (see Section 4.2.3 and 4.2.4). At this stage the timing for delivery of some of this infrastructure has yet to be determined, and therefore it will not be discussed in this section on current land use and disturbance.

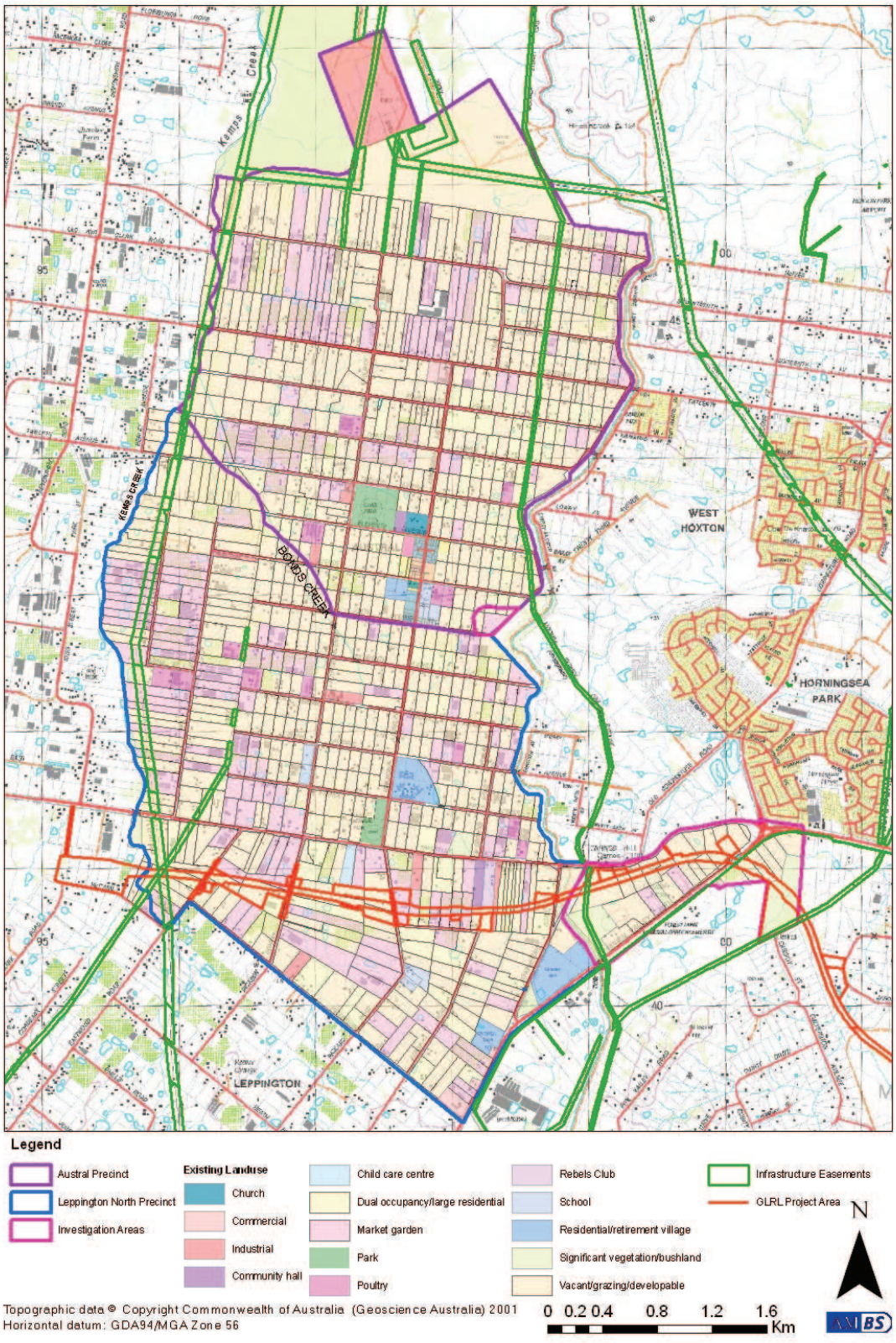

Figure 3.3 Existing land use in the study area.

4 Aboriginal Archaeological Context

This chapter describes the nature of the known Aboriginal archaeology of the study area, based upon a review of relevant archaeological reports and publications, and a search and review of previously recorded sites in the OEH Aboriginal Heritage Information Management System (AHIMS). This review and discussion allows for the development of a predictive model for potential Aboriginal sites within the study area, and establishes context for a comparative significance assessment. Summary descriptions of site types are provided in Table 4.1 below.

Table 4.1 Summary descriptions of Aboriginal site types referred to in this report.

Site Type	Details
Open Camp Sites/ Stone Artefact Scatters/ Isolated Finds	Open camp sites represent past Aboriginal subsistence and stone knapping activities, and include archaeological remains such as stone artefacts and hearths. This site type usually appears as surface scatters of stone artefacts in areas where vegetation is limited and ground surface visibility increases. Such scatters of artefacts are also often exposed by erosion, agricultural events such as ploughing, and the creation of informal, unsealed vehicle access tracks and walking paths. These types of sites are often located on dry, relatively flat land along or adjacent to rivers and creeks. Camp sites containing surface or subsurface deposit from repeated or continued occupation are more likely to occur on elevated ground near the most permanent, reliable water sources. Flat, open areas associated with creeks and their resource-rich surrounds would have offered ideal camping areas to the Aboriginal inhabitants of the local area. Isolated finds may represent a single item discard event, or be the result of limited stone knapping activity. The presence of such isolated artefacts may indicate the presence of a more extensive, in situ buried archaeological deposit, or a larger deposit obscured by low ground visibility. Isolated artefacts are likely to be located on landforms associated with past Aboriginal activities, such as ridgelines that would have provided ease of movement through the area, and level areas with access to water, particularly creeks and rivers.
Scarred Trees	Tree bark was utilised by Aboriginal people for various purposes, including the construction of shelters (huts), canoes, paddles, shields, baskets and bowls, fishing lines, cloaks, torches and bedding, as well as being beaten into fibre for string bags or ornaments. The removal of bark exposes the heart wood of the tree, resulting in a scar. Over time the outer bark of the tree grows across the scar (overgrowth), producing a bulging protrusion around the edges of the scar. Trees may also have been scarred in order to gain access to food resources (e.g. cutting toe-holds so as to climb the tree and catch possums or birds), or to mark locations such as tribal territories. The locations of scarred trees often reflect historical clearance of vegetation rather than the actual pattern of scarred trees. Unless the tree is over 150 years old, scarring is not likely to be of Aboriginal cultural origin; therefore, these sites most often occur in areas with mature, remnant native vegetation.
Axe Grinding Grooves	Grinding grooves are the physical evidence of tool making or food processing activities undertaken by Aboriginal people. The manual rubbing of stones against each other creates grooves in the rock, which are usually found on flat areas of soft rock such as sandstone, in areas of creek beds and other water sources. They are often associated with rock pools in creek beds and on platforms to enable the wet-grinding technique.
Quarries	Aboriginal quarry sites are sources of raw materials, primarily for the manufacture of stone tools, but also for ochre procurement. They are only found where raw materials (stone or ochre) occur within the landscape, and where these have been exploited in the past. Such sites are often associated with stone artefact scatters and stone knapping areas. Loose or surface exposures of stone or cobbles may be coarsely flaked for removal of portable cores. Raw materials can be sourced to these sites and provide evidence for Aboriginal movement and/or exchange.
Rock Engravings	Rock engravings are a type of Aboriginal art, and are often located on high vantage points along ridge lines at the headwaters of creeks, but can be located on any suitable fine grained stone surface.
Shelter Sites with Art (Engraving, Painting or Drawing) or Occupation Deposit	These are art or occupation sites located in areas where suitable rock outcrops and surfaces occur, where weathering has resulted in suitable overhangs or recesses in boulder outcrops or cliff-lines.

Middens	Shell middens result from Aboriginal exploitation and consumption of shellfish, in marine, estuarine or freshwater contexts. Middens may also include faunal remains such as fish or mammal bone, stone artefacts, hearths, charcoal and occasionally, burials. They are usually located on elevated dry ground close to the aquatic environment from which the shellfish has been exploited and where fresh water resources are available. Deeper, more compacted, midden sites are often found in areas containing the greatest diversity of resources, such as river estuaries and coastal lagoons.
Bora/Ceremonial	Aboriginal ceremonial sites are locations that have spiritual or ceremonial values to Aboriginal people. Aboriginal ceremonial sites may comprise natural landforms and, in some cases, will also have archaeological material. Bora grounds are a ceremonial site type, usually consisting of a cleared area around one or more raised earth circles, and often comprised two circles of different sizes, connected by a pathway, and accompanied by ground drawings or mouldings of people, animals or deities, and geometrically carved designs on the surrounding trees. Unfortunately, the raised earth features are easily destroyed by agricultural and pastoral activities, vegetation growth and exposure to weather.
Stone Arrangements	Stone arrangements usually consist of geometric arrangements of portable stone on prominent rock outcrops, such as vantage points along escarpments where other key landmarks are visible. Some stone arrangements also include circles and pathways. They are thought to be ceremonial in nature, and may have also sometimes been used for corroborees (dances), fights or judicial meetings. Stone arrangements are often isolated from known camp site areas.
Natural Mythological (Ritual) Sites	These types of sites are usually identified by the local Aboriginal community as locations of cultural significance, and they may not necessarily contain material evidence of Aboriginal associations with the place.
Carved Trees	Carved trees generally marked areas for ceremonial purposes, or the locations of graves.
Burial Sites	Aboriginal burial of the dead often took place relatively close to camp site locations. This is due to the fact that most people tended to die in or close to camp (unless killed in warfare or hunting accidents), and it is difficult to move a body long distances. Soft, sandy soils on, or close to, rivers and creeks allowed for easier movement of earth for burial; and burials may also occur within rockshelters or middens. Aboriginal burial sites may be marked by stone cairns, carved trees or a natural landmark. Burial sites may also be identified through historic records, or oral histories.
Contact/ Historical Sites	These types of sites are most likely to occur in locations of Aboriginal and settler interaction, such as on the edge of pastoral properties or towns. Artefacts located at such sites may involve the use of introduced materials such as glass or ceramics by Aboriginal people, or be sites of Aboriginal occupation in the historical period.

4.1 Regional Archaeological Context

At the time of European settlement, the Aboriginal people of the Sydney region were organised into named territorial groups. Groups local to the study area are likely to have belonged to the Darug (Dharug), Gundundurra and the Dharawal (Thurrawal) language groups (Attenbrow 2010: 221,222).

Aboriginal occupation of the Sydney region is likely to have spanned at least 20,000 years, although dates of more than 40,000 years have been claimed for artefacts found in gravels of the Cranebrook Terrace on the Nepean River (Nanson et al. 1987; Stockton 1993; Stockton & Holland 1974). Late Pleistocene occupation sites have been identified on the fringes of the Sydney basin and from rock shelter sites in adjoining areas. Dates obtained from these sites were 14,700 years Before Present (BP) at Shaws Creek in the Blue Mountain foothills (Kohen et al. 1984), c.11,000 BP at Loggers Shelter in Mangrove Creek (Attenbrow 1981, 2004), and c.20,000 BP at Burrill Lake on the South Coast (Lampert 1971). The majority of sites in the Sydney region, however, date to within the last 3,000 to 5,000 years, with many researchers proposing that occupation intensity increased from this period (Kohen 1986; McDonald 1994; McDonald & Rich 1993). This increase in sites may reflect an intensity of occupation which was influenced by rising sea levels, which stabilised approximately 6,500 years ago. Older occupation sites along the now submerged coastline would have been flooded, with

subsequent occupation concentrating on and utilising resources along the current coastlines and in the changing ecological systems of the hinterland (Attenbrow 2003).

The spread of urban development across the Cumberland Plain, particularly over the last few decades, has meant that archaeological investigations have intensified with the need for environmental impact assessments. Most archaeological investigations conducted within this framework have been restricted by small study areas (as defined by individual developments) and limited project briefs. As a result, the Cumberland Plain has become the most intensively investigated archaeological landscape in Australia. The studies carried out over these decades of development in the west provide a broad picture of the archaeological context of the region.

A number of predictive models relating to Aboriginal occupation patterns and site locations have been formulated through archaeological investigations in the Cumberland Plain (Dallas 1989a; Haglund 1980; Kohen 1986; Smith 1989). More recent works have contributed to refining these models (AMBS 2000a, 2002; Jo McDonald Cultural Heritage Management [JMCHM] 1997, 1999, 2001a; McDonald 1999). However, it should be noted that archaeological investigations still reveal site information in contradiction to the current, general predictive model for the area, and it is expected that further archaeological work will continue to refine the model.

The most common site types found on the Cumberland Plain are open artefact scatters/open camp sites, followed by scarred trees and isolated finds. Shelter sites and grinding grooves are also found, although mainly around the periphery of the Plain in sandstone geology. Key trends are summarized below:

- site frequency and density are directly related to the location of sites within the landscape;
- complex sites are usually located close to permanent water sources, with major confluences being a key requirement for occupation sites, and would have been used intensively by larger groups, or used repeatedly by smaller groups over a longer period of time;
- sites with large numbers of artefacts can occur on ridge tops and hill crests;
- sites situated in alluvial soils retain the potential for stratified deposits;
- Potential Archaeological Deposits (PADs) are most likely to be located along valley floors and low slopes in well-drained areas; and surface artefact distribution does not accurately reflect the composition or density of subsurface archaeological deposits. Some areas with few or no surface manifestations have often been shown to contain subsurface archaeological deposits.
- artefact scatters are most commonly linked to the close proximity of permanent water sources in areas such as creek and river banks and alluvial flats. The majority of these sites are located within 100m of permanent fresh water;
- artefact assemblages generally comprise a small proportion of formal tool types with the majority of assemblages dominated by unretouched flakes and debitage;
- high concentrations of artefacts are more likely to be located within resource rich areas;
- silcrete is the dominant raw material used for tool manufacture, followed by chert (also known as tuff). Silcrete sources are located in the north western Cumberland Plain at places such as St Marys, Plumpton Ridge, Marsden Park, Schofields, Riverstone, Deans Park, Llandilo and Ropes Creek (the closest source to the study area, approximately 5.5 km north). Other raw materials include indurated mudstone from Nepean River gravels, quartz, porphyry and hornfels which may be derived from Rickabys Creek gravels, and basalt;
- stands of remnant old growth vegetation retain the potential for scarred trees to be present; however, large scale land clearance of the plain in general means that such stands of vegetation are rare; and
- evidence of post-contact camp sites may be located in close proximity to early European houses and farms, or official buildings.

4.1.1 The Current Regional Model

Regional trends indicate that Aboriginal sites are most frequently located in close proximity to permanent water courses; on creek banks and alluvial flats, or on high ground, and within range of food resources and the raw materials for tool making. However, some exceptions have been demonstrated in excavations at Mungerie Park and Parklea Leisure Centre, where large artefact scatters were identified up to 200-250m from major watercourses (AMBS 2000a). McDonald suggested that this site distribution pattern may be due to surface visibility and site formation processes, rather than a true depiction of the cultural distribution of artefacts across the landscape (1994, cited in Mills & Kelton 2002). In 2009, ENSR Australia Pty Ltd (ENSR) undertook excavations at the Oran Park and Turner Road Land Release Precincts, approximately 9km south west of the project study area, and concluded 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).*

ENSR also found that large sites tend to be located in elevated areas with a good outlook over surrounding major creek valleys, at a distance of over 150m from creeks. It was suggested that this may reflect strategic defensive positioning of camp sites within a cultural interaction zone between three different language groups; the Darug, Gundungurra and Tharawal speaking peoples (ENSR 2009). It should be noted that the ENSR excavations were concerned with testing archaeological patterning throughout a large landscape; however, this type of landscape model has not been extensively tested in other archaeological studies, and further work is needed to determine whether this pattern is seen in other areas. It is also possible that the 'strategic defensive positioning' of sites will not be seen in areas that were not major cultural interaction zones between Aboriginal groups.

Previous studies have also highlighted the problems inherent in characterising archaeological sites on the Cumberland Plain solely by the presence of visible surface stone artefacts, and the importance of test excavation in establishing the nature and density of archaeological material in the Cumberland Plain. Studies have demonstrated that the average ratio of subsurface artefacts to those found at surface could be 25:1, with more recent work indicating this could be as much as 2,000:1 in some locations (JMCHM 2001a). Further, the detection of sites is often influenced by factors such as previous land-use and disturbance, and location within the landscape (JMCHM 2003). A high proportion of sites located in the region are found in disturbed contexts (e.g. Smith 1989).

4.1.2 Archaeological Excavations in the Vicinity of Austral & Leppington North

Although Sections 4.2.3 and 4.2.4 provide a review of archaeological investigations within the Austral and Leppington North Precincts study area and its near vicinity, there are several archaeological excavations which have been undertaken within the wider vicinity of the study area, which have relevance to predictive modelling in the area.

Navin Officer 1993

Navin Officer undertook test excavations on the banks and flats of Maxwells Creek, near the intersection of the M5/M7 and Camden Valley Way (approximately 3km east of the current study

area; Figure 4.1), in accordance with recommendations made by Haglund & Associates in 1992. Although no artefacts were recovered in the 57 pits excavated by spade, it is estimated that only 0.016% of the three testing areas was excavated. Further, the excavated soil was not completely sieved in order to recover artefacts, with Navin Officer noting that 'soil was hand-crumbled into a 5mm mesh but, in most localities, was too damp to sieve' (1993:9). Navin Officer found that the areas had been affected by considerable disturbance and regular flooding in the past, and considered that the potential for significant, *in situ* sites was low; instead, they postulated that a background scatter of artefacts was likely to be present in this location, which was unlikely to be discovered by test pit sampling (1993:13). Therefore, although the tested areas were in close proximity to the reliable water of Maxwells Creek, no large sites were found; however, this result may have been affected by the limited excavation area and, limitations in the excavation methodology.

Figure 4.1 Test areas (1, 2 and 3) excavated by Navin Officer (1993:Figure 2).

Rich & McDonald 1995

Rich and McDonald undertook excavations near a fairly reliable tributary of Cabramatta Creek in West Hoxton, at site WH3 (approximately 1km east of the current study area; Figure 4.2). Despite the fact that mechanical grader scrapes were used for the excavation, a total of 3,686 artefacts were recovered. This was interpreted as resulting from two silcrete knapping floors.

Figure 4.2 Site WH3 excavated by Rich & McDonald (1995:Figure 2).

Navin Officer 1998

Following their survey of The Crossroads in 1997, Navin Officer undertook test excavations on the banks and flats of Maxwells Creek (approximately 3km east of the current study area; Figure 4.3), approximately 200m south of the 1993 Navin Officer excavations (see above). While no artefacts had been recovered from the 1993 excavations, Navin Officer considered this area to be relatively undisturbed, and identified it as having archaeological potential, although ground visibility was too low to identify any surface artefacts. Therefore, mechanical excavation of the area by backhoe was undertaken. Although only 0.12% of the area of archaeological potential was excavated (of which only a sample was sieved), 92 artefacts were recovered (an average of almost two artefacts per square metre of the excavated area). Navin Officer interpreted the site as representing background scatter. Although the tested area was in close proximity to the reliable water of Maxwells Creek, no large sites were found; however, this result may have been affected by the limited excavation area and, limitations in the excavation methodology.

Figure 4.3 General study area (top) and area of archaeological potential (bottom; area outlined in red) excavated by Navin Officer (1998:Figures 1 and 2).

AMBS 2000b

AMBS undertook salvage excavations in an area of PAD near site MC-1, on the bank of Maxwells Creek in a relatively undisturbed area of Cumberland Plain Woodland (approximately 5.5km east of the current study area; Figure 4.4). Three areas of the PAD were excavated, by hand and mechanically, resulting in the recovery of 151 artefacts from 78m^2 (an average of almost two artefacts per square metre that was excavated). The site was interpreted as evidence of low-density/background artefact scatter throughout the area. It was noted that undisturbed Aboriginal sites are thought to be rare on Maxwells Creek, due to extensive development along the creek line (AMBS 2000b:15).

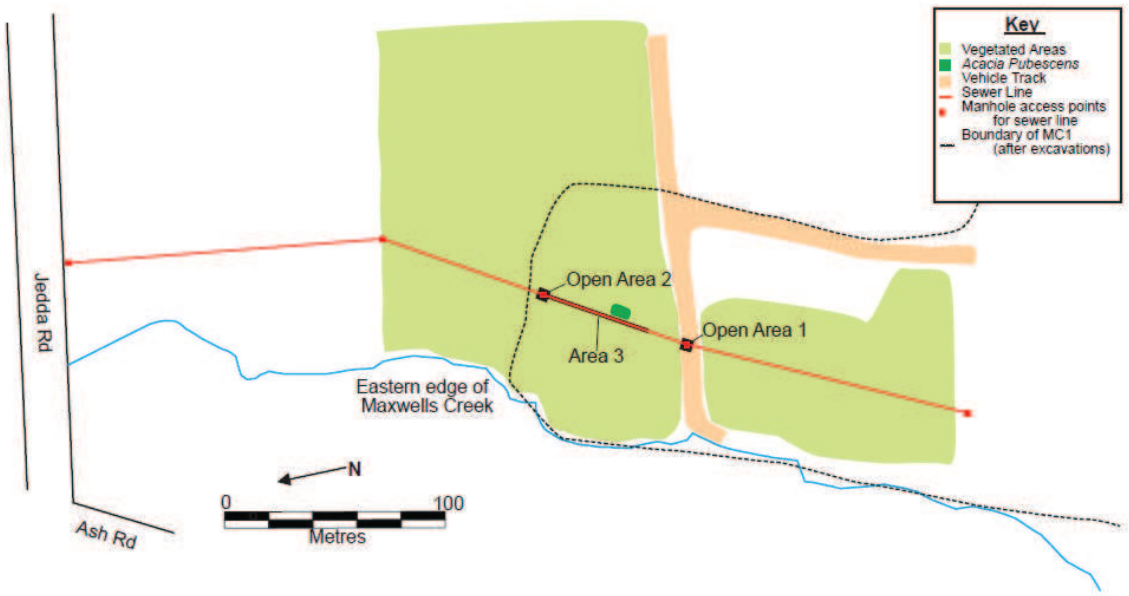

Figure 4.4 Location of MC-1 excavated by AMBS (2000b:Figure 11).

Dallas 2000

Dallas undertook test excavation of an area of PAD that had been identified as potentially representing Aboriginal occupation focused around a bend of Bunbury Curran Creek, near Macquarie Fields House (approximately 4.5km south east of the current study area; Figure 4.5). The test excavations consisted of 17 1m^2 backhoe trenches in an area proposed to be impacted by a perimeter road and house blocks, and four backhoe trenches in landfill within the PAD. The excavations revealed a low density background scatter of stone artefacts, of types common in the region, and hence considered to be of low archaeological significance (Dallas 2000).

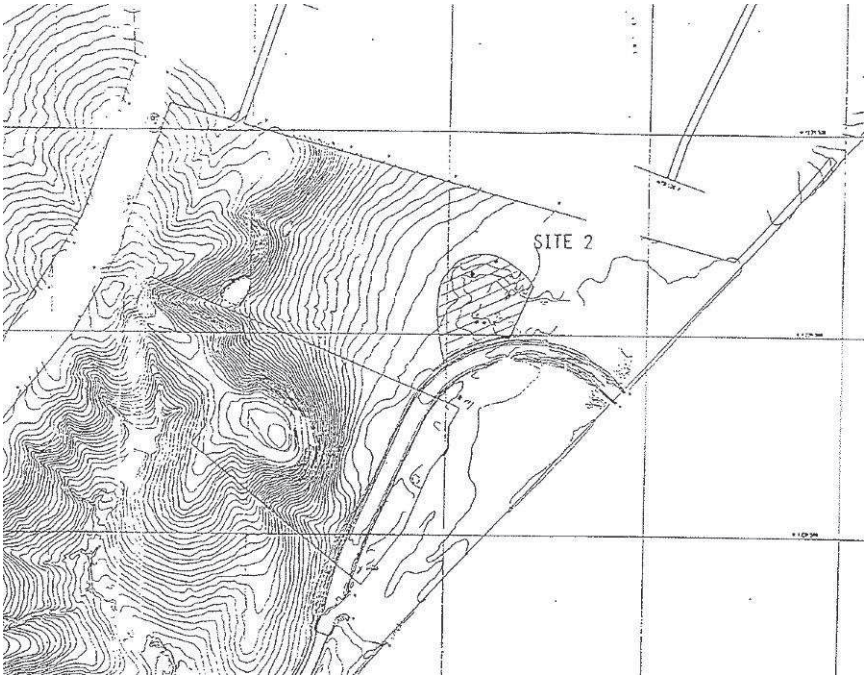

Figure 4.5 Location of MFH#2 and area of PAD (cross-hatching) excavated by Dallas in 2000 (Source: Dallas 1989b:Map 3).

Mills & Kelton 2002

Mills and Kelton undertook test excavation of 16 PADs along the alignment of the Western Sydney Orbital (now known as the M7) in 2002 (no map was available from the report; however, the M7 is approximately 1.5-3km east of the current study area). These excavations located 556 artefacts within 1876 test pits. Mills and Kelton considered that the 82 artefacts recovered from 456 pits at PAD1 demonstrate that there was more intense occupation at Maxwells Creek than in other areas.

Central West Archaeological and Heritage Services 2003

Central West Archaeological and Heritage Services (CWAHS) undertook test excavations of a PAD (WSO PAD 6) that had been identified during the M7 assessments, on the western flood-prone creek bank of Maxwells Creek (no map was available from the report; however, the site is in the vicinity of MC-1, approximately 5.5km east of the current study area; see Figure 4.4). Only four stone artefacts were recovered from the 21 50 x 50 cm pits that were excavated, and it was concluded that flooding of the site had impacted any archaeological deposit that may have been located there.

Haglund & Associates 2007

Haglund & Associates undertook test excavations along The Horsley Drive, between the M7 and Cowpasture Road, at Horsley Park (approximately 7.5km north east of the current study area; Figure 4.6). Six landforms along a 2.4 km long section of the road were excavated, including areas on each side of Eastern Creek, which had been assessed as having particularly high archaeological potential.

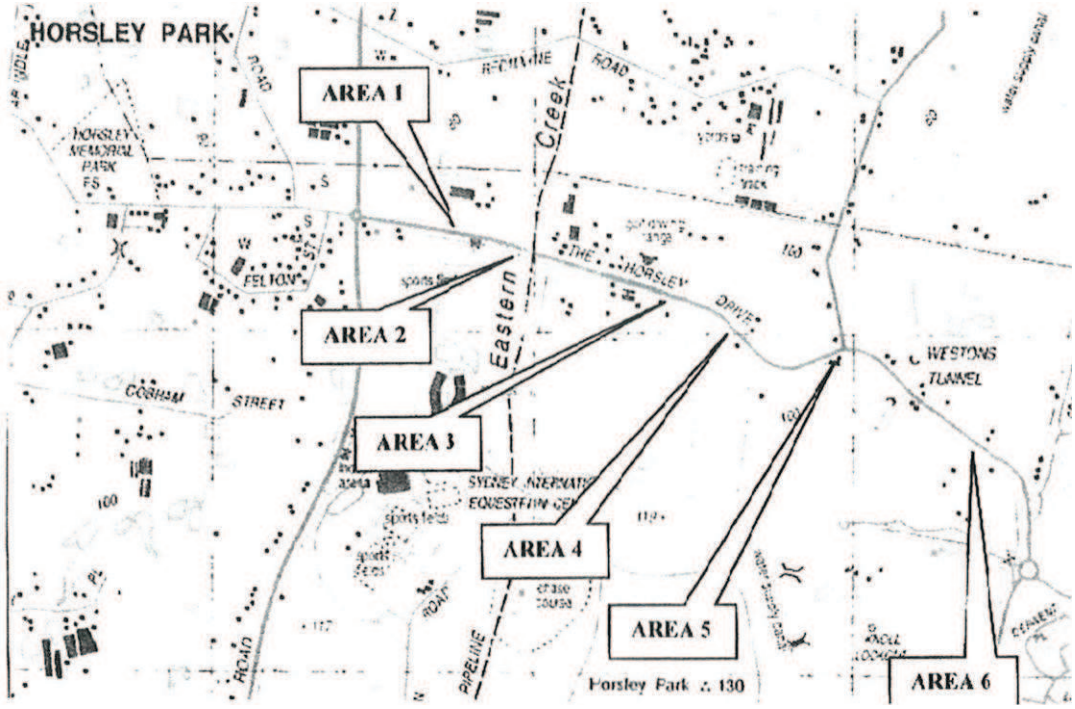

Figure 4.6 Areas excavated by Haglund & Associates (2007:Figure B).

Few Aboriginal artefacts were recovered from five of the areas, which had been affected by cultivation and disturbance down to the basal clay level; these landforms comprised an east-facing slope 130m from Eastern Creek, a mid-lower hill slope overlooking a first order watercourse, a mid-lower slope to first order creek line, a northward-running ridge crest with upper lopes off a ridge and mid-hill slope near an east-west drainage depression. However, excavation of a lower hill slope to the Eastern Creek flat recovered 191 artefacts, including geometric microliths, a silcrete core and silcrete and silicified tuff microblades. The area was described as having retained its *stratigraphic integrity*, and the variation in reduction technologies was assessed as indicating usage of the site over a period of time. Therefore,

the area was assessed as having some research potential, particularly with regards to the shift from silcrete to silicified tuff, and it was recommended it be fully salvaged prior to any development of the site. It was also noted that other undisturbed deposits may be present of outside the impact zone.

4.1.3 Summary

Excavations in this region of the Cumberland Plain have predominantly concentrated on the major creeks (particularly Eastern, Hinchinbrook, Cabramatta and Maxwells), and have found extensive deposits representing repeated use of the area for occupation or resource use within c.100m of these permanent water sources and their reliable tributaries (e.g. Haglund & Associates 2007; Mills & Kelton 2002; Rich & McDonald 1995). Low densities of artefacts representing one-off resource use or infrequent occupation have also been located near reliable water sources, although prior disturbance of these sites is often a factor in the low density of artefacts found (e.g. AMBS 1996; Haglund & Associates 2007; Mills & Kelton 2002; Navin Officer 1993, 2007a). Sites or PADs in the vicinity of less reliable, ephemeral creeks are generally considered likely to have low-to-moderate density archaeological deposits (more than background scatter, which may be defined as an average of 0.01 artefacts/m^2). Low-lying, flood prone areas are also unlikely to have been used extensively for camping (CWAHS 2003); higher areas overlooking creeks are more likely to have been suitable locations for repeated use by Aboriginal people camping in the area (ENSR 2009). However, it may be seen from Section 4.1.2 that archaeological investigations of areas considered to have archaeological potential may have results which are contrary to expectations, based on the current predictive model. Further, there has been limited archaeological investigation undertaken in the study area and its immediate vicinity (AMBS 2010a; Environmental Resources Management [ERM] 2005, 2007; Navin Officer 2007; Rich & McDonald 1995). It is clear that further excavation of the area is required in order to refine predictive modelling.

4.2 Local Archaeological Context

4.2.1 Ethnographic Context

The Aboriginal history of the Campbelltown/Liverpool area was compiled as a Bicentennial project by Liston (1988). This study documents interactions between Europeans and the Tharawal people from the early 18th century. Traditionally, this area was thought to be close to the intersection of a number of language group (tribal) boundaries. Language groups include the Dharug who inhabited much of the Cumberland Plain between the Blue Mountains and the coast, the Tharawal who ranged from the coast westwards towards Camden, and the Gandangara who inhabited areas westward and southwest of the Tharawal and into the Blue Mountains. The Tharawal people and other Aboriginal groups continue to be active in the Campbelltown area (Liston 1988).

4.2.2 Site Types

A search of the AHIMS database was undertaken on 1 November 2010, and 86 registered Aboriginal sites were identified within a search centred on the study area, with a buffer zone of approximately 1km. The search results are summarised in Table 4.2 and presented in Figure 4.7.

Table 4.2 Summary of Aboriginal sites previously recorded near the study area.

Site Type	Number Present	Percentage (to 2 decimal places)
Open Camp Site	39	45.35%
Isolated find	37	43.02%
PAD	8	9.3%
Scarred Tree	2	2.33%
Total	**86**	**100%**
Results of OEH AHIMS search undertaken on 1 November 2010		

Figure 4.7 Location of registered AHIMS sites in the vicinity of the study area (based on a search of the AHIMS database on 1 November 2010) (see Volume 2 of the report).

Previous archaeological investigations have recorded Aboriginal heritage items within and near the study area. There are 34 previously recorded sites located within the study area, two sites immediately adjacent to the study area, and seven more sites in its vicinity (within 100 metres). A summary of recorded sites that are relevant to the current study area, including sites that have not yet been registered on the AHIMS, is provided in Table 4.3 (organised according to distance from the study area, and roughly north to south and east to west) and Figure 4.8. It should be noted that sites identified by Kelleher Nightingale (KN) were not registered at the time of the AHIMS search, but were registered after the current survey was undertaken.

Table 4.3 Sites within 100m of the study area (includes all sites recorded previously).

Site	AHIMS No.	Site Type	Location	Recorder/report
2014-46	N/A	Artefact scatter and PAD	Within study area, on boundary of Lot 10 DP 771080 and Lot 15 DP 831988.	Archaeological and Heritage Management Solutions (AHMS) (in prep.) – South West Growth Centre (SWGC) water pipelines
2015-46	N/A	Artefact scatter and PAD	Within study area, at back of properties at 35-45 Gurner Ave.	AHMS (in prep.) – SWGC water pipelines
GLC2	45-5-2560	Open Camp Site – 4 artefacts (red silcrete - 2 flakes, 1 retouched flake, 1 backed blade)	Within study area. Artefacts described as scattered on each side of small drainage line at base of hill. AHIMS coordinates plot the site within the property at 5 Gurner Ave; but the site card describes the site as being located 0.5km north of 18th Ave, in the existing gas pipe-line easement. This places it within the area of land south-east of Transgrid substation.	Annie Nicholson – AASC report on Wilton-Horsley Park section of Eastern Gas Pipeline (report not available from AHIMS)
2017-6	N/A	PAD	Within study area, along front of properties at 205-225 and 210 Gurner Ave.	AHMS (in prep.) – SWGC water pipelines
2016-5	N/A	Isolated find	Within study area. Corner of Fourth and Gurner Ave, on property at 95 Gurner Ave.	AHMS (in prep.) – SWGC water pipelines
2018-6	N/A	PAD	Within study area. At front of properties at 590-610 and 645-655 Fifteenth Ave.	AHMS (in prep.) – SWGC water pipelines
2021-5	N/A	Isolated find	Within study area. On property at 225 Tenth Ave.	AHMS (in prep.) – SWGC water pipelines
2019-6	45-5-4018	PAD	Within study area. On properties at 140-150 Seventh Ave.	AHMS (in prep.) – SWGC water pipelines
2020-6	45-5-4019	PAD	Within study area. On properties at 130-140 Seventh Ave.	AHMS (in prep.) – SWGC water pipelines
BRP-IF-09	45-5-3858	Isolated Find – mudstone flake	Within study area. On road verge in front of 431 Bringelly Road.	Austral Archaeology (AA) (2010) – Bringelly Road upgrade
BRP-S-13	45-5-3868	Open Camp Site - 3 artefacts (1 mudstone and 2 silcrete flakes)	Within study area. On road verge c. 115m east of the front of 431 Bringelly Road.	AA (2010) – Bringelly Road upgrade
2024-46	45-5-4023	Artefact scatter and PAD	Within study area. At front of properties at 532-543 and 419 Bringelly Road.	AHMS (in prep.) – SWGC water pipelines
BRP-S-12	45-5-3898	Open Camp Site – 2 artefacts (silcrete core and flake)	Within study area. In front yard of 112 (or 419) Bringelly Road.	AA (2010) – Bringelly Road upgrade

BRP-S-11	45-5-3897	Open Camp Site – 5 artefacts (1 quartz and 4 silcrete flakes)	Within study area. Between fence and 100m into property at 14 Eastwood Road.	AA (2010) – Bringelly Road upgrade
BRP-S-10/ BRP-S-10 PAD (or BRP-PAD-01)	45-5-3887/ 45-5-3900 (one site, registered twice)	Open Camp Site and PAD – 32 artefacts	Within study area. On slope down to Bonds Creek at 444 Bringelly Road.	AA (2010) – Bringelly Road upgrade
2032-6	45-5-4031	PAD	Within study area. At front of properties at 532-543 and 419 Bringelly Road.	AHMS (in prep.) – SWGC water pipelines
BRP-IF-06	45-5-3855	Isolated Find – red silcrete flake	Within study area. Near tree 10m from road, 120m west of intersection of Bringelly Road and Edmondson Avenue.	AA (2010) – Bringelly Road upgrade
BRP-IF-07	45-5-3856	Isolated Find – silcrete flake	Within study area. Near tree opposite benches, 2m from fence of Scott Memorial Oval, 70m north of intersection of Bringelly Road and Edmondson Avenue.	AA (2010) – Bringelly Road upgrade
BRP-IF-08	45-5-3857	Isolated Find – silcrete flake	Within study area. In disused garden bed, 217 Bringelly Road (corner of Rickard Road).	AA (2010) – Bringelly Road upgrade
SWRL Site 4	45-5-3536	Isolated Find –red silcrete flake	Within study area. In soil from trenching for a gas pipeline; 40m south of Bringelly Road, 100m west of the Upper Canal, within Lot 18 DP19406.	AMBS (2010b) – survey for South West Rail Link (SWRL)
SWRL Site 3	45-5-3537	Open Camp Site – 8 artefacts (1 mudstone and 7 red silcrete broken/ whole flakes, flaked pieces and heat shatters)	Within study area. Near old corral and property fenceline, 200m south of the junction of Camden Valley Way and Bringelly Road, within Lot 3 DP205472.	AMBS (2010b) – survey for SWRL
SWRL Site 12	45-5-3906	Isolated Find – quartz broken flake	Within study area. Adjacent to a stand of trees, in a horse paddock, within Lot 1 D513403.	AMBS (2010b) – survey for SWRL
BRP-S-19	45-5-3874	Open Camp Site – 2 artefacts (silcrete flakes)	Within study area. On access track 20m east of Upper Canal, 70m east of Cowpasture Road, 200m south of Bringelly Road.	AA (2010) – Bringelly Road upgrade
SWRL Site 7	N/A	Open Camp Site – 4 artefacts (1 mudstone and 3 silcrete broken flake, flaked pieces and heat shatter)	Within study area. On access track immediately east of Upper Canal.	AMBS (2010b) – survey for SWRL
TP25	N/A - test pit dug by AMBS (2010b)	Open Camp Site – 7 artefacts (3 silcrete, 2 silicified wood and 2 mudstone broken/ whole flakes)	Within study area. On grazing land at back of 50 Eastwood Road.	AMBS (2010a) - preliminary test excavations for SWRL
SWRL Site 9	45-5-3532	Open Camp Site – 3 artefacts (red silcrete broken/ whole flakes)	Within study area. At base of electricity transmission line poles, 5m west of Kemps Creek, 200m north east of McCann Road, within Lot 102 DP736147.	AMBS (2010b) – survey for SWRL
SWRL Site 13 (2 locations)	45-5-3907	Open Camp Site – 7 artefacts (1 mudstone and 6 silcrete broken/ whole flakes)	Within study area. On old vehicle tracks on gentle slope c.250-350m west of a small second order tributary of Kemps Creek, within Lot 2 DP1082805.	AMBS (2010b) – survey for SWRL
SW1	N/A	Isolated find (1 quartz artefact)	Within study area. Low slope of a closed depression.	Heritage Concepts (2006) – survey for SWRL
SWRL Site 10 (three locations)	45-5-3903	Open Camp Site – 14 artefacts (1 quartz, 2 silcrete	Within study area. In powerline easement adjacent to the end of Cassidy Street, and on track	AMBS (2010b) – survey for SWRL

		and 11 mudstone flaked pieces, flakes and heat shatter)	downslope into vegetated area.	
2063-6	N/A	PAD	Within study area. On back of properties at 61-71 Cowpasture Road.	AHMS (in prep.) – SWGC water pipelines
TLC1	45-5-2559	Open Camp Site – 2 artefacts (red silcrete flake, quartz retouched flake)	Within study area. 400m north of Camden Valley Way; in existing gas pipeline easement. Artefacts on rise 200m south of narrow creek line.	Annie Nicholson - report on Wilton-Horsley Park section of Eastern Gas Pipeline (report not available from AHIMS)
LIF-1	45-5-3300	Isolated Find – silcrete flaked piece	AHIMS coordinates plot the site outside the study area; but the site card shows the site to be within the additional investigation area. In horse paddock, north of Camden Valley Way, between Upper Canal and Cowpasture Road.	Navin Officer (2006) - Leppington Caravan Park redevelopment
LP-3	45-5-3946	Isolated Find – silcrete retouched flake	Within study area. On western side of Camden Valley Way, between Upper Canal and Bringelly Road.	KN (2010) – Camden Valley Way upgrade
LP-4	45-5-3947	Open Camp Site – 2 artefacts (broken silcrete flakes)	Within study area. In Lochie's Hotel carpark at corner of Ingleburn Road and Camden Valley Way.	KN (2010) – Camden Valley Way upgrade
2005-846	N/A	Artefact scatter, PAD and cultural site	Adjacent to north western edge of study area, on Kemps Creek, at back of property at 225 Gurner Ave.	AHMS (in prep.) – SWGC water pipelines
SWRL Site 11	45-5-3905	Isolated Find –red silcrete flake	Immediately adjacent to south eastern section study area. On dirt track adjacent to old property boundary fenceline, next to BMX bike jumps, within Lot 7 DP 205472.	AMBS (2010b) – survey for SWRL
2013-6	N/A	PAD	10m north of northern point of study area.	AHMS (in prep.) – SWGC water pipelines
LP-1	45-5-3944	Isolated Find – silcrete flaked piece/heat shatter	10m south east of study area at Leppington. On eastern side of Camden Valley Way between Bonds Creek and Upper Canal.	KN (2010) – Camden Valley Way upgrade
LP-2	45-5-3943	Open Camp Site – 5 artefacts (flaked silcrete and silicified tuff; backed artefact)	40m south east of study area On eastern side of Camden Valley Way, north of Upper Canal.	KN (2010) – Camden Valley Way upgrade
SWRL Site 6	45-5-3534	Open Camp Site – 13 artefacts (4 mudstone and 9 silcrete broken/ whole flakes, flaked pieces and heat shatters)	65m east of study area. At back of Adventureland property, 550m south of Camden Valley Way, within Lot 2A DP365586.	AMBS (2010b) – survey for SWRL
TP49v	N/A - test pit dug by AMBS (2010b)	Open Camp Site – 30 artefacts (3 mudstone and 27 silcrete broken/ whole flakes, flaked pieces, heat shatters and core fragment)	75m west of study area. On grazing land at back of Lot 214 McCann Road.	AMBS (2010b) - preliminary test excavations for SWRL
BRP-IF-05	45-5-3854	Isolated Find – red silcrete flake	90m west of study area. Within llama enclosure, 620 Bringelly Road.	AA (2010) – Bringelly Road upgrade
PP-F3	45-5-3298	Isolated Find – red silcrete core fragment	AHIMS coordinates plot the site 20m east of the study area; but the site card describes the site as being on a ridge top on a vehicle	Mark Rawson (2006) - pedestrian/cycle path (report not available from

			track, 290m north of 27th & McIver Avenues, which is approximately 200m east of the study area.	AHIMS)

Figure 4.8 Location of all known previously identified sites in the vicinity of the study area (sites with incorrect co-ordinates in AHIMS have been moved to fit the description of the site given in the site card) (see Volume 2 of the report).

4.2.3 Previous Archaeological Investigations within the Austral & Leppington North Precincts

There have been a number of archaeological investigations in the general vicinity of the study area; however it appears that the majority of the land within the study area, particularly to the north of Bringelly Road, has not been previously subject to Aboriginal heritage survey or assessment. The information in the following sections is based on reports that have been registered with the OEH AHIMS, and which are most relevant and informative to archaeological background of the current project.

Kemps Creek Substation, 1979

Haglund undertook a survey of the area proposed for Kemps Creek Substation, including the access road between the substation and Fourth Avenue/Gurner Avenue (no map was available in the report). No sites were identified, and the area was considered to have low archaeological potential, given its location on a hill exposed to cold southerly winds.

South West Growth Centres

Archaeological and Heritage Management Solutions (AHMS) (in prep.) recently undertook investigations of the North West Growth Centres (NWGC) and the South West Growth Centres (SWGC) for the Sydney Water Corporation (SWC). The report has not yet been completed; however, given the relevance to the Austral and Leppington North Precincts within the SWGC, some completed sections of the report were obtained by DP&I.

In comparing the two Growth Centres, AHMS states that their archaeological investigations in the NWGC area suggest that stone raw material for tool manufacture was transported to the SWGC area, due to the lack of naturally occurring material in its vicinity, and the disproportionate core-to-flake ratio, lack of cortex and small size of stone tools seen in artefact assemblages (AHMS in prep:83, 85). Further, in the SWGC, sites were generally located near watercourses, and stream order does not appear to have a predictable influence on site size, density or complexity; sites with greater frequency, size and complexity are found 120m-180m from creeklines on gentle slopes and hillcrests, and within 500m of watercourses on ridgelines and their associated mid to lower slopes (AHMS in prep:84).

The survey undertaken by AHMS for the SWGC included parts of the current study area; mainly creeks and roads where SWC propose to install infrastructure (Figure 4.9). A total of 65 sites were identified in the area, comprising four artefact scatters, 17 artefact scatters with associated PAD, 25 PADs, one scarred tree, 19 isolated finds and two cultural sites. All sites were affected to various degrees by disturbance. Eleven of these sites are within the current study area, and an additional two are within the immediate vicinity (see Table 4.3 for details).

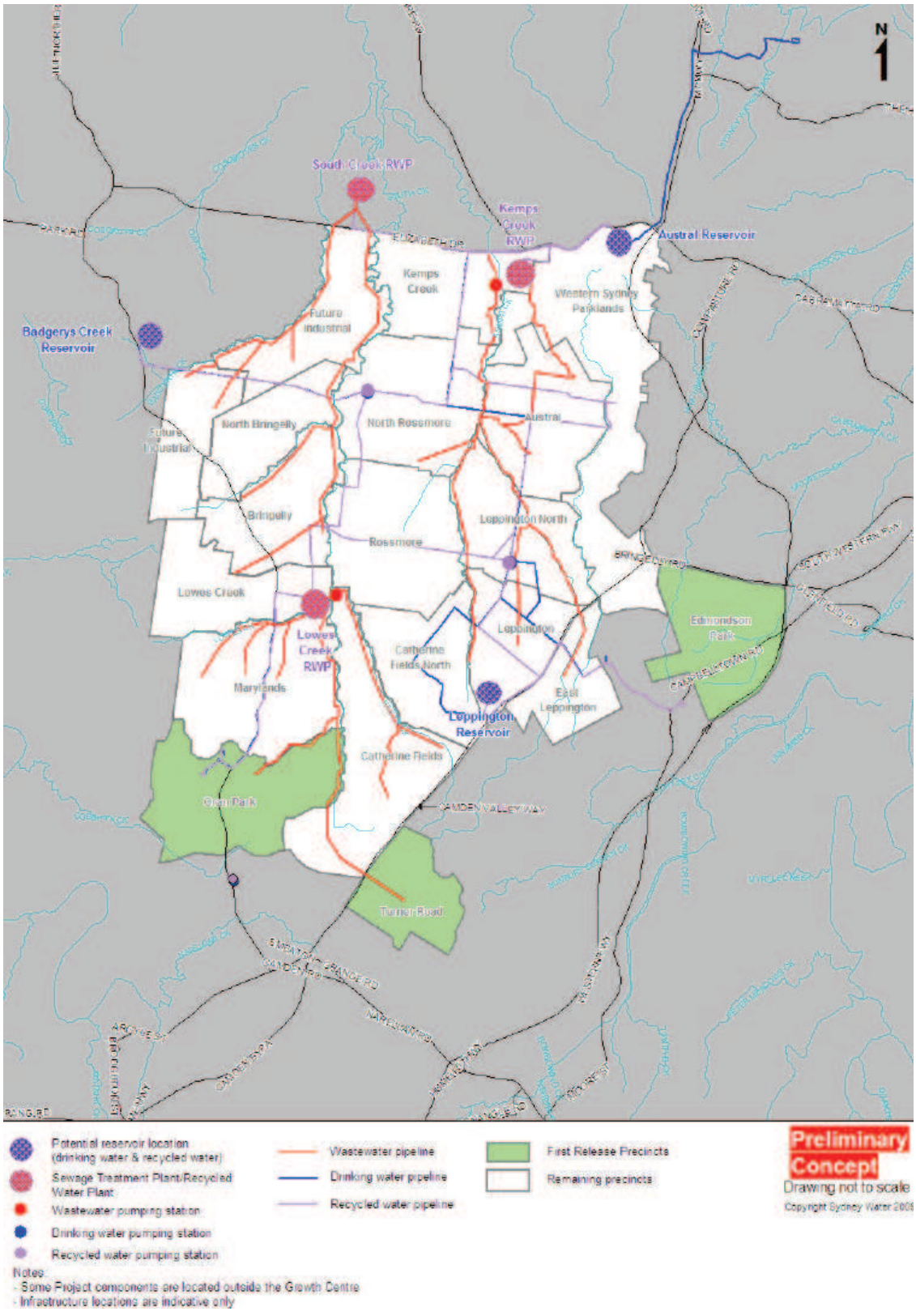

Figure 4.9 Preliminary concept locations of SWGC pipelines (SWC 2011:Figure 4.2).

Bringelly Road

Austral Archaeology (AA) recently undertook the Phase 1 assessment for the upgrade of Bringelly Road, between Camden Valley Way (Leppington) and the North Road (Bringelly), approximately half of which is within the current study area (AA 2010). Although the site cards are available in the OEH

AHIMS (19 of which were identified during an AHIMS search for the study area and its vicinity), the report (including map) has not yet been released.

Glenfield-Leppington South West Rail Link

Heritage Concepts (2006) undertook the Stage 1 preliminary archaeological assessment of the South West Rail Link (SWRL; now known as the Glenfield to Leppington Rail Line [GLRL]), an 11km rail alignment extending from south west of the existing Glenfield Rail Station to a proposed train stabling facility at Rossmore (the western end of which extends into the current study area). Heritage Concepts identified two artefact scatters, four isolated artefacts and one possible scarred tree (see Table 4.4 and Figure 4.10). Further assessment of all of the sites identified by Heritage Concepts was recommended, which was undertaken by AMBS in 2008 and 2010 as part of Stages 2 and 3 of the SWRL assessment.

Table 4.4 Summary of Aboriginal sites located by Heritage Concepts (2006).

Site Name	Site Type	Material	Landform
SWST1	Possible scarred tree	Grey box eucalypt	Flat ground, c.500 from creekline
SW1	Isolated find	1 quartz artefact	Low slope of a closed depression
SW2	Artefact scatter c.50mx10m	Mudstone, silcrete and quartz artefacts	Low slope adjacent to creekline
SW3	Isolated find	1 silcrete artefact	Creek flat
SW4	Isolated find	1 mudstone artefact	Creek flat
SW5	Artefact scatter	2 mudstone artefacts	Ridge near creekline
SW6	Isolated find	1 red-grey silcrete artefact, quartz inclusions	Ridge near creekline

Figure 4.10 Aboriginal heritage sites recorded by Heritage Concepts (Source: Heritage Concepts 2006:50) (see Volume 2 of the report).

Of the sites recorded by Heritage Concepts, the possible scarred tree and isolated find SW1 are within the current study area (however, neither has been registered on the AHIMS). The possible scarred tree was inspected by AMBS and Aboriginal community representatives in 2010, and the scar on the tree was determined not to be of Aboriginal origin; rather, it appeared to be the result of damage from a horse (such as from a bite). A nearby tree was observed to have a similar scar (AMBS 2010b:62-63). Site SW1 was unable to be found during the AMBS survey, but this is not unexpected given that the site comprises a single artefact.

The AMBS surveys identified 14 new sites (SWRL Sites 1-14) and located five previously recorded sites (Figure 4.11). SWRL Sites 3-4, 7 and 9-13 are within the current study area, with SWRL Site 6 located adjacent to the easternmost section of the study area (Table 4.5). However, AMBS identified areas of archaeological sensitivity within the current study area and its vicinity (Figure 4.11), and recommended test excavations in the following areas:

- land between Cabramatta and Maxwells Creeks, including Ingleburn, which was considered to have moderate-high archaeological sensitivity, for the potential to reveal a continuity of activity in the landscape around Cabramatta and Maxwells Creeks;
- land adjacent to Kemps Creek, which was considered likely to have high archaeological sensitivity; and
- an elevated area in the landscape at the back of a property at 511 Bringelly Road, in the immediate vicinity of a tributary of Kemps Creek, which was considered to have moderate archaeological sensitivity.

Table 4.5 Summary of Aboriginal heritage sites identified during AMBS SWRL surveys, which are within the current study area and its immediate vicinity.

Site Name	Type	Landform	Details
SWRL Site 3	Stone Artefact Scatter	Creek flat	8 artefacts recorded
SWRL Site 4	Isolated Artefact	Mid-slope	1 artefact recorded
SWRL Site 6	Stone Artefact Scatter	Flat/gentle slope	13 artefacts recorded
SWRL Site 7	Stone Artefact Scatter	Flat	4 artefacts recorded
SWRL Site 9	Stone Artefact Scatter	Creek flat	3 artefacts recorded
SWRL Site 10	Stone Artefact Scatter	Flat/gentle slope	15 artefacts recorded
SWRL Site 11	Isolated Artefact	Flat	1 artefact recorded
SWRL Site 12	Isolated Artefact	Ridge	1 artefact recorded
SWRL Site 13	Stone Artefact Scatter	Slope	7 artefacts recorded
SWRL Site 14	Stone Artefact Scatter	Flat/gentle slope	4 artefacts recorded

AMBS completed preliminary test excavations in June–July 2010. The location of the excavation areas was determined by geotechnical testing requirements and environmental constraints, and as such, pits were not necessarily placed in locations most likely to contain archaeological deposit. The largest numbers of excavated artefacts were recovered from lower slopes and flats within 300m of significant water resource zones in the region, just outside the flood inundation zones of the creeks (Figure 4.12). Within the current study area, these water resources include Kemps Creek at Leppington/Rossmore; 30 artefacts were recovered from TP49v located immediately to the west of the Kemps Creek (and the boundary of the current study area), and seven artefacts were recovered from TP25, within the current study area (see Figure 4.8). Although few artefacts were recovered along elevated landforms in the GLRL study area, this may be a result of an increase in previous impacts and associated erosion affecting site integrity, and may not reflect past Aboriginal land use.

Figure 4.11 Identified sites and areas of archaeological sensitivity identified for the SWRL corridor (AMBS 2010c:Figure 3.14) (see Volume 2 of the report).

Preliminary analysis of the results of the test excavation suggests that there is potential for significant Aboriginal archaeological deposits to be present within the identified areas of high archaeological sensitivity in the GLRL corridor, particularly in association with creeks and swamp areas.

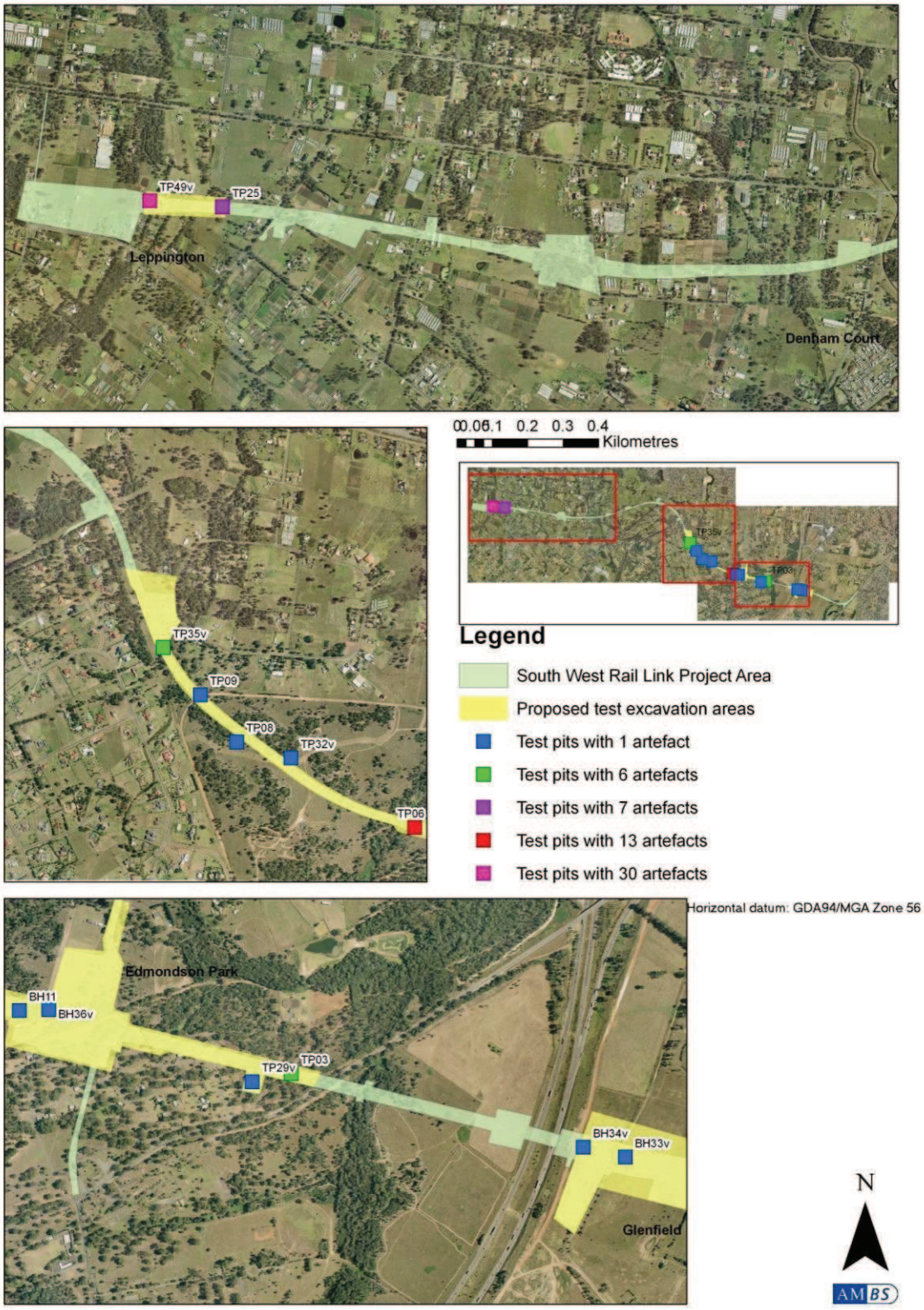

Figure 4.12 SWRL preliminary test excavation artefact distribution (AMBS 2010a:Figure 6.1).

Leppington Caravan Park, 2006

Navin Officer undertook a survey as part of the proposed redevelopment of Leppington Caravan Park, Camden Valley Way, Leppington, which is within the current study area. Navin Officer's study area

comprised the approximately 8.1ha caravan park, and an additional 2.2ha of undeveloped land (Figure 4.13).

Figure 4.13 Location of Leppington Caravan Park and undeveloped land (outlined in green), surveyed by Navin Officer (2006:Figure 1.1).

The caravan park area was found to comprise heavily disturbed and modified ground, sealed roads, kerb and guttering and associated electricity, sewerage and drainage infrastructure. The survey therefore focussed on the 2.2ha of undeveloped land; however, despite excellent visibility, only one artefact was identified. Based on the lack of associated material in the study area and vicinity, the site was assessed as being of low archaeological significance, and indicative of low archaeological potential for the study area.

Camden Valley Way, 2010

Kelleher Nightingale undertook a survey of Camden Valley Way between Cobbitty Road and Cowpasture Road, which includes part of the current study area (Figure 4.14). The road corridor, adjacent property boundaries and creeklines which were to be affected by the road upgrade were

inspected. Fourteen sites were identified, comprising ten artefact scatters, two isolated finds and two scarred trees. Within the vicinity of the current study area, isolated finds LP-1 and LP-3 and artefact scatter LP-4 were assessed as having low archaeological potential and significance, while artefact scatter LP-2 was assessed as having high archaeological potential and significance. A Section 90 was recommended for LP-1 and LP-4, while LP-2 and LP-3 were able to be avoided by the development.

Figure 4.14 Area of Camden Valley Way surveyed by Kelleher Nightingale (2010:Figure 2).

4.2.4 Previous Archaeological Investigations in close proximity to the Austral & Leppington North Precincts

Kemps Creek Transmission Line, 1980

Koettig surveyed a transmission line extending from the Kemps Creek Substation, to Eraring near Newcastle (Figure 4.15). A total of 34 sites were identified. The sites in closest proximity to the study area were found in the vicinity of South Creek.

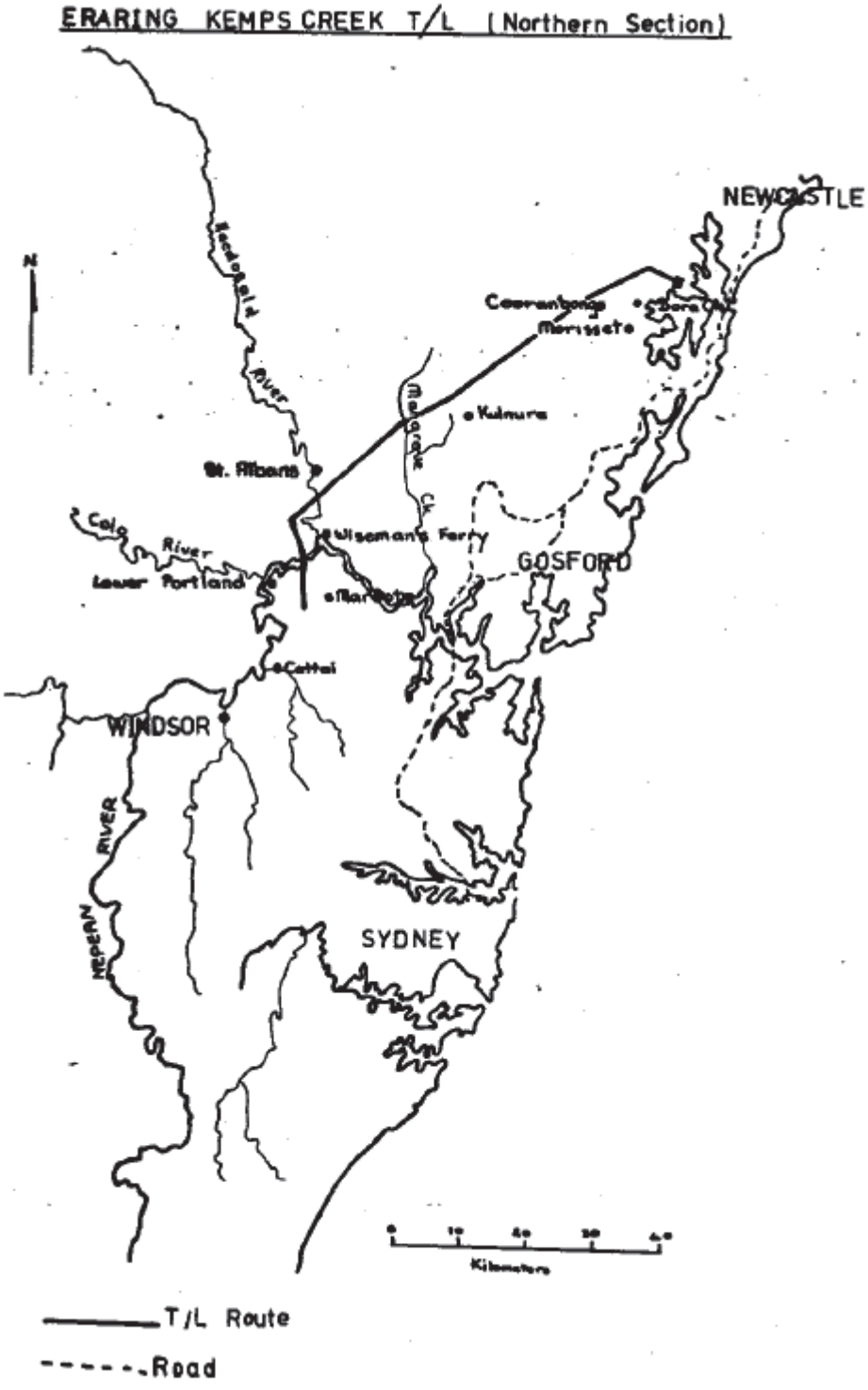

Figure 4.15 Study area assessed by Koettig (1980:Map 1).

Cowpasture Road, 2004

AHMS undertook an Aboriginal archaeological assessment for the proposed upgrade of Cowpasture Road between Main Street and Camden Valley Way, the southern end of which adjoins the current study area (Figure 4.16). The study area comprised land adjacent to the road corridor, and was found to have been significantly disturbed by the construction of Cowpasture Road. No sites were located, and the corridor was considered to have low archaeological potential. AHMS considered that no further archaeological work was necessary prior to the upgrade.

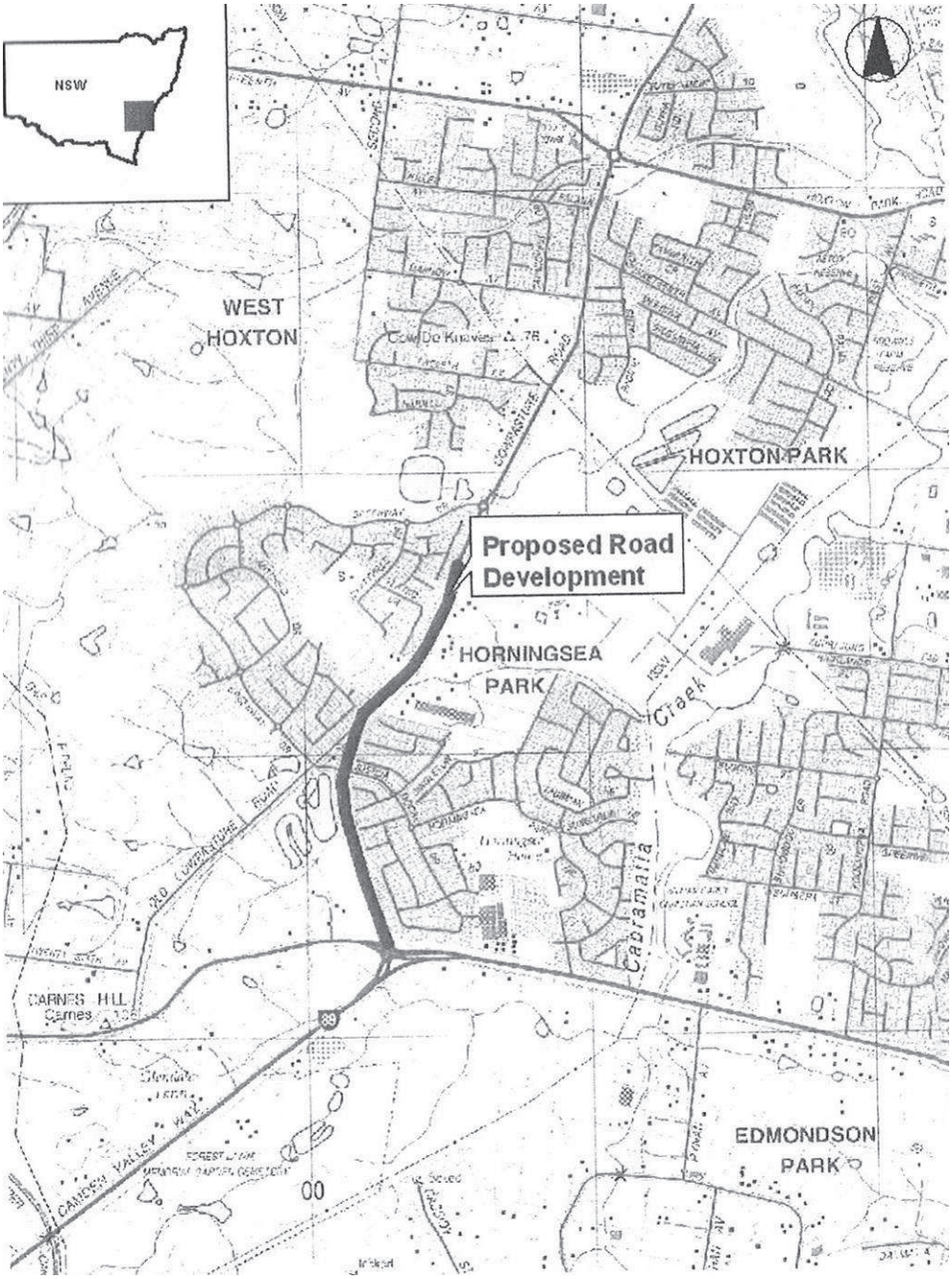

Figure 4.16 Study area investigated by AHMS (2004:Figure 1.1).

Edmondson Park

AMBS undertook surveys of the Edmondson Park area (which adjoins the easternmost extent of the current study area) as part of the Edmondson Park Composite Site (EPCS) Master Plan in 2003. It was noted that 13 artefact scatters and five isolated finds had previously been recorded across the

EPCS, comprising a total of 276 artefacts, and that *[m]ost sites were located in areas of low or moderate disturbance along tributaries of Maxwells Creek, either on the alluvial flats immediately adjacent to the creekline or on the associated elevated, gently sloping undulating rises above the creeks* (AMBS 2003:10). The survey covered a large part of the study area and identified 15 new stone artefact sites (EPCS1 – EPCS15), comprising a total of 32 artefacts (see Figure 4.17).

Figure 4.17 Location of sites in Edmondson Park Composite Site (AMBS 2003:Figure 6) (see Volume 2 of the report).

AMBS identified several areas of sensitivity where *in situ* archaeological deposits were considered likely to remain. Most areas of sensitivity are associated with known surface archaeological manifestations or landforms conducive to Aboriginal occupation. Areas were divided into four categories in accordance with their estimated archaeological potential:

- areas of high sensitivity are those where the original landscape has not been significantly disturbed and include locations conducive to Aboriginal occupation. These locations have either surface archaeological evidence and/or have the potential to yield substantial subsurface archaeological deposits based on landform and degree of disturbance;
- areas of moderate sensitivity are those where the original landscape has been partially disturbed by past land uses, although subsurface archaeological deposits are likely to remain intact to some degree. These locations have been identified by surface archaeological evidence or their potential to yield subsurface archaeological deposits based on landform and degree of disturbance;
- areas of low sensitivity are those where the original landscape has been more substantially disturbed by past land uses and subsurface archaeological deposits are likely to remain intact to a lesser degree. Locations were identified by surface evidence or their potential to yield subsurface archaeological deposits based on landform; and
- the remainder of the site has been categorised as disturbed landscape because of the substantial degree of previous land disturbance that has taken place. While the presence of archaeological material within these zones cannot be ruled out, it is considered unlikely that intact archaeological deposits would still be present (AMBS 2003:27-30) (see Figure 4.18).

Figure 4.18 Archaeological sensitivity zones within EPCS (AMBS 2003:Figure 4) (see Volume 2 of the report).

Navin Officer undertook test excavations on a rise overlooking Cabramatta Creek, adjacent to the easternmost extent of the current study area. A total of 68 test pits, in areas of least disturbance, were mechanically excavated throughout the area, including site EPCS5 (see Figure 4.19). Only 0.008% of the area of archaeological potential was excavated (of which only a sample was sieved, 'equivalent to the in situ deposit that would be recovered from an excavation area of 100 x 48 cm'; Navin Officer 2007a:5). A low density of artefacts was recovered, 33 in total from the 68 pits (an average of 1.3 artefacts per square metre that was excavated), with the majority on a low slope near the banks of a second order tributary of Cabramatta Creek. All finds were within the site designated as EPCS5 except for one isolated artefact (LLB1). Navin Officer recommended that this area did not require further archaeological assessment (Navin Officer 2007a).

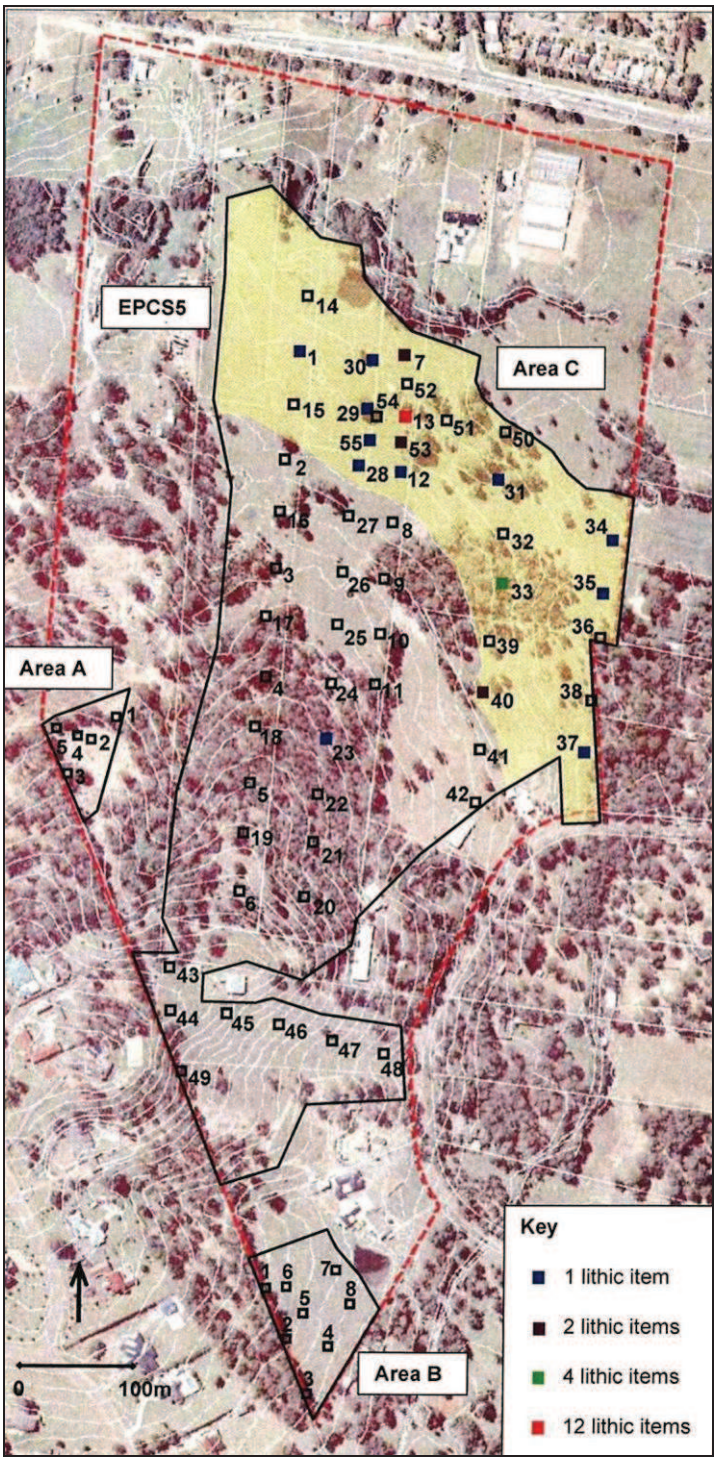

Figure 4.19 Location of test pits excavated by Navin Officer (2007a:27).

Based on the results of this subsurface archaeological testing, Navin Officer revised the areas of archaeological potential identified by AMBS within Edmondson Park. Navin Officer's justification for the reassessment of the entire Edmondson Park precinct was that 'the subsurface investigation [at LLB1] found that soils within the test area were very shallow, with minimal subsurface deposits. Consequently the overall archaeological potential of the area was downgraded. There are now four areas of moderate archaeological potential and three areas of low archaeological potential in the area' (Navin Officer2007b:5). However, it should be noted that this is based on the excavation of a very small percentage (0.008%) of the area considered by AMBS in 2003, to have high sensitivity, particularly as only a sample of excavated soil was sieved. Given the contradictions between excavations in the vicinity of the area (see Section 4.1.3), it is inadequate to attempt to reassess all sites

throughout the Edmondson Park precinct, sight unseen, based on the results of one small-scale excavation.

In 2009, AA undertook an archaeological risk assessment of 20 route options, as part of a wastewater planning study of the Edmondson Park area. The assessment was desktop-based, with a limited site inspection undertaken off Rynan Avenue (approximately 400m west of the current study area; see Figure 4.20). No new sites were identified during the inspection; however, it was noted that ground surface visibility was limited. Further, AA considered that most areas close to creeks, particularly those that are relatively undisturbed, were likely to contain Aboriginal archaeological deposits.

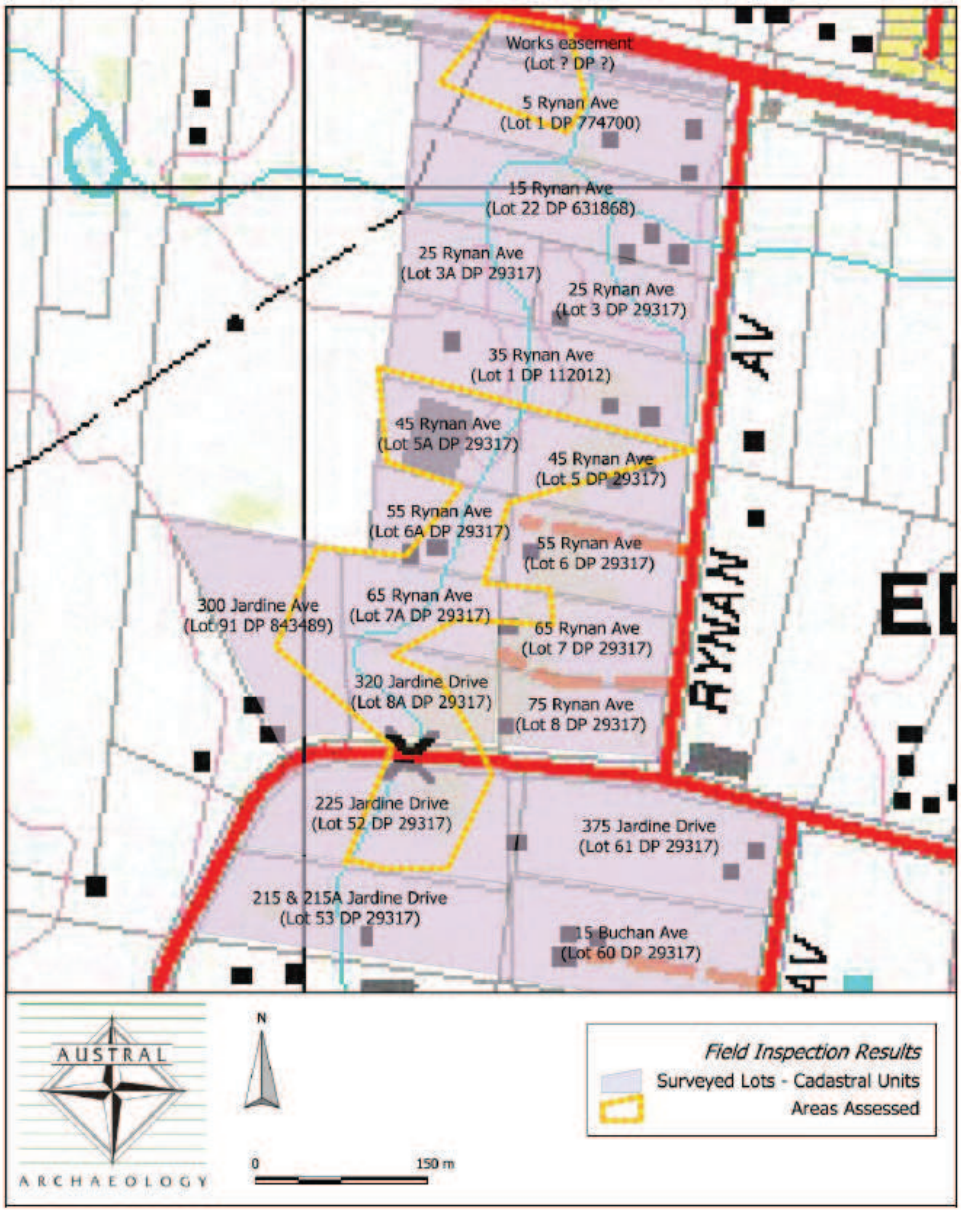

Figure 4.20 Area subject to site inspection by AA (2009:Figure 5.3).

AMBS (2011) recently undertook a survey of the proposed trunk water, wastewater and recycled water infrastructure for the Edmondson Park Release Area; however, no sites or areas of archaeological sensitivity were identified in the immediate vicinity of the current study area (Figure 4.21).

Figure 4.21 Identified sites and areas of archaeological sensitivity identified for water infrastructure at Edmondson Park, in closest proximity to the current study area (AMBS 2011:Figure 9.1) (see Volume 2 of the report).

Gas Pipeline, 1994

English undertook a survey of the proposed Moomba to Sydney ethane pipeline, between Wilton and Botany. A sample of the pipeline area was surveyed, with sampled areas chosen on the basis of landform and previous landuse/disturbance. One of the surveyed sections extended from Denham Court Road to Camden Valley Way, which is adjacent to the current study area (Figure 4.22). Only two isolated finds were identified during the survey of nine sample sections, one of which (IF2) is located approximately 250m south of the current study area (although the AHIMS data plots the site approximately 300m south of the location recorded in English's report).

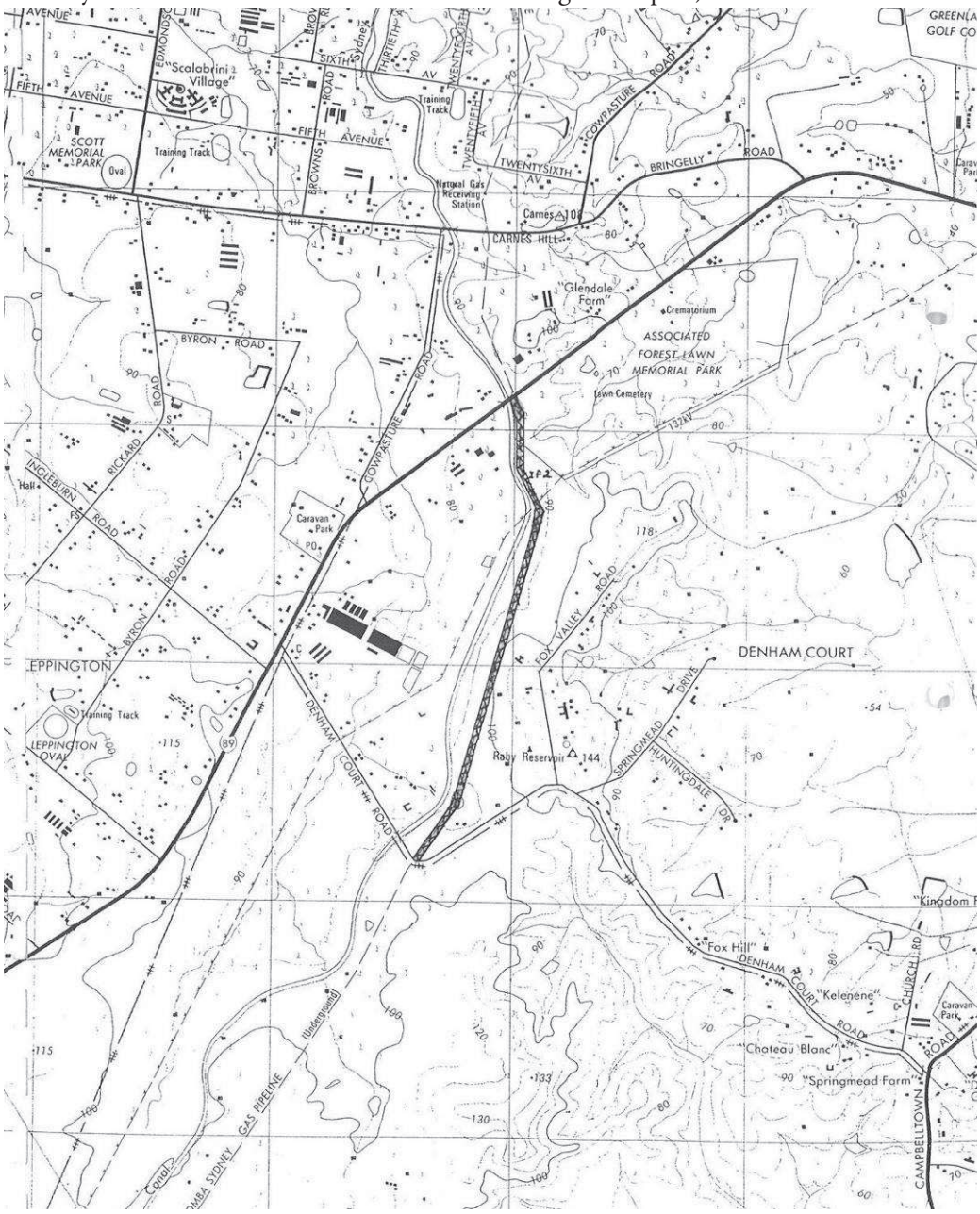

Figure 4.22 Survey Section 4 and site IF2, identified by English (1994:Figure 4).

Middleton Grange, 2001

JMCHM investigated an area approximately 500m east of the current study area as part of the South Hoxton Park Aerodrome Master Plan. This preliminary archaeological assessment confirmed the location of one previously recorded site (PCP5) and identified two open camp sites and nine PADs in relatively undisturbed areas along the northern, central and southern creek and their tributaries (see