



**CAMDEN COUNCIL
PLANNING PROPOSAL**

Amendment No. 16 – Carrington (5 Smalls Road, Grasmere)

November 2017

Table of Contents

- Executive Summary 1**
- 1.0 Introduction 2**
- 1.2 Planning History.....2
- 2.0 Site Locality and Context..... 4**
 - 2.1 Site Locality 4
 - 2.2 Site Context 5
- 3.0 Statutory Framework..... 5**
 - 3.1 Zoning..... 5
 - 3.2 Other Controls 6
- 4.0 The Planning Proposal..... 4**
 - 4.1 Objectives and Intended Outcomes 5
 - 4.2 Explanation of Provisions..... 5
 - 4.3 Justification 6
 - 4.3.1 Section A – Need for the Planning Proposal..... 6
 - 4.3.2 Section B – Relationship to Strategic Planning Framework11
 - 4.3.3 Section C – Environmental, Social and Economic Impact.....15
 - 4.3.4 State and Commonwealth Interests.....16
 - 4.5 Mapping17
 - 4.6 Community Consultation17
 - 4.7 Project Timeline18
- 5.0 Conclusions and Recommendations18**
- 6.0 Appendices20**
 - Appendix 1: Consistency against State Environmental Planning Policies.....21
 - Appendix 2 : S117 Directions.....24
 - Appendix 3: Gateway Determination.....28
 - Appendix 4: Office of Environment and Heritage Comment
 - Appendix 5: Draft DCP Controls **Error! Bookmark not defined.**
- 7.0 Attachments (Specialist Studies).....31**

Table of Figures

Figure 1: Location of Subject Site 4

Figure 2: Zoning Extract from Camden LEP 2010 5

Figure 3: Indicative Layout Plan 7

Executive Summary

The subject site (5 Smalls Road, Grasmere) is approximately 27.2ha of land located within the suburb of Grasmere, 3km west of Camden Township. The land is intended to be an extension of the Carrington Campus operated by Carrington Centennial Care (CCC).

The site is zoned R5 Large Lot Residential under the Camden Local Environmental Plan 2010 (Camden LEP 2010). The Planning Proposal seeks to rezone the site to a range of zones, including R2 Low Density Residential to allow seniors living dwellings, B1 Neighbourhood Centre to allow a range of community and commercial uses, and E2 Environmental Conservation to ensure the conservation of critically endangered vegetation and an area containing Aboriginal cultural heritage material.

1.0 Introduction

The subject site (5 Smalls Road, Grasmere) is currently zoned R5 Large Lot Residential under the Camden LEP 2010. This Planning Proposal seeks commencement of the statutory process to rezone the site to a range of zones, including R2 Low Density Residential, B1 Neighbourhood Centre and E2 Environmental Conservation.

It is envisioned that the rezoning will facilitate the development of an extension of the Carrington Aged Care facility that will provide the following:

- further seniors living dwellings in the form of Independent Living Units (duplexes, townhouses and two storey apartments) and a Residential Aged Care Facility (RACF)
- a neighbourhood centre providing services ancillary to seniors living, and could include a medical centre, local shop, café/restaurant, childcare centre, and wellness centre. It is intended that the public will be able to access some of the services.
- a conservation area that will ensure conservation of critically endangered vegetation and an area containing Aboriginal cultural heritage material.

1.1 Planning History

A request to rezone the land to R1 – General Residential was received by Council on 20 December 2011 from Michael Brown Planning Strategies Pty Ltd on behalf of the owners of Carrington Centennial Care. The proposed rezoning would permit seniors housing and a range of services ancillary to seniors living and could include a medical centre, a local shop, a café/restaurant, childcare centre, and wellness centre. Council had concerns regarding the rezoning of the entire site to R1 – General Residential, as this would permit other uses on the site that would not be appropriate given the site context and location. As a result, Council sought to allow specified additional permitted uses (under Schedule 1 of Camden LEP 2011) on the site to facilitate the proposed development, while protecting the site from inappropriate uses.

The Council referred the planning proposal to the Department of Planning and Environment (DPE) (at that time Department of Planning and Infrastructure - DoPI) for Gateway Determination. While the DPE supported the intended outcome it did not support the use of Schedule 1. Under the Gateway Determination Council was encouraged to consider alternate options to achieve the intended outcome. While the options suggested under the Gateway Determination were considered, they did not allow for retail premises.

Additionally, the Office of Environment and Heritage (OEH) raised issues with the potential removal of critically endangered Cumberland Plain Woodland vegetation on the site and the need to protect an Aboriginal area containing cultural heritage material.

Accordingly, the planning proposal has been amended to reflect the preferred zones of R2 Low Density Residential, B1 Neighbourhood Centre and E2 Environmental Conservation.

Gateway Determination was issued on 29 June 2012 and required a number of specialist studies to be undertaken. The findings of the studies are detailed later in the report.

2.0 Site Locality and Context

2.1 Site Locality

The area that is the subject of this Planning Proposal is shown in Figure 1.



Figure 1: Location of the Subject Site

The subject site is located within the suburb of Grasmere 3km west of Camden Township. The land is an extension of the Carrington Campus and is surrounded by large lot residential development. It has a dual frontage to Smalls Road to the north and Werombi Road to the North East.

2.2 Site Context

This Planning Proposal refers to the land identified as Lot 201 in DP 734620 (5 Smalls Road, Grasmere).

The subject site is irregular in shape with a total area of 27.21ha. It is gently undulating with part of the site grading from the northern part of the site at the high point near the round-about intersection of Werombi Road and Smalls Road, south-west toward the existing natural watercourse traversing the centre of the site in an east-west direction. A small part of the northern portion of the site grades towards Werombi Road.

The purpose of this planning proposal is to allow the Smalls Road site to be developed for the purposes of seniors housing and services ancillary to seniors living which could include a medical centre, local shop, café/restaurant, childcare centre, and wellness centre. This would provide development potential to expand the existing Carrington Centennial Care Aged Care Facility at the main Carrington Campus to meet the future requirements for aged care services and associated facilities for existing and future residents.

3.0 Statutory Framework

3.1 Zoning

The site is currently zoned R5 Large Lot Residential under the provisions of the Camden LEP 2010 (refer to Figure 2).

LEGEND

Land Zoning Map - Sheet LZN_004

Zone

R5	Large Lot Residential
RE1	Public Recreation
RE2	Private Recreation
RU1	Primary Production
RU2	Rural Landscape
RU4	Primary Production Small Lots
SP1	Special Activities
SP2	Infrastructure
SRGC	SEPP Sydney Region Growth Centres

Cadastre

Cadastre 27/01/2016 © Camden Council

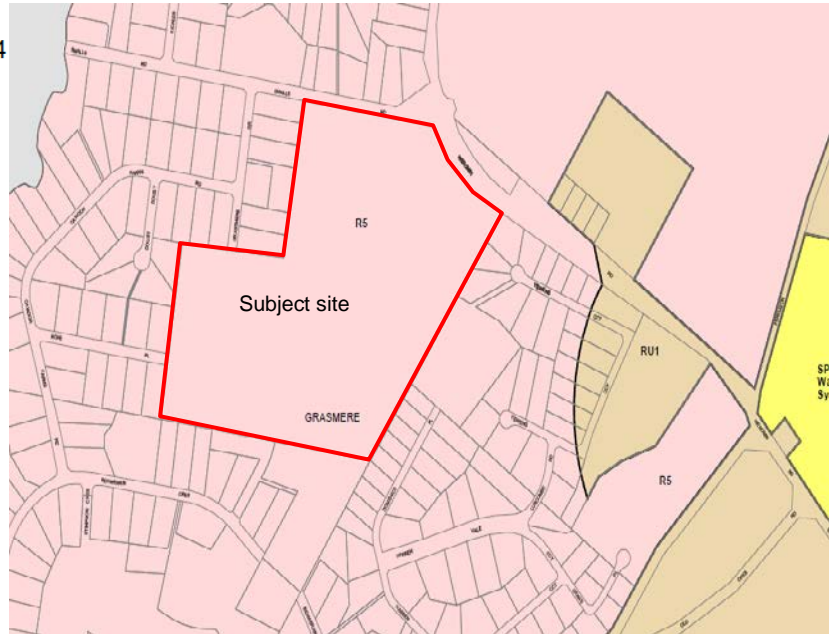


Figure 2: Zoning Extract from Camden LEP 2010

The zoning map in Figure 2 demonstrates the subject site is currently zoned R5 Large Lot Residential and is surrounded by large lot residential development. The current Carrington Centennial Care campus is also zoned R5 Large Lot Residential and provides an existing Aged Care Facility. The purpose of this Planning Proposal is to rezone the subject site from R5 Large Lot Residential to a range of zones, including:

- R2 Low Density Residential to enable the development of Seniors Living Dwellings and a Residential Aged Care Facility;
- B1 Neighbourhood Centre to enable services ancillary to seniors living, which could include a medical centre, a local shop, café/restaurant, child care and a wellness centre;
- E2 Environmental Conservation to ensure conservation of critically endangered vegetation and an area containing Aboriginal cultural heritage material.

3.2 Other Controls

A maximum height of 9.5 metres currently applies to the site. A minimum lot size of 4000sq metres currently applies to the site. It is not proposed to change these controls.

4.0 The Planning Proposal

4.1 Objectives and Intended Outcomes

The objective of this Planning Proposal is to enable the existing Carrington Centennial Care facility to expand south across Werombi Road on to the Smalls Road site to establish a seniors housing campus that could include a Residential Aged Care Facility (RACF), Independent Living Units (ILUs), and a 'Village Hub' that could include a medical centre, a local shop, café/restaurant, child care centre, and a wellness centre.

It is intended that some of the facilities located within the 'Village Hub' will be accessible by the public, helping to integrate this senior's housing development into the broader Camden community.

The objective of the Planning Proposal is also to enable the conservation of critically endangered vegetation and an area containing Aboriginal cultural heritage material.

An Indicative Layout Plan (ILP) for the site has been prepared following completion of the specialist studies. The ILP is shown in Figure 3 and will help ensure logical development of the site.

The Planning Proposal would form an amendment to the Camden LEP 2010.

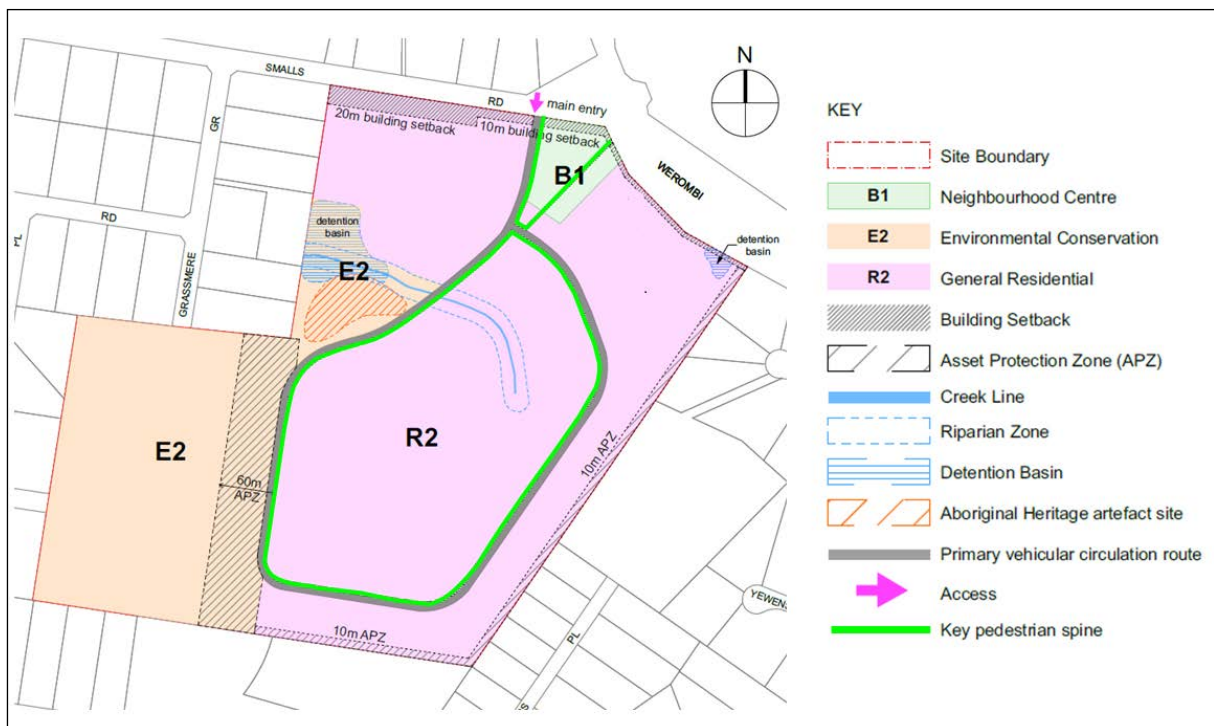


Figure 3: Indicative Layout Plan

4.2 Explanation of Provisions

The amendment proposed to Camden LEP 2010 will facilitate the development of the site. The proposed zoning controls will allow for the extension of the Carrington Centennial Care Campus.

The current maximum height of buildings will restrict development to a maximum of two storeys and ensure that the new development will be in keeping with the surrounding development. Lot size controls will not be amended as it is not intended that the site be subdivided.

The proposed controls include the following:

- Amend the Land Zoning Map to show R2 Low Density Residential, B1 Neighbourhood Centre and E2 Environmental Conservation;
- Retain the maximum height of buildings control of 9.5m on the Height of Buildings Map over the site;
- Retain the minimum lot size to show a minimum lot size of 4,000m² on the Lots Size Map over the site.

There are no other provisions that are required to be amended.

The proposed amendments to the Camden LEP 2010 are also supported by DCP provisions which will provide an Indicative Layout Plan and site specific controls. A copy of the draft amendments to Camden DCP 2011 is provided as **Appendix 5** to this Planning Proposal.

4.3 Justification

This section addresses the need for the rezoning, identifies the background studies undertaken, details why the Planning Proposal is the best approach, and identifies what the community benefits will be.

4.3.1 Section A – Need for the Planning Proposal

Is the planning proposal a result of any strategic study or report?

The Planning Proposal is not directly related to a specific strategic study or report. However a number of site specific studies have been undertaken to inform the Planning Proposal. Summaries of these studies are outlined below:

Note: The following ‘Flora & Fauna, Riparian and Bushfire Study (Offsets Strategy)’ and the ‘Conservation Landuse Management Plan (CLUMP)’ covers the subject site at 5 Smalls Road, Grassmere and the main Carrington Campus at 90 Werombi Road. However, this Planning Proposal only deals with the proposed rezoning of 5 Smalls Road, Grasmere. It was originally proposed to offset vegetation clearance on the subject site with existing vegetation on the main Carrington Campus. The vegetation offset on the main campus is now not being pursued. The proponent, the Office of Environment and Heritage (OEH) and Council have been investigating a range of options to ensure conservation of the vegetation, including Bio-banking, however there is no agreed position at this time.

Flora & Fauna, Riparian and Bushfire Study (Offsets Strategy)

Flora and Fauna

The Flora & Fauna, Riparian and Bushfire Study (Offsets Strategy) is provided as **Attachment 1** to this proposal. The Study covers both the main Carrington Campus at 90 Werombi Road and the subject site of 5 Smalls Road, Grasmere. However specific recommendations are made for the subject site.

The Study has identified approximately 9.21 ha of Critically Endangered Cumberland Plain Woodland (CPW) vegetation on the site and the proposal is to conserve approximately 5.2ha of this vegetation. Much of this vegetation will be within an E2 Environmental Conservation zone. Whilst Bio-certification is not being sought for the site, the report includes an offsets strategy based on the Biodiversity Certification Assessment Methodology (BCAM). BCAM requires different levels of conservation security and ongoing management results in the generation of different number of credits. These are:

- Biobanking – 100% credit entitlement;
- Voluntary Conservation Agreement (VCA) – 90% credit entitlement;
- Environmental Zoning – 30% credit entitlement.

The proponent has indicated that they are not in a position to undertake Bio-banking and OEHL have indicated that they do not intend to enter into a VCA with the proponent.

The proponent is proposing that the offset will be secured through an E2 Environmental Conservation zoning and conditions of development consent including, the implementation of the Conservation and Land Use Management Plan (CLUMP), preparation of a detailed Vegetation Management Plan (VMP) and a Section 88 instrument requiring compliance with the CLUMP and VMP.

The Office of Environment and Heritage (OEHL) do not accept that conditions of development consent are secure enough but recognise that zoning provides a low level of security (30%). As outlined above there have been ongoing discussions with the proponent, OEHL and Council, however there is no agreed position at this time.

Riparian

The Study identifies two small watercourses which have been assessed according to the Strahler based methodology. Both streams have been identified as 1st order streams. As required the Indicative Layout Plan for the Smalls Road Campus includes a minimum 20m riparian corridor (10m each side of the outer bank) along the central watercourse. This excludes the eastern portion where the stream runs south to north. This eastern portion of the watercourse is proposed to be removed as part of the development. The additional watercourse in the south-west of the Smalls Road site will be largely retained in areas of conservation and managed Bushfire Asset Protection Zones (APZs).

Preparation of a Vegetation Management Plan will be informed by the Ecological Studies undertaken for this rezoning and should include requirements to ensure conservation of the riparian and APZ areas.

The overarching objective of the controlled activities provisions of the Water Management Act 2000 is to establish and preserve the integrity of riparian corridors. A number of principles are proposed in the Study and should be considered during the design for any Development Applications for the site.

Bushfire

The Study identifies most of the site is considered to have a low relative bushfire hazard rating but that the remnant vegetation in the west of the site is a moderate bushfire hazard.

Further, the Study outlines that the site is considered capable of meeting the requirements of *Planning for Bushfire Protection (2006)*, subject to appropriate urban design and provision of required infrastructure, particularly reticulated water. It is recommended that future urban development incorporates a perimeter road adjacent to any residual hazards and particularly the south west remnant vegetation within the proposed conservation area.

The Indicative Layout Plan within the draft DCP amendments includes a perimeter road adjacent to the conservation area and APZs.

Bushfire Risk Management controls in Camden DCP 2011 are a requirement for bushfire prone land and include the submission of a Bushfire Protection and Attack Assessment Report with any development application.

Conservation and Land Use Management Plan (CLUMP)

The Conservation and Land Use Management Plan (CLUMP) is provided as **Attachment 2** to the proposal and identifies high biodiversity value areas on the site. The Study covers both the main Carrington Campus at 90 Werombi Road and the subject site of 5 Smalls Road, Grasmere. However this Planning Proposal only deals with the proposed rezoning of 5 Smalls Road, Grasmere.

In order to ensure that the rezoning proposal (and any subsequent development) leads to no overall loss of biodiversity values of the Carrington Centennial Care estate in perpetuity, conservation of the parts of the estate with high biodiversity value has been proposed in the Study.

The CLUMP sets out the overall framework and objectives for the management of the Conservation Lands and its implementation is proposed to be guaranteed through development consent conditions.

As outlined above the proponent proposes to secure the conservation of the vegetation through the E2 zoning and conditions of consent, including a section 88 instrument requiring compliance with the CLUMP and VMP. As outlined above OEHL are requiring a higher level of security for vegetation conservation.

Aboriginal Heritage Preliminary Assessment

The Aboriginal Heritage Preliminary Assessment is provided as **Attachment 3** to the proposal.

The findings of the Assessment indicate that while Aboriginal objects are known to be present on the site, their distribution is consistent with regional patterns. No sites are considered to be present which should prevent rezoning, or which could not be managed (through the controls of the *National Parks and Wildlife Act*), following rezoning.

Following rezoning but prior to any further land disturbance a number of actions are recommended. These include but are not limited to the following:

- Use results of this assessment, particularly the demonstration of relatively higher density and significance of Aboriginal cultural heritage material in the area of Site CR4, in any early stage concept planning so that impact avoidance can be appropriately considered;

- Continue formal Aboriginal community consultation process according to the OEH Aboriginal cultural heritage consultation requirements for proponents 2010 (already commenced).

An Aboriginal Heritage Impact Permit (AHIP) will be required by OEH prior to any physical commencement of works on site. The AHIP will determine if it is permissible to destroy the Aboriginal objects and determine any future steps required to conserve intangible Aboriginal Cultural Heritage values associated with the site.

Historical Archeological Assessment

The Historical Archeological Assessment is provided as **Attachment 4** to the Planning Proposal.

The Assessment noted the history of the site, including the site being part of the second grant made to John Macarthur in the Cowpastures area, in 1825. Subsequently the land was sold to William Henry Paling in 1882. Paling undertook substantial works on the farm, including establishment of a vineyard and the construction of a cottage and outbuildings in the study area. In 1888 Paling donated the land to the state for the establishment of the Carrington Convalescent Hospital.

Remains of the c.1882 structures exist in the study area in the form of an underground cistern. There is also likely to be archaeological remains of the cottage. Remains of the outbuildings are less likely to have survived as they would have been less substantial. There are some items which may relate to the historical occupation and agricultural use of the study area, including troughs, a harrow, a gatepost, and items discarded in the cistern.

The cistern and potential archaeological remains of the cottage are considered to have heritage significance, as they are associated with WH Paling. However the potential remains are unlikely to provide substantial additional information and the cistern is unlikely to be considered a relic, as defined by the *Heritage Act 1977*.

The cistern and potential cottage remains are within an area proposed for development, it is therefore probable that the development will result in the complete removal of the remains. Considering the local heritage significance of the identified item and potential remains the following recommendations are made:

- An archival photographic record should be made of the remnant features and items related to the nineteenth century occupation of the study area. Copies of this record should be lodged with the OEH, Camden Council, and the Carrington Centennial Care archives or records;
- Once development plans have been drawn up, the level of impact to the potential archaeological remains of the former cottage should be assessed.

The Assessment also notes a number of requirements if the development is likely to result in the complete or partial removal of the potential remains:

- An Exception Notification should be submitted to the Heritage Branch of the Office of Environment and Heritage. No excavation should be undertaken until the Notification has been endorsed and returned by the Heritage Branch;

- The location of the former cottage, so far as it will be impacted, should be archaeologically excavated and recorded. Should the investigation reveal remains of the former cottage, copies of the excavation report should be lodged with the Heritage Branch, Camden Council, and Carrington Centennial Care archives or records;

Any development applications for this site will need to take account of general heritage provisions within the Camden DCP 2011

Flood Risk Management Review

A Flood Risk Management Review is provided as **Attachment 5** to the Planning Proposal.

The majority of the site drains North West through two water courses with two smaller catchment areas draining north east and south west. The watercourse running south to north at the western portion of the site will be retained in the proposed conservation zone. The second watercourse which runs east to west through the middle of the site has two distinct areas – the western end has some significant environmental value and will be maintained as part of the development. The eastern section of the watercourse has been assessed as having little or no environmental value and appropriate to be removed for urban development.

The Flood Risk Management Review of the site notes that the site is not subject to regional flooding and therefore is suitable for the proposed development, subject to detailed analysis and planning of flood risk and construction of suitable mitigation measures.

Further analysis of the local watercourses will be required at a development application stage to determine local flood impacts up to the Probable Maximum Flood (PMF) event.

Traffic and Access Assessment

A Traffic and Access Assessment is provided as **Attachment 6** to the Planning Proposal.

The Assessment found that the proposal is a 7 day use moderate traffic generating development in shoulder peaks and in off peak times and will result in minimal traffic and/or pedestrian impacts on the adjacent road network. The proposal will have adequate car parking available in the proposed on site car park areas and the internal low volume vehicle circulation and maneuvering is considered to be satisfactory.

The impact of increased traffic and car parking demands as a result of the proposal on the adjoining area or road system during overlapping peak hours is minimal and within the available capacity of the site and access road network.

The proponent has advised that a private bus service run by Carrington Centennial Care will provide transport for residents of the proposed site, including to and from the existing main campus. A draft DCP control requiring submission of a Pedestrian Mobility Plan at any future development application stage is part of the draft DCP for this site.

Acid Sulphate Soil Assessment

An Acid Sulphate Soil Assessment is provided as **Attachment 7** to the Planning Proposal.

Based on the Assessment the site is not impacted by Acid Sulphate Soil and therefore an Acid Sulphate Soil management plan is not required.

Notwithstanding this, it is recommended the proposed development be monitored for the presence of Acid Sulphate Soil during construction and appropriate remedial works should be carried out in the event where Acid Sulphate Soil is encountered during construction. In this event a number of actions are identified in the Assessment.

Retail Assessment

A Retail Assessment is provided as **Attachment 8** to the Planning Proposal. The Report assessed the impacts if a retail component was to be part of a Neighbourhood Centre on the subject site. The key assumption underpinning the Assessment is that a 1,000m² floor space restriction would apply to the retail segment. The retail segment would include a neighbourhood shop and a cafe/restaurant. However it should be noted that the draft DCP has a restriction of 500sqm of gross floor area on the retail segment of the Neighbourhood Centre as required by a Council resolution dated 10 April 2012.

The Assessment reviewed the trade area that could be potentially served by retail on the subject site. The main trade area likely to be served by retail facilities at the subject site incorporates the suburbs of Grasmere and Ellis Lane, as well as Brownlow Hill. The trade area population is estimated to grow at an average annual rate of 2.0%.

There are currently no retail facilities provided within the defined trade area. However Camden Town Centre is approximately 3km east of the subject site, Narellan Town Centre is approximately 7.5km north-east of the subject site, and Camden South small set of shops is approximately 5.7km south east of the subject site.

The Assessment estimates that population growth in the trade area will ensure any impact to surrounding retail facilities will be considered minor or negligible and within the normal bounds of competition. It is also expected that any impacts would be temporary in nature and expected to dissipate within 1 to 2 years with population growth and retail market growth.

Is the planning proposal the best means of achieving the objectives or intended outcomes, or is there a better way?

The Planning Proposal is considered the best option for delivery of an extension of the Aged Care Facility for Carrington Centennial Care on the Smalls Road Site. The current zoning of R5 Large Lot Residential precludes the use of a Site Compatibility Certificate for a Seniors Living Village under the Seniors Living State Environmental Planning Policy (SEPP).

4.3.2 Section B – Relationship to Strategic Planning Framework

Is the planning proposal consistent with the objectives and actions contained within the applicable regional or sub-regional strategy (including the Plan for Growing Sydney, the Draft Greater Sydney Regional Plan, and the draft Western City District Plan)

Draft Greater Sydney Regional Plan

The draft Greater Sydney Regional Plan was released by the Greater Sydney Commission in October 2017. The draft Plan is seeking to meet the needs of a growing and changing population by transforming Greater Sydney into a metropolis of three cities – the Western Parkland City, The Central River City and the Eastern Harbour City.

The proposed rezoning site is within the Western Parkland City.

This Planning Proposal is consistent with the visions and priorities of the draft Sydney Regional Plan as outlined in the table below:

Draft Greater Sydney Regional Plan	Compliance Statements
Liveability Objective 6: Services and infrastructure meet communities' changing needs.	The Planning Proposal aligns with this objective as it will provide additional seniors living and ancillary facilities.
Liveability Objective 10: Greater Housing Supply.	The Planning Proposal aligns with this objective as it supplies additional housing with a range of housing types that will accommodate an ageing population.
Sustainability Objective 27: Biodiversity is protected, urban bushland and remnant vegetation is enhanced.	The Planning Proposal aligns with this objective as it conserves an area of critically endangered Cumberland Plain Woodland vegetation within an E2 Environmental Conservation zone.

A Plan for Growing Sydney

A Plan for Growing Sydney was released by the NSW Government in December 2014. This new document supersedes the draft Metropolitan Plan for Sydney 2036 – A Plan for Sydney's future plan which was released in December 2010.

The Sydney metropolitan area will face increasing pressure over the next twenty years with the projected increase in population of 1.6 million people, requiring 664,000 more dwellings and 689,000 more jobs by 2031. These pressures require careful and integrated land use and infrastructure planning and mechanisms for delivery. A Plan for Growing Sydney is the NSW Government's response to these pressures. The plan provides a strategy for accommodating Sydney's future population growth over the next 20 years and a framework for delivering investment and jobs growth, particularly for the Western Sydney region.

The proposed rezoning for an Aged Care Facility is in close proximity to the significant growth planned and underway in the South West Priority Growth Area. As this growing population ages further Aged Care Facilities will be required and this addition to the existing Carrington Centennial Care Aged Care Facility will go some way to meeting these needs.

This Planning Proposal is consistent with the objectives and directions for a Plan for Growing Sydney as outlined in the table below:

Plan for Growing Sydney	Compliance Statement
Direction 2.3: Improve housing choice to suit different needs and lifestyles.	The Planning Proposal aligns with this Direction by providing for housing for an ageing population. The proposal will help deliver a range of seniors housing, including independent living units and a residential aged care facility for higher needs residents. This will help ensure an increase in seniors living accommodation in a high growth area, which also includes high growth in older age groups.
Direction 4.1: Protect our natural environment and biodiversity.	The Planning Proposal aligns with this Direction by providing an E2 Environmental Conservation zone for critically endangered Cumberland Plain Woodland vegetation.

Draft Western City District Plan

The draft Western City District Plan supersedes the draft South West District Plan and was released by the Greater Sydney Commission in October 2017. The draft Western City District Plan is seeking to guide the growth of the District within the context of Greater Sydney's three cities to improve the District's social, economic and environmental assets.

The Planning Proposal is consistent with the priorities for the draft Western City District Plan as outlined in the table below:

Draft Western City District Plan	Compliance Statement
Planning Priority W3: Providing services and social infrastructure to meet people's changing needs.	The Planning Proposal aligns with this Priority by providing seniors living and ancillary services.
Planning Priority W6: Creating and renewing great places and local centres, and respecting the Districts heritage.	The Planning Proposal aligns with this Priority by ensuring Aboriginal Cultural Heritage material is conserved within an E2 Environmental Conservation zone. Also a record of a number of European archaeological items will be required to be assessed and recorded under the Camden DCP 2011.
Planning Priority W14: Protecting and enhancing bushland and biodiversity.	The Planning Proposal aligns with this Priority by ensuring an area of critically endangered Cumberland Plain Woodland vegetation is conserved within an E2 Environmental Conservation zone.

Is the planning proposal consistent with the local council’s Community Strategic Plan, or other local strategic plan?

Community Strategic Plan

Council approved the Community Strategic Plan (CSP) in June 2017, superseding Camden’s previous Strategic Plan ‘Camden 2040 – A Strategic Plan for Camden’. The Plan is a road map for a long term community vision with key directions, objectives, strategies and indicators.

The Planning Proposal is consistent with the Community Strategic Plan Directions as outlined in the table below:

Community Strategic Plan	Compliance Statement
Key Direction 1: Actively Managing Camden Local Government Area’s Growth – Strategy 1.1.1 Ensure provision of appropriate urban development for sustainable growth in the Camden LGA.	The Planning Proposal aligns with this Direction and Strategy by providing additional aged care accommodation and facilities for an ageing population.
Key Direction 2: Healthy Urban and Natural Environment - Strategy 2.1.2 Conserve native flora and fauna and their habitats, and promote local involvement through community education programs.	The Planning Proposal aligns with this Direction and Strategy by conserving critically endangered Cumberland Plain Woodland vegetation within an E2 Environmental Conservation zone.

Is the planning proposal consistent with applicable state environmental planning policies?

State Environmental Planning Policies

The relevant State Environmental Planning Policies and deemed State Environmental Policies have been addressed at **Appendix 1 to this report.**

The Planning Proposal is consistent with all State Environmental Planning Policies (SEPPs) with the exception of SEPP 19 (Bushland in Urban Areas). The proposal is inconsistent with the aims of SEPP 19 as an agreed mechanism to secure conservation of critically endangered Cumberland Plain Woodland (CPW) has not been reached with the Office of Environment and Heritage. Council is working with the proponent and OEH to find an agreed outcome.

S117 Directions

Is the planning proposal consistent with applicable Ministerial Directions (s117 Directions)?

The s117 directions applicable to the Planning Proposal have been addressed at **Appendix 2 of this report.**

The Planning Proposal is consistent with all relevant s117 Directions with the exception of s117 Direction: Environment and Heritage. The objective of this Direction is to protect and conserve environmentally sensitive areas. The proposal is inconsistent with the objective of Direction as an agreed mechanism to secure conservation of critically endangered Cumberland Plain Woodland (CPW) has not been reached with the Office of Environment and Heritage. Council is working with the proponent and OEH to find an agreed outcome.

4.3.3 Section C – Environmental, Social and Economic Impact

Is there any likelihood that critical habitat or threatened species, populations or ecological communities, or their habitats, will be adversely affected as a result of the proposal?

The Study has identified approximately 9.21 ha of Critically Endangered Cumberland Plain Woodland (CPW) vegetation on the site and the proposal is to conserve approximately 5.2ha of this vegetation. Much of this vegetation will be within an E2 Environmental Conservation zone.

The proponent is proposing that the offset will be secured through an E2 Environmental Conservation zoning and conditions of development consent including, the implementation of the Conservation and Land Use Management Plan (CLUMP), preparation of a detailed Vegetation Management Plan (VMP) and a Section 88 instrument requiring compliance with the CLUMP and VMP.

The Office of Environment and Heritage (OEH) do not accept that conditions of development consent are secure enough but recognise that zoning provides a low level of security (30%). As outlined above there have been ongoing discussions with the proponent, OEH and Council, however there is no agreed position at this time.

Are there any other likely environmental effects as a result of the planning proposal and how are they proposed to be managed?

The remnant vegetation in the west of the site is a moderate bushfire hazard. However, the site is considered capable of meeting the requirements of *Planning for Bushfire Protection (2006)*, subject to appropriate urban design and provision of required infrastructure, particularly reticulated water. The Indicative Layout Plan within the draft DCP amendments includes a perimeter road adjacent to the conservation area, and APZs.

How has the planning proposal adequately addressed any social and economic effects?

Social Effects

The Planning Proposal will provide the opportunity for an expansion of the Carrington Centennial Care Aged Care Facility. It will enable the provision of Independent Living Units and a Residential Aged Care Facility that will help ensure housing choice for an ageing population. Additionally other facilities such as neighbourhood shops including café/restaurant and a child care centre may be provided onsite. These will be accessible to

the public, helping to integrate the proposed senior’s housing development into the broader Camden community.

Economic Effects

The Aged Care Facility and additional facilities will provide a range of long term employment opportunities. These will include employment for medical, nursing and administration staff within the Aged Care Facilities. It will also include employment in the neighbourhood shop and child care facility. Short term employment will also be generated during the construction phase of the development.

4.4.1 State and Commonwealth Interests

Is there adequate public infrastructure for the planning proposal?

All services are readily available or can be augmented on site. The traffic report has not identified any additional works, other than construction of access to the site. Capacity for the sewerage connection to the West Camden Treatment Plan will be investigated. While it is understood there is capacity within the system, further consultation is required at any development application stage.

What are the views of State and Commonwealth public authorities consulted in accordance with the Gateway Determination?

Gateway Determination (**Appendix 3 to this report**) required a number of Public Authorities to be consulted prior to Public Consultation. The following table outlines their responses:

Public Authority	Public Agency Comment	Council Response
Federal Department of Sustainability, Environment, Water, Population & Communities (DSEWPC) – now the Department of Environment and Energy	<p>Have advised they will only provide comment on an ‘Action’. An ‘Action’ is a project, development, activity, or series of activities. A rezoning is not an ‘Action’.</p> <p>Local governments are not responsible for making a referral to DSEWPaC on behalf of other applicants. However, it may be prudent to advise development applicants of the need to address the requirements of the EPBC Act.</p>	Noted.
OEH (Environment)	<p>OEH require E2 zoning of the critically endangered vegetation in the south west of the site – the area should be an area consistent with required amount of vegetation to offset the proposed development.</p> <p>OEH do not consider deferring the offsetting arrangements to conditions of consent on future DAs is an appropriate conservation measure to secure offsets as it believes it cannot be guaranteed that this will eventuate.</p>	The proponent, OEH and Council have not reached an agreed position on any mechanism to secure the vegetation conservation.

Public Authority	Public Agency Comment	Council Response
OEH (Heritage)	<p>Aboriginal cultural heritage material (CR4) should be covered by the E2 zone.</p> <p>Prior to works commencing the Applicant must obtain an appropriate approval under the NSW Heritage Act to disturb any archaeology on site.</p>	<p>Aboriginal cultural heritage material (CR4) is proposed to be included in the E2 zone.</p> <p>Noted.</p>
Local Aboriginal Councils	<p>No objections or issues were raised in relation to rezoning of the site.</p> <p>Were consulted during the Aboriginal Heritage Preliminary Stage and no objections or issues were raised in relation to rezoning of the site.</p> <p>Further consultation once an AHIP is applied for will be undertaken – prior to DA stage.</p>	Noted.
NSW RFS	No objection	Noted.
RMS	No objection	Noted.
Transport for NSW	<p>TfNSW advises the following:</p> <ul style="list-style-type: none"> • The proponent needs to identify existing bus routes and assess the pedestrian links from the site to connect with the existing bus stops; • No existing public buses operate via Smalls Road due to the varying road widths; • A consistent 3.5m lane width in each direction, with additional 3.0m width for bus stops/parking is required for the operation of a bus route. Upgrading of road sections including Smalls Road is required for future bus services to the site; and • The proponent needs to prepare detailed plans on the internal road width, height restrictions, and dedicated bus stops for a bus to potentially internally access the site. 	<p>The proponent has provided advice that the proposed seniors living campus will be serviced by a regular timetabled private bus service operated by Carrington Centennial Care (operator of the existing seniors living campus and owner of the proposed site).</p> <p>The private bus service will also operate between the existing campus and the proposed campus.</p> <p>To ensure safe access to bus transport a DCP control will require a Pedestrian Mobility Plan to be submitted with the first DA.</p>
Telstra	No comment	Noted.
Sydney Water	No objection	Noted.
Adjoining Councils	No objection	Noted.

These Public Authorities will be further consulted during the Public Consultation period.

4.5 Mapping

The following map will need to be amended:

- Land Zoning Map _016

4.6 Community Consultation

The Planning Proposal and draft DCP amendments will be publicly exhibited for a period of 56 days. A 28 day exhibition is required as a condition of the Gateway determination. However a longer period for exhibition will be provided due the closeness to the Christmas period.

A notification will be placed in the local newspaper and the exhibition material available at:

- Camden Council Customer Service Centre – 70 Central Ave Oran Park
- Camden and Narellan Libraries
- Council website for the length of the exhibition period (Electronic Copy).

During the exhibition period, a letter notifying land owners nearby to 5 Smalls Road Grasmere (subject site) and Smalls Road will be sent a letter to advise of the exhibition of the proposal. At the conclusion of the exhibition period, if there are unresolved submissions a report will be submitted back to Council detailing the submissions received.

Further consultation with Public Agencies and adjoining Councils will also be undertaken.

4.7 Project Timeline

Gateway Determination original timeframe and current timeframe	29 June 2013
Studies updated	January 2014/April 2016
Timeframe for government agency consultation (pre and post exhibition as required by Gateway determination)	Initial notification June/July 2013 to February 2016
Expected Commencement and completion dates for public exhibition period	November 2017 – January 2018
Dates for public hearing (if required)	N/A
Timeframe for consideration of submissions	TBA
Timeframe for the consideration of a proposal post exhibition	TBA
Date of submission to the Department to finalise the LEP	TBA
Anticipated date RPA will make the plan (if delegated)	TBA
Anticipated date RPA will forward to the department for notification	TBA

5.0 Conclusions and Recommendations

This Planning Proposal for Lot 201 DP734620, 5 Smalls Road, Grasmere seeks to rezone the subject site from R5 Large Lot Residential to a range of zones, including R2 Low Density

Residential to allow seniors living dwellings, B1 Neighbourhood Centre to allow a range of community and commercial uses, and E2 Environmental Conservation to ensure the conservation of critically endangered Cumberland Plain Woodland vegetation and an area of Aboriginal cultural heritage material.

The site is owned by Carrington Centennial Care who have been intending to develop it to extend the adjacent Aged Care Facility. However, as noted above under the current zoning this is no longer permissible. The development of the site as an extension of the adjacent Aged Care Facility at 90 Werombi Road will provide Aged Care accommodation and facilities for the growing population of Camden and its surrounds.

The provision of a Village Hub will incorporate a neighbourhood shop and a child care centre that can be accessed by the general public and would help ensure that the aged care community is integrated into the general community.

The proposed rezoning may also help ensure the conservation of Critically Endangered Vegetation, Endangered Fauna and an area of Aboriginal cultural heritage material. The conservation of the vegetation can be facilitated through conditions of consent and the requirement of the Conservation Land Use Management Plan (CLUMP) on title. However the Office of Environment and Heritage (OEH) do not accept these mechanisms are a secure enough to ensure conservation of the vegetation.

6.0 Appendices

Appendix 1: Consistency against State Environmental Planning Policies

Appendix 2: S117 Directions

Appendix 3: Gateway Determination

Appendix 4: Office of Environment and Heritage comment

Appendix 5: Draft DCP Controls

Appendix 1: Consistency against State Environmental Planning Policies

SEPP Title	Consistency	Comment
1. Development Standards	Yes	This SEPP does not apply to the Camden LEP 2010.
19. Bushland in Urban Areas	No	<p>The Environmental Studies undertaken for the proposed rezoning have identified approximately 9.21 ha of Critically Endangered Cumberland Plain Woodland (CPW) vegetation on the site and the proposal is to conserve approximately 5.2ha of this vegetation. Much of this vegetation will be within an E2 Environmental Conservation zone.</p> <p>The proponent is proposing that the offset will be secured through an E2 Environmental Conservation zoning and conditions of development consent including, the implementation of the Conservation and Land Use Management Plan (CLUMP), preparation of a detailed Vegetation Management Plan (VMP) and a Section 88 instrument requiring compliance with the CLUMP and VMP.</p> <p>The Office of Environment and Heritage (OEH) do not accept that conditions of development consent are secure enough but recognise that zoning provides a low level of security (30%). OEHs preferred mechanism to ensure conservation is through Bio-banking. There have been ongoing discussions with the proponent, OEH and Council, however there is no agreed position at this time.</p>
30. Intensive Agriculture	N/A	The provisions of this SEPP relate to cattle feed lot proposals. This does not apply to the proposal.
36. Manufactured Home Estates	N/A	
44. Koala Habitat Protection	N/A	The SEPP does not apply to Camden LGA.

SEPP Title	Consistency	Comment
55. Remediation of Land	Yes	The land is already zoned for residential development.
70. Affordable Housing (Revised Schemes)	N/A	The SEPP does not apply to Camden LGA.
SEPP (Building Sustainability Index: BASIX) 2004	Yes	This SEPP is relevant to development that would be permitted under the Planning Proposal. Future development would need to comply with these provisions.
SEPP (Educational Establishments and Child Care Facilities) 2017	Yes	This SEPP is relevant to specific development that would be permitted under the Planning Proposal ie a child care facility is proposed within the proposed B1 zone. Future development would need to comply with these provisions.
SEPP (Exempt and Complying Development Codes) 2008	Yes	This SEPP is relevant to particular development categories. This Planning Proposal does not detract from or alter the application of the SEPP to future development.
SEPP (Housing for Seniors or People with a Disability) 2004	Yes	This SEPP is relevant to specific intended development that would be permitted under the Planning Proposal and would need to comply with these provisions.
SEPP (Infrastructure) 2007	Yes	This SEPP is relevant to particular development categories. This Planning Proposal does not detract from or alter the application of the SEPP to future development.
SEPP (Rural Lands) 2008	N/A	This SEPP does not apply to the Camden LGA.
SEPP (Sydney Drinking Water Catchment) 2011	N/A	This SEPP does not apply to the Camden LGA
SEPP (Sydney Region Growth Centres) 2006	N/A	The SEPP does not apply to this area.
SEPP (Western Sydney Parklands) 2009	N/A	The SEPP does not apply to the Camden LGA.

SEPP Title	Consistency	Comment
SREP20 Hawkesbury-Nepean River (No 2 – 1997)	Yes	<p>The SREP requires consideration be given to the impact of future land use in Hawkesbury-Nepean River catchment in a regional context. The plan covers water quality and quantity, environmentally sensitive areas, riverine scenic quality, agriculture, and urban and rural residential development.</p> <p>The Planning Proposal is unlikely to alter or impact adversely upon the water quality and quantity, environmentally sensitive areas and flora and fauna within the Hawkesbury-Nepean River catchment.</p>

Appendix 2 : S117 Directions

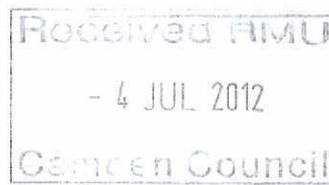
S117 Direction Title	Consistency	Comment
1.0 Employment and Resources		
1.1 Business and Industrial Zones	N/A	
1.2 Rural Zones	N/A	This Direction does not apply to the site as it zoned R5 Large Lot Residential.
1.5 Rural Lands	N/A	This Direction does not apply to the Camden LGA.
2.0 Environment and Heritage		
2.1 Environment Protection Zones	No	<p>The objective of this direction is to protect and conserve environmentally sensitive areas. The proposal does not comply with this Direction.</p> <p>The Environmental Studies undertaken for the proposed rezoning has identified approximately 9.21 ha of Critically Endangered Cumberland Plain Woodland (CPW) vegetation on the site and the proposal is to conserve approximately 5.2ha of this vegetation. Much of this vegetation will be within an E2 Environmental Conservation zone.</p> <p>The proponent is proposing that the offset will be secured through an E2 Environmental Conservation zoning and conditions of development consent including, the implementation of the Conservation and Land Use Management Plan (CLUMP), preparation of a detailed Vegetation Management Plan (VMP) and a Section 88 instrument requiring compliance with the CLUMP and VMP.</p> <p>The Office of Environment and Heritage (OEH) do not accept that conditions of development consent are secure enough but recognise that zoning provides a low level of security (30%). OEHs preferred mechanism to ensure conservation is though Bio-</p>

S117 Direction Title	Consistency	Comment
		banking. There have been ongoing discussions with the proponent, OEH and Council, however there is no agreed position at this time.
2.3 Heritage Conservation	Yes	<p>The objective of this Direction is to conserve items, areas, objects and places of environmental heritage significance and indigenous heritage significance.</p> <p>The subject site contains the remains of an underground cistern c1882, potential archaeological remains of a cottage and some items that may relate to historical occupation and agriculture use of the site.</p> <p>In general, archaeological relics are protected by the Heritage Act 1977, and no impact of relics is permitted without an Excavation Permit issued by the Office of Environment and Heritage on behalf of the Heritage Council. However, a number of standard Exceptions have been granted by the Heritage Council.</p> <p>The Historical Archaeological Assessment states that impact to the potential archaeological remains of the cottage would be consistent with an Exception allowing the cottage to be archaeologically excavated and recorded. The Assessment also states that the cistern and items that may relate to historical occupation and agricultural use of the site are unlikely to be considered relics. An archival photographic record of these items is recommended.</p> <p>Providing these measures are undertaken the proposal is consistent with this Direction.</p>
3.0 Housing, Infrastructure and Urban Development		
3.1 Residential Zones	Yes	The Planning Proposal will increase the range of housing opportunities for seniors.

S117 Direction Title	Consistency	Comment
3.4 Integrating Land Use and Transport	Yes	The Planning Proposal proposed the provision of services and facilities such as a medical centre, childcare centre and a neighbourhood shop that will be available to the public. This will reduce travel length to these services for the local community.
3.5 Development Near Licensed Aerodromes	Yes	<p>Camden Airport is located a short distance away from the subject site. However the subject site is not located within the ANEF 20.</p> <p>The subject site is located within the 'Inner Horizontal Surface' on the Camden Airport Obstacle Limitations Surfaces map. However there are many developed areas with similar proposed building heights located within this area.</p> <p>In addition, the subject site is not on the direct approach to the runway. There is no proposed change to the existing building height.</p>
4.0 Hazard and Risk		
4.1 Acid Sulphate Soils	Yes	The site is not known to be affected by acid sulphate soils.
4.2 Mine Subsidence and Unstable Land	N/A	
4.3 Flood Prone Land	Yes	<p>The Flood Risk Management Review of the site notes that the site is not subject to regional flooding and therefore is suitable for the proposed development.</p> <p>Further analysis of local watercourses is required at a development application stage to determine local flood impacts up to the Probable Maxine Flood (PMF) event.</p>
4.4 Planning for Bushfire Protection	Yes	The subject site contains land that is identified in Council's maps as being bushfire prone. The Indicative Layout Plan for the development of the site addresses this site constraint. A Bushfire Assessment Report

S117 Direction Title	Consistency	Comment
		<p>has been submitted as part of the Planning Proposal that also addresses this issue.</p> <p>Consultation with the Rural Fire Service has been undertaken and the RFS raises no objection to the Planning Proposal.</p>
5.0 Regional Planning		
5.2 Sydney Drinking Water Catchments	N/A	This Direction does not apply to the Camden LGA.
5.8 Second Sydney Airport: Badgerys Creek	N/A	
5.10 Implementation of Regional Plans	Yes	The proposal is consistent with A Plan for Growing Sydney, the draft Sydney Regional Plan and the draft Western City District Plan. Detail of consistency is outlined in 4.3.2 Section B of the Planning Proposal.
6.0 Local Plan Making		
6.1 Approval and Referral Requirements	Yes	It is not intended to include provisions in the LEP. However, the development of the subject site will be an Integrated Development and will require referral to the RFS.
6.3 Site Specific Provisions	Yes	The Planning Proposal is consistent with this Ministerial Direction.
7.0 Metropolitan Plan Making		
7.1 Implementation of A Plan for Growing Sydney	Yes	The Planning Proposal is consistent with the relevant actions from the strategy as outlined in 4.3.2 Part B of the Planning Proposal
7.2 Implementation of Greater Macarthur Land Release Investigation	N/A	This Direction does not apply to the Camden LGA.

Appendix 3: Gateway Determination



Contact: Mato Prskalo
Phone: (02) 9860 1560
Email: Mato.Prskalo@planning.nsw.gov.au
Postal: GPO Box 39 Sydney NSW 2001

Our ref: PP_2012_CAMDE_008_00 (12/08103)

Mr Greg Wright
General Manager
Camden Council
PO Box 183
CAMDEN NSW 2570

Dear Mr Wright,

Planning proposal to permit 'seniors housing', 'health services facility' and 'retail premises' on land at 5 Smalls Road, Grasmere

I am writing in response to your Council's letter dated 23 April 2012 requesting a Gateway Determination under section 56 of the Environmental Planning and Assessment Act 1979 ("EP&A Act") in respect of the above mentioned planning proposal to amend the Camden Local Environmental Plan 2010.

As delegate of the Minister for Planning and Infrastructure, I have now determined that the planning proposal should proceed subject to the conditions in the attached Gateway Determination.

Use of Schedule 1

The Department supports Council's intended outcome but not does support the use of Schedule 1 to achieve the objectives of the planning proposal in this circumstance as it does not provide sufficient clarity, certainty and transparency regarding the future use of the land. Council is encouraged to consider one of the following alternative options to achieve the objectives of the planning proposal using standard instrument zones:

- Rezone the site to SP1 Special Activities, (Seniors Housing): this zone will allow for seniors housing and any other development that is ordinarily incidental or ancillary to that use;
- retain the existing R5 Large Lot Residential zoning for the medical services component of the proposal as 'Health Services Facility' is a permitted land use and rezone remaining land using Standard Instrument zones for the purposes of seniors living, retail development and environmental conservation, if necessary; or
- a combination of the above options.

Council should consider the above options, and consult the Department's Regional Office to determine the desired approach to achieve the intended outcome.

S117 Directions

I have agreed that the planning proposal's inconsistencies with S117 3.4 Integrating Land Use and Transport, 6.3 Site Specific Provisions and 7.1 Implementation of the Metropolitan Plan for Sydney 2036 are of minor significance. No further approval is required in relation to these Directions.

Revised Planning Proposal

Council is to amend the planning proposal and undertake any additional assessment as required by the attached Gateway determination. Council is to provide a copy of any additional information together with the revised planning proposal to the Department's Regional Office prior to the commencement of community consultation.

Finalisation

The amending Local Environmental Plan (LEP) is to be finalised within 12 months of the week following the date of the Gateway Determination. Council should aim to commence the exhibition of the Planning Proposal as soon as possible following consultation with the authorities listed in the Gateway Determination. Council's request for the Department to draft and finalise the LEP should be made six (6) weeks prior to the projected publication date.

The State Government is committed to reducing the time taken to complete LEPs by tailoring the steps in the process to the complexity of the proposal, and by providing clear and publicly available justification for each plan at an early stage. In order to meet these commitments, the Minister may take action under s54(2)(d) of the EP&A Act if the time frames outlined in this determination are not met.

Department Contact

Should you have any queries in regard to this matter, please contact Mato Prskalo of the Regional Office of the Department on 02 9860 1560.

Yours sincerely,



Sam Haddad
Director-General

29/6/2012.

Gateway Determination

Planning Proposal (Department Ref: PP_2012_CAMDE_008_00): to permit 'seniors housing', 'health services facility' and 'retail premises' on land at 5 Smalls Road, Grasmere

I, the Director General, Department of Planning and Infrastructure as delegate of the Minister for Planning and Infrastructure, have determined under section 56(2) of the EP&A Act that an amendment to the Camden Local Environmental Plan 2010 to permit 'seniors housing', 'health services facility' and 'retail premises' on land at 5 Smalls Road, Grasmere should proceed subject to the following conditions:

1. The use of Schedule 1 to achieve the objectives of the planning proposal is not supported in this circumstance. Council is to rezone the land appropriately to reflect the intended use of the land. Council needs to consult the Department's Regional Office in considering the zoning options to determine the appropriate mechanism to proceed.
2. Council needs to consult the Federal Department of Sustainability, Environment, Water, Population and Communities and the NSW Office of Environment and Heritage (Environment Branch) in regards to the environmental sensitivity of the site and the potential implications for threatened species as a result of the planning proposal.
3. Council needs to demonstrate consistency with S117 Direction 2.1 Environment Protection Zones and, if necessary, amend the planning proposal, prior to public consultation.
4. Council is to update the following environmental studies prior to the commencement of community consultation:
 - a Flora and Fauna Assessment;
 - a Vegetation Management Plan;
 - a Conservation and Land Use Management Plan; and
 - an Offsetting Strategies report.
5. Council is to ensure that the Aboriginal Archaeological Survey and Assessment is updated and an assessment into potential additional heritage value of the land is undertaken prior to community consultation.
6. It is noted that the subject site contains Aboriginal archaeological items on parts of the site that are proposed for development. In addition, it is noted that the site contains remnants of a former cottage that is not listed but may contain some historical value. Therefore, Council needs to ensure that the Aboriginal Archaeological Survey and Assessment is updated and an assessment into potential additional heritage value of the land forms part of the public exhibition material. Council should also consult the NSW Office of Environment and Heritage and the relevant Local Aboriginal Land Councils and address any issues raised. Council needs to address any inconsistencies with S117 Direction 2.3 Heritage Conservation and amend the planning proposal accordingly, if necessary, prior to public consultation.
7. Council is to consult with Sydney Water and Transport for NSW – Roads and Maritime regarding the inconsistencies of the planning proposal with S117 Direction 3.1 Residential Zones. Following the completion of consultation with these public authorities, Council needs to demonstrate consistency with the S117 Direction and amend the planning proposal accordingly, if necessary, prior to public consultation.

8. As per the requirements of S117 Direction 4.1 Acid Sulfate Soils, Council is to provide the Departments Regional Office with an acid sulphate soils assessment and demonstrate consistency with the S117 Direction. Council is to amend the planning proposal, if necessary, prior to public consultation.
9. Council is to provide the Department's Regional Office with sufficient and updated information regarding S117 Direction 4.3 Flood Prone Land. Council is to amend the planning proposal, if necessary, prior to public consultation.
10. As per the requirements of S117 Direction 4.4 Bushfire Prone Land, Council is to consult with the Commissioner of the NSW Rural Fire Service. Council is to take into account any comments made and amend the planning proposal, if necessary, prior to undertaking community consultation.
11. Council is to provide further information on the current location of the Asset Protection Zone and justify its absence in other locations, such as within the Cumberland Plain Woodland.
12. Council is to amend the planning proposal following the implementation of the Gateway conditions. Subsequently, Council is to provide a copy of the revised planning proposal to the Department's Regional Office.
13. Community consultation is required under sections 56(2)(c) and 57 of the Environmental Planning and Assessment Act 1979 ("EP&A Act") as follows:
 - (a) the planning proposal must be made publicly available for **28 days**; and
 - (b) the relevant planning authority must comply with the notice requirements for public exhibition of planning proposals and the specifications for material that must be made publicly available along with planning proposals as identified in section 4.5 of *A Guide to Preparing LEPs (Department of Planning 2009)*.
14. Consultation is required with the following public authorities under section 56(2)(d) of the EP&A Act:
 - Federal Department of Sustainability, Environment, Water, Population and Communities
 - Integral Energy
 - NSW Rural Fire Service
 - NSW Office of Environment and Heritage (Heritage Branch)
 - NSW Office of Environment and Heritage (Environment Branch)
 - Transport for NSW - Roads and Maritime Services
 - Sydney Water
 - Telstra
 - Local Aboriginal Councils
 - Adjoining LGAs

Each public authority is to be provided with a copy of the planning proposal and any relevant supporting material. Each public authority is to be given at least 21 days to comment on the proposal, or to indicate that they will require additional time to comment on the proposal. Public authorities may request additional information or additional matters to be addressed in the planning proposal.

15. A public hearing is not required to be held into the matter by any person or body under section 56(2)(e) of the EP&A Act. This does not discharge Council from any obligation it



Planning & Infrastructure

may otherwise have to conduct a public hearing (for example, in response to a submission or if reclassifying land).

16. The timeframe for completing the LEP is to be **12 months** from the week following the date of the Gateway determination.

Dated

29th day of

June

2012.

SHaddad

Sam Haddad
Director-General
Delegate of the Minister for Planning and
Infrastructure

Appendix 4: Office of Environment and Heritage Comment



Office of
Environment
& Heritage

Our reference: DOC13/17652
Contact Marnie Stewart, 9995 6868

Ms Mary-Anne Madden
Senior Project Officer
Camden Council
PO Box 183
Camden NSW 2570

Dear Ms Madden

I refer to your letter received by the Office of Environment and Heritage (OEH) on 24 April 2013 seeking comments on a planning proposal at No. 5 Smalls Road, Grassmere (Lot 201 DP 734620) to allow a rezoning of the site from R5 large Lot Residential to part R2 Low Density Residential, part B1 Neighbourhood Centre and part E2 Environmental Conservation. The purpose of the rezoning is to facilitate the expansion of the Carrington Centennial Care by the provision of a seniors housing campus.

OEH has reviewed the relevant documentation and provides comments on biodiversity, Aboriginal cultural heritage and floodplain risk management in Attachment 1.

Of particular concern to OEH is Council's recommendation that Carrington Centennial Care develop and enter into a Conservation Agreement with OEH for the lands in the study area shown as conservation lands and that this commitment be made via a Voluntary Planning Agreement. At this stage, OEH does not agree to entering into a Conservation Agreement with Carrington Centennial Care as they have not applied to OEH for a CA and the suitability of the site for CA has not been assessed. Given this situation, OEH also does not agree to this commitment being in the Voluntary Planning Agreement.

Given the uncertainty of the mechanism proposed to secure the proposed offset areas, OEH is unable to support the planning proposal and I seek your assurance that the planning proposal will be amended prior to public exhibition.

Please arrange a time to discuss this important matter by contacting Marnie Stewart, Conservation Planning Officer on 9995 6868 or Susan Harrison, Planning Unit Manager on 9995 6864.

Yours sincerely

Lou Ewins 30/5/13

LOU EWINS
Manager Planning and Aboriginal Heritage
Regional Operations Group, Metropolitan
Office of Environment and Heritage

Attachment 1 – OEH comments on Amendment No. 16- Carrington Centennial Care

Biodiversity

Biodiversity Certification Assessment Methodology

The Flora and Fauna, Riparian and Bushfire Study - Offsets Strategy (FFRB Study Offsets Strategy) indicates that the "*Biodiversity Certification Assessment Methodology (BCAM) has been used to conduct an analysis of the proposed rezoning of the Smalls Road Site of the broader Carrington Centennial Care estate*", however there is no intention to seek formal biodiversity certification of all or part of the Carrington Centennial Care estate. Furthermore, that proposed conservation areas exist on both portions of the estate and are to be managed in accordance with the Conservation and Land use Management Plan.

OEH has not conducted an in depth analysis and has not been able to assess the applicant's calculations as it is not a formal biocertification application and the applicant has not provided the appropriate level of data. However, a preliminary assessment has identified the following issue detailed below.

The planning proposal states "*to ensure that the conservation outcomes required to meet the BCAM assessment credit calculations in regards to maintenance and improvement in biodiversity values across the entire study area it is recommended that the Carrington Centennial Care develop and enter into a Voluntary Conservation Agreement with NSW OEH for the lands in the study area shown as conservation lands. This commitment should be made via a Voluntary Planning Agreement prior to the development taking place*". The FFRB Study Offsets Strategy, Section 4.2 BCAM Conservation Values, states that the "*credits calculated for this proposal have used the 90% credit entitlement option, as the conservation lands will be managed through a Voluntary Conservation Agreement*".

Council is advised that Conservation Agreements (CA) are legal agreements under section 69 of the National Parks and Wildlife Act 1974 between landholders and the Minister for Environment covering identified areas of land with significant conservation values. Once entered into, they are legally binding on both current and future landholders and the land subject to a CA is identified and registered on the land title. It is important for Council to note that the applicant/landowner must apply to OEH for a CA and that any proposal to enter into a CA as part of a rezoning or development proposal will be considered on a case-by-case basis. On receiving an application form, the property will be assessed to determine its conservation significance and suitability for a CA. In these instances, the intending developer must meet any costs associated with the assessment of the suitability of the land for a CA, establishment of the agreement and ongoing monitoring and support. Council must also seek OEH's consent before making any approval or rezoning conditional upon the establishment of a CA. Further information on CAs can be found on OEH's website at: <http://www.environment.nsw.gov.au/cpp/ConservationAgreements.htm>

OEH notes that Council has based its assessment and conclusions on the assumption that the Minister for the Environment will agree to enter into a CA for this subject site. However, at this stage OEH does not agree to entering into a CA with Carrington Centennial Care as they have not applied to OEH for a CA and the suitability of the site for CA has not been assessed. Given this situation, OEH also does not agree to this commitment being made in the Voluntary Planning Agreement.

It is important to note that if the Minister for the Environment determines not to enter into a CA, this will impact upon the credits calculated for the proposal and will require a revised BCAM assessment. The conclusions and outcomes of the FFRB Study Offsets Strategy will also need to be amended. At this stage OEH considers that the credits assigned to the creation of the CA are premature and should not be used in the calculation.

Conclusions

At this stage, given the uncertainty of the mechanism proposed to secure the proposed offset areas, OEH is unable to support the planning proposal. OEH also requires Council to amend the planning proposal to reflect the advice provided on the CA agreement prior to any public exhibition.

OEH recommends that Council examine alternative options for securing the proposed conservation areas. OEH also suggests that Council consider amending the planning proposal to avoid or minimise impacts to the high biodiversity values within the site.

Aboriginal cultural heritage

OEH notes that the western portion of the proposed rezoning area is proposed to be zoned E2 Environmental Conservation and that this area contains a number of Aboriginal objects. However, the most significant objects, as represented by AHIMS #52-2-3949 (CR4), are located in the R1 zone, adjacent to the proposed detention basin. OEH recommends that measures be explored to avoid impact on this site.

Any impact to Aboriginal objects throughout the proposed development area will require a s90 Aboriginal Heritage Impact Permit prior to impact. Please note, all known Aboriginal objects must be registered on AHIMS in accordance with s89A of the National Parks and Wildlife Act 1974.

Floodplain risk management.

The primary objective of the Government's Flood Prone Land Policy is to reduce the impact of flooding and flood liability on individual owners and occupiers of flood prone land and reduce private and public losses resulting from floods. The most appropriate method to assess the development of flood prone land is through the floodplain risk management process which is detailed in the NSW Government's Floodplain Development Manual (2005).

Local flood investigation

Cardno, February 2013—Section 5.1, states that "flood mapping and information derived from previous Upper Nepean floodplain risk management studies indicates that the site sits outside all regional flood events up to and including the PMF". However, Cardno (February 2013) states "However, from discussions with Council we understand that some of these areas are currently under review by new flood studies which may result in revised flood levels. In addition, to define flooding caused by the local catchment affecting the site's two water courses previously described in this report, detailed flood studies will be required to support the Development Application Process".

As a consequence, the onset of local catchment flooding could be rapid with little advanced warning which may pose risk to life. It should be noted that, the principles in the Floodplain Development Manual apply to all overland flow associated with major drainage. Therefore a hydrological and hydraulic assessment should be undertaken based on the principles of the Floodplain Development Manual (FDM), prior to determining how S117 Direction 4.3 Flood Prone Land applies to the land.

This assessment should examine both existing and post developed conditions and is to be extended to include the proposed site and adjacent areas. The assessment of overland flow is to comprise:

- a comprehensive understanding of flood risk by flash flooding from overland flow to people and properties for the full range of the floods up to the probable maximum flood (PMF) event,
- the impact of the proposed development on the behaviour of overland flooding (i.e. levels, velocities and duration of flooding),
- the impact of the proposed development on adjacent, downstream and upstream areas,

- an assessment of the impacts on overland flow of earthworks and filling of land within the proposed development. This assessment should be based on understanding of cumulative flood impacts of any possible development in the local catchment, and
- a sensitivity analyses to determine the potential impacts from climate change (i.e. increase in rainfall intensities) on flooding behaviour.

Vulnerability of proposed development

Planning Circulation PS 07-003 Guideline does acknowledge that controls may need to apply to critical infrastructure (such as hospitals) and consideration given to evacuation routes and vulnerable developments (like nursing homes) in areas above the 100 year flood. It has also stated that *".....As such, they are areas where no development controls should apply for residential development but the safety of people and associated emergency response management needs to be considered and may result in: - Restrictions on types of development which are particularly vulnerable to emergency response, for example developments for aged care"*.

The proposed land use will include a residential aged care facility, child care centre and medical centre. This type of development classify as vulnerable development where people would have difficulty or would be unable to self-evacuate in a flood event. Under the NSW Government's Flood Prone Land Policy, local councils have the prime responsibility for floodplain risk management including areas affected by local overland flooding and determining the acceptability of flood impacts. Therefore, once the food risk assessment has been completed, Council will be in a position to determine whether it can consider controls to such type of development. These controls may include habitable floor level to be above the PMF and structure soundness to ensure safe refuge within the facility.

Information regarding S117 Direction 4.3 Flood Prone Land

Following completion of the flood risk assessment described above, Council will be in a position to determine whether the proposal adequately demonstrates consistency with Section 117 Direction 4.3 Flood Prone Land or whether the Section 117 Direction does not apply to the proposal.

Appendix 5: Draft Development Control Plan (DCP)

DRAFT DCP CONTROLS

PART C: RESIDENTIAL SUBDIVISION

Section C3 Subdivision in Large Lot Residential Areas

INSERT: Subsection – C14 Carrington (Smalls Road)

C1 Introduction

- Figure C1 – Residential Subdivision Flow Chart to be updated to include 5 Smalls Road, Grasmere under C3.
- Figure C2 Three categories of residential subdivision in Camden LGA to be updated to include 5 Smalls Road, Grasmere under Large Lot Residential areas

C14 CARRINGTON (SMALLS ROAD)

C14.1 Introduction

The Carrington Retirement Village - Smalls Road site comprises approximately 27.21ha of land located within the suburb of Grasmere 3km west of the Camden Township. The land is an extension of the Carrington Campus operated by Carrington Centennial Care (CCC). CCC provides aged care facilities in the form of Residential Aged Care Facilities and Lifestyle Living for the ageing population.

Carrington (Smalls Road) Planning Principles

- Establishment of a Village Hub within the B1 Neighbourhood Centre zone, which will contain a range of community and commercial uses, such as a medical centre, child care centre, neighbourhood shop and café/restaurant, Wellness centre and other facilities which will serve the retirement village and the surrounding neighbourhood. A series of public spaces will be connected by a central spine for good accessibility for the residents and the local community.
- Establishment of a Northern Precinct, providing Independent Living Units (ILUs), including duplexes, townhouses and two storey apartments. This precinct will provide a transition between the higher density Village Hub and the surrounding residential dwellings. The dwellings will be built along the line of contours of the site, utilising the topography by stepping down the slope, ensuring views to the riparian corridor.
- Establishment of a Southern Precinct, providing lower density ILUs. These will be located on the steepest slope of the site and will step up the slope, maximising solar orientation and views towards the north.
- The preservation of the existing large stand of Cumberland Plain Woodland vegetation in the south west of the site and an area containing Aboriginal cultural heritage material. These components will be conserved through zoning and appropriate location of infrastructure.
- The creation of a premium residential location which promotes sustainability. Building and site design will respond appropriately to the site context, including the Cumberland Plain Woodland vegetation, an area containing Aboriginal cultural heritage material, the riparian corridor, and topography.

- The provision of a safe and convenient pedestrian and cycle linkages to other areas within the surrounding places. Internally, the development pattern will promote accessibility by residents.

Design Structure

The Indicative Layout Plan (ILP) is shown in Figure C97. The proposed entry point to the development is off Smalls Road. The entry will provide access to the Neighbourhood Centre, and the Northern and Southern residential precincts via an internal circulation road. The ILP defines the critical components of the site. These include Bushfire Asset Protection Zones, site setbacks, drainage, vegetation and heritage conservation areas, access road and internal circulation road.

Related Studies

The Carrington (Smalls Road) Indicative Layout Plan (ILP) is based on the following technical and environmental studies:

- Ecological Australia, May 2016, Flora & Fauna Riparian and Bushfire Study, Offset Strategy.
- Ecological Australia, May 2016, Conservation and Land Use Management Plan.
- Transport and Urban Planning, April 2016, Traffic and Access Assessment.
- Cardno, April 2016, Flood Risk Management Review.
- AHMS, January 2013, Aboriginal Heritage Preliminary Assessment.
- AHMS, April 2016, Historical Archaeological Assessment.
- Geo Enviro Consultancy Pty Ltd, September 2016, Acid Sulphate Soil Assessment.
- Macro Plan Dimasi, June 2014, Retail Impact Assessment.

C14.2 Traffic and Access

Objectives

1. Provision of a clear entry point to the development providing safe entry and exit from the site.
2. Provision of an internal circulation road providing access to the Village Hub, and the Northern and Southern residential precincts.
3. Provision of a key pedestrian spine providing safe pedestrian access to all parts of the Retirement Village.
4. Regular private bus transport for residents to access key destinations and main Carrington Campus.

Controls

1. The entry point, internal circulation road and key pedestrian spine are to generally be in accordance with Figure C97.

2. Prior to the first development application for subdivision or construction being submitted a Pedestrian Mobility Plan must be submitted and approved by Council – should include safe pedestrian access to bus transport.

Related Study:

- *Traffic and Access Assessment, prepared by Transport and Urban Planning dated April 2016*

C14.3 Vegetation Conservation

Objectives

1. Ensure the protection and enhancement of an existing large stand of Cumberland Plain Woodland vegetation in the south west of the site (Conservation Lands).
2. Facilitate the implementation of the Conservation and Land Use Management Plan (CLUMP) for 5 Smalls Road, Grasmere.

Controls

1. The Conservation Lands should be secured through:
 - Conditions of development consent requiring the implementation of the CLUMP;
 - A detailed Vegetation Management Plan (VMP) must be prepared and submitted with the first Development Application. The VMP is to set out detailed Management Actions and Costs to be delivered, and set out how they are tied to the staging of development;
 - A Section 88 instrument must be registered on the lot requiring compliance with the CLUMP and VMP.

Related Studies:

Refer to the following Studies when preparing the Vegetation Management Plan:

- *Conservation and Land Use Management Plan, prepared by Ecological Australia dated May 2016;*
- *Flora & Fauna Riparian and Bushfire Study, Offset Strategy, prepared by Ecological Australia dated May 2016*

Note:

For general objectives and controls the Neighbourhood Centre refer to DCP section D3, for specific site objectives and controls refer to D3.10.

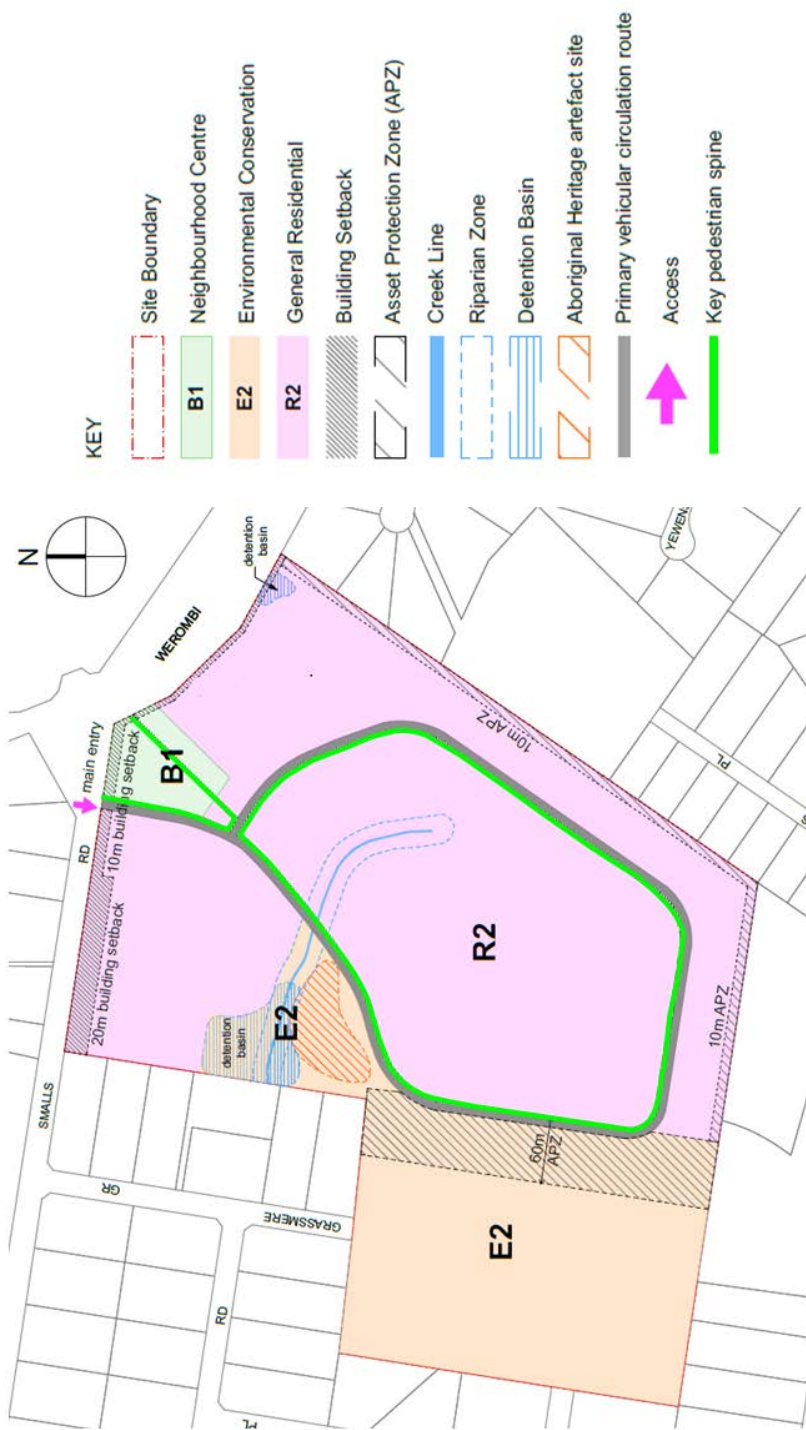


Figure: C97 Indicative Layout Plan

DRAFT DCP CONTROLS

PART D: Controls Applying to Specific Land Uses/Activities

Section D3 Commercial and Retail Development

INSERT: Subsection – D3.10 Carrington (Smalls Road) – B1
Neighbourhood Centre

D3.1 Business Zone and Retail Hierarchy

- Zone B1 Neighbourhood Centre section to be updated to include Carrington (Smalls Road).

D3.10 CARRINGTON (SMALLS ROAD) – B1 Neighbourhood Centre

C3.10.1 Introduction

The Neighbourhood Centre will form part of Carrington (Smalls Road) Seniors Living Village in the B1 Neighbourhood Centre zone. The Neighbourhood Centre will contain a range of community and commercial uses, such as a medical centre, child care centre, neighbourhood shop and café/restaurant, Wellness centre and other facilities which will serve the retirement village and the surrounding neighbourhood

C3.10.2 Maximum Floor Area

Objectives

1. Ensure the retail component of the site is appropriately sized.

Controls

1. The combined gross floor area for the neighbourhood shop and café/restaurant will be no greater than 500sq m.

C3.10.3 Layout and Design

Objectives

1. Facilitation of good design and layout of the Neighbourhood Centre.

Controls

1. A separate masterplan for the Neighbourhood Centre shall be submitted to Council for approval with the first development application, other than development applications for the purposes of remediation, environmental landscape works and other minor works that, in the opinion of Council, do not predetermine an outcome on the land covered by the B1 Neighbourhood Centre zone boundaries in Camden LEP 2010.

Related Study:

- *Retail Impact Assessment, prepared by Macro Plan Dimasi dated June 2014.*

7.0 Attachments (Specialist Studies)

Attachment 1: Flora & Fauna, Riparian & Bushfire Study (Offsets Strategy)

Attachment 2: Conservation & Land Use Management Plan (CLUMP)

Attachment 3: Aboriginal Heritage Preliminary Assessment

Attachment 4: Historical Archaeological Assessment

Attachment 5: Flood Risk Management Review

Attachment 6: Traffic Access Assessment

Attachment 7: Acid Sulphate Soil Assessment

Attachment 8: Grasmere Retail Assessment



Note:

The following Flora & Fauna, Riparian and Bushfire Study (Offsets Strategy) covers 5 Smalls Road, Grasmere (subject site) and the Carrington main campus at 90 Werombi Road. However the Planning Proposal only deals with the 5 Smalls Road, Grasmere site. It was originally proposed to offset vegetation clearance on the subject site with the existing vegetation on the main Carrington Campus. The vegetation offset on the main campus is now not being pursued. The proponent, the Office of Environment and Heritage (OEH) and Council have been investigating a range of options to ensure conservation of the vegetation, including Bio-banking, however there is no agreed position at this time.



Carrington Aged Care Facility

Flora & Fauna, Riparian and Bushfire Study

Offsets Strategy

Prepared for
Michael Brown Planning



DOCUMENT TRACKING

ITEM	DETAIL
Project Name	Carrington Aged Care Facility – Flora & Fauna, Riparian and Bushfire Study
Project Number	1155
Prepared by	Sally Perry, Katherine Lang, Darren James, Joanne Daly
Approved by	Steven House
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This document has been prepared by Eco Logical Australia Pty Ltd with support from Michael Brown Planning Strategies.

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Contents

List of Tables	iv
List of Figures	v
Part 1 - Background	1
1 Introduction	1
1.1 Background.....	1
1.2 Description of Project	1
1.3 Study Area	2
1.4 Document Structure.....	3
1.5 Conditions Of BCAM Assessment.....	3
1.6 Legislative requirEments	6
Part 2 – Flora and Fauna Assessment.....	10
2 Methods	10
2.1 Field Survey Overview.....	11
3 Results.....	15
3.1 Literature and Database Review	15
3.2 Biometric Vegetation Type and Condition Mapping	15
<i>Vegetation Zones</i>	16
3.3 Vegetation Type Descriptions.....	18
3.4 Flora.....	22
3.5 Fauna.....	26
4 Biodiversity Certification Assessment Results	33
4.1 Biodiversity Certification assessment Area	34
4.2 BCAM Conservation Values	36
4.3 Vegetation Mapping and Zones.....	36
4.4 landscape TG Values	39
4.5 Transect Data and Site Value Scores	39
4.6 Landscape Score.....	41
4.7 Threatened Species Assessment.....	43
4.8 Red Flags	43
4.9 Indirect Impacts	43

4.10	Credit Calculations.....	44
4.11	BCAM Conclusion.....	46
5	Additional Ecological Issues	47
6	Recommendations.....	47
Part 3 – Riparian Assessment.....		49
7	Methods	49
7.1	Results.....	49
8	Recommendations.....	53
Part 4 – Bushfire Assessment.....		56
9	Methods	56
10	Results.....	56
10.1	Vegetation.....	56
10.2	Slope.....	57
10.3	Bushfire Hazard Summary	57
11	Planning for Bushfire Protection (2006) Assessment.....	59
11.2	Bushfire Protection Measures	60
11.3	Management Requirements	66
11.4	Emergency Response	68
11.5	Planning Controls	71
11.6	Development Staging	71
12	Recommendations.....	72
References		73
Appendix A: Species Predicted and Requiring Survey		74
Appendix B: Field Survey Results Flora and Fauna Species List.....		76
Appendix C: Landscape TG		82
Appendix D: Transect Data		84

List of Tables

Table 1: Threatened Species and Endangered Ecological Communities previously recorded in the study area	15
Table 2: Summary of vegetation communities and zones	21
Table 3: Likelihood of Occurrence Species in the Study Site (Potential, Likely and Known species only)	24
Table 4: Likelihood of Occurrence of Threatened Fauna Species within the study site	28
Table 5: Biocertification Land Use Table	33
Table 6: Land Use Breakdown (under rezoning proposal) of Study Area	34
Table 7: Area of vegetation within the Carrington Centennial Care estate study area	36
Table 8: Extents of Vegetation Types and Vegetation Zones within the study area.....	38
Table 9: Landscape Tg assigned to each vegetation type.....	39
Table 10: Vegetation Zones and transects / plots required	40
Table 11: Site value scores allocated to each vegetation zone	41
Table 12 : Native vegetation in assessment circle	42
Table 13: Connectivity scores allocated for the assessment	42
Table 14 : BCAM calculations for credits and offsetting	44
Table 15: NOW Riparian Categories and Buffer Specifications.....	49
Table 16: Controlled Activity Riparian Corridor Matrix	55
Table 17: Minimum specifications for Asset protection Zones for SFPPs to achieve <math><10\text{kW}/\text{m}^2</math>	61
Table 18 : Performance criteria for internal roads within SFPP Developments	64
Table 19: Static Water Requirements	65
Table 20: Recommended Inter-fire Periods	68
Table 21: Local Fire Stations.....	68

List of Figures

Figure 1: Carrington Centennial Care Estate study site, showing Smalls Road and the Northern Campus	4
Figure 2: The Smalls Road Rezoning Campus Concept Master Plan	5
Figure 3: Study Site Vegetation Types (as per BCAM Classifications).....	13
Figure 4: Location of Biocertification Assessment Transects	14
Figure 5: Study Site Vegetation Types and Vegetation Zones	17
Figure 6: Grey Box – Forest Red Gum grassy woodland on shales of the southern Cumberland Plain, Sydney Basin – Ancillary Code High (Good)	18
Figure 7: Grey Box – Forest Red Gum grassy woodland on shales of the southern Cumberland Plain, Sydney Basin – Ancillary Code Medium (Moderate).....	19
Figure 8: Grey Box – Forest Red Gum grassy woodland on shales of the southern Cumberland Plain, Sydney Basin – Ancillary Code Poor (Olive).....	19
Figure 9: Grey Box – Forest Red Gum grassy woodland on shales of the southern Cumberland Plain, Sydney Basin Ancillary Code Other (Derived Native Grassland)	20
Figure 10: Forest Red Gum - Rough Barked Apple grassy woodland on the alluvial flats of the Cumberland Plain, Sydney Basin - Ancillary Code Poor (Olive).....	21
Figure 11: Example of Hollow Bearing Trees.....	26
Figure 12: Dam on site presenting aquatic habitat.....	27
Figure 13: Location of Threatened Species recorded during survey and Hollow Bearing Trees	32
Figure 14: BCAM Assessment Development Lands and Conservation Lands.....	35
Figure 15: Strahler Stream Order Assessment and Site Concept Plan	52
Figure 16: Riparian Corridor Averaging Rule. (<i>Source: NOW Controlled Activity Riparian Corridor Guidelines</i>)	55
Figure 17: Existing Vegetation, Slope and Hazard	58
Figure 18: Asset Protection Zones within the Proposed Masterplan	62
Figure 19: Fire Stations within close proximity to study area	70

Part 1 - Background

1 Introduction

1.1 BACKGROUND

Eco Logical Australia (ELA) was engaged by Michael Brown Planning Strategies, on behalf of Carrington Centennial Care, to undertake flora and fauna, riparian and bushfire studies to identify potential constraints and opportunities for the proposed rezoning of land within the Carrington Centennial Care estate at Grasmere, located in the south-west area of Camden Local Government Area (**Figure 1**).

The objectives of the ecological studies are to identify areas of ecological significance including areas with Endangered Ecological Communities (EEC), rare or threatened flora and fauna species and Matters of National Environmental Significance (MNES).

Whilst Biodiversity Certification is not being sort for the site, this report also includes an offsets strategy based on an ecosystem level assessment using the Biodiversity Certification Assessment Methodology (BCAM).

The riparian study focuses on determining the ecological value of the onsite watercourses, identifying appropriate stream order categories and hence riparian corridor widths.

The objective of the bushfire study is to demonstrate that an adequate level of bushfire protection can be provided at the site by meeting the requirements of *Planning for Bushfire Protection, 2006*.

1.2 DESCRIPTION OF PROJECT

Preparation of these studies is required to understand the environmental, riparian and bushfire constraints and opportunities of land located within the Carrington Centennial Care estate in Grasmere. The studies have been undertaken to capture the background information required to inform the master planning and eventual rezoning of the part of the estate to a variety of commercial uses, aged care facilities, independent living units, a childcare centre and environmental conservation uses.

This ecological, riparian and bushfire study of the Carrington Centennial Care site has been completed using field and desktop assessment methods, utilising existing information from previous flora and fauna assessments from the site, flora and fauna databases and vegetation mapping products where possible. Additional site survey has been undertaken by ELA for this project, predominantly consisting of biometric vegetation transects/plots and targeted flora survey and fauna.

ELA have used the NSW Office of Environment and Heritage (OEH) Biodiversity Certification Assessment Methodology (BCAM) adopted by OEH in 2011, to test the ‘improve or maintain’ standard for biodiversity levels, as defined by the BCAM. This approach was considered the most appropriate as it aligns with current state government policy and provides a consistent, quantifiable and repeatable approach to determining and analysing the biodiversity values of an area.

Whilst it would be ideal to pursue biodiversity certification for the project, due to the interplay of an existing development consent for the site and the lack of any savings provisions within the Biodiversity Certification methodology, it is not practical to pursue biodiversity certification for the site as OEH has indicated that in addition to the offset required under the current development consent an entirely new offset would also be required under Biodiversity Certification. This would in effect require the proposed clearing of vegetation to be offset twice.

As such, this BCAM assessment has been undertaken to demonstrate that the quantum of the proposed offset is reasonable, and consistent with current standards. As demonstrated in the above assessment, the proposed offset is reasonable. The offset will be secured through conditions of consent, a covenant on title under the *Conveyancing Act* and the implementation of the Conservation and Landuse Management Plan.

1.3 STUDY AREA

The study area is located within Camden Local Government area in the south-west fringe of the Sydney Metropolitan Region (see **Figure 2**). The study area comprises the northern and southern portion of the Carrington Centennial Care estate at Grasmere, which includes the following allotments:

LOT AND DP NUMBER	STREET ADDRESS
Lot 201, DP734620	5 Smalls Road
Lot 10, DP845472	90 Werombi Road

Whilst the study area comprises the sites north and south of Werombi Road, only the portion of land south of Werombi Road is proposed for rezoning. This southern portion of the study area is referred to in this report as the “Smalls Road Rezoning Campus” and the northern portion of the study area is referred to as the “Northern Campus”. These areas are identified in **Figure 1**.

The Smalls Road Rezoning Campus currently contains no existing development but retains two moderately sized areas of remnant bushland as well as areas of open exotic pasture grass. The land is fringed by low density rural residential housing. The Northern Campus contains a mix of existing aged care and assisted living facilities with stands of vegetation predominantly around the edges of the site.

The landscape of the study area is typical of the surrounding area, with gentle to moderate slopes and rolling hills, pockets of remnant native vegetation interspersed with large expanses of exotic pasture grasses reflecting the recent low intensity agricultural uses of the area.

The north-east corner of the site drains to a small watercourse running from east to west while the south-west portion of the site drains towards the west into a different watercourse. Both watercourses are tributaries of Sickles Creek, which feeds into the Nepean River approximately 3km north. Within the

Northern Campus, a large dam exists in the eastern portion and much of the site drains to this dam, however the north-west corner of this site drains to a small tributary of the Nepean River.

The vegetation across the Smalls Road Rezoning Campus is dominated by open exotic grasslands, interspersed with several medium sized patches of remnant native vegetation. The native vegetation remaining on site is generally in good condition, however it has little connectivity to stands of vegetation in adjacent areas. On the Northern Campus, several medium sized stands of native vegetation exist, with varying levels of condition reflecting the differing length and intensity of disturbance from landscape maintenance and urban development onsite.

1.4 DOCUMENT STRUCTURE

This report is divided into four parts:

Part 1 – Background

Part 2 – Flora and Fauna Assessment (including BCAM Assessment and Offsets Strategy)

Part 3 – Riparian Assessment

Part 4 – Bushfire Assessment

Parts 2, 3 and 4 contain an overview of the methodology and results of each of the studies and recommendations for incorporation into rezoning and subsequent planning documents.

A separate report has also been prepared for the site, being a Conservation and Land Use Management Plan, within which a Vegetation Management Plan for the riparian corridor and general site restoration works is contained.

1.5 CONDITIONS OF BCAM ASSESSMENT

The information provided in this report outlines the methodology used, the results obtained, the credits required and the credits generated, for the entire Carrington Centennial Care site at Grasmere.

In rezoning the study area, Carrington Centennial Care seeks to ensure that the overall post-development biodiversity values of the study area are at least maintained, if not improved, compared to their pre-development levels. This will ensure that development of the area takes into account the environmental features of the area and focuses development activities in the areas with lower biodiversity value.

The Smalls Road Masterplan used in this assessment is shown in **Figure 2**.



Figure 1: Carrington Centennial Care Estate study site, showing Smalls Road and the Northern Campus

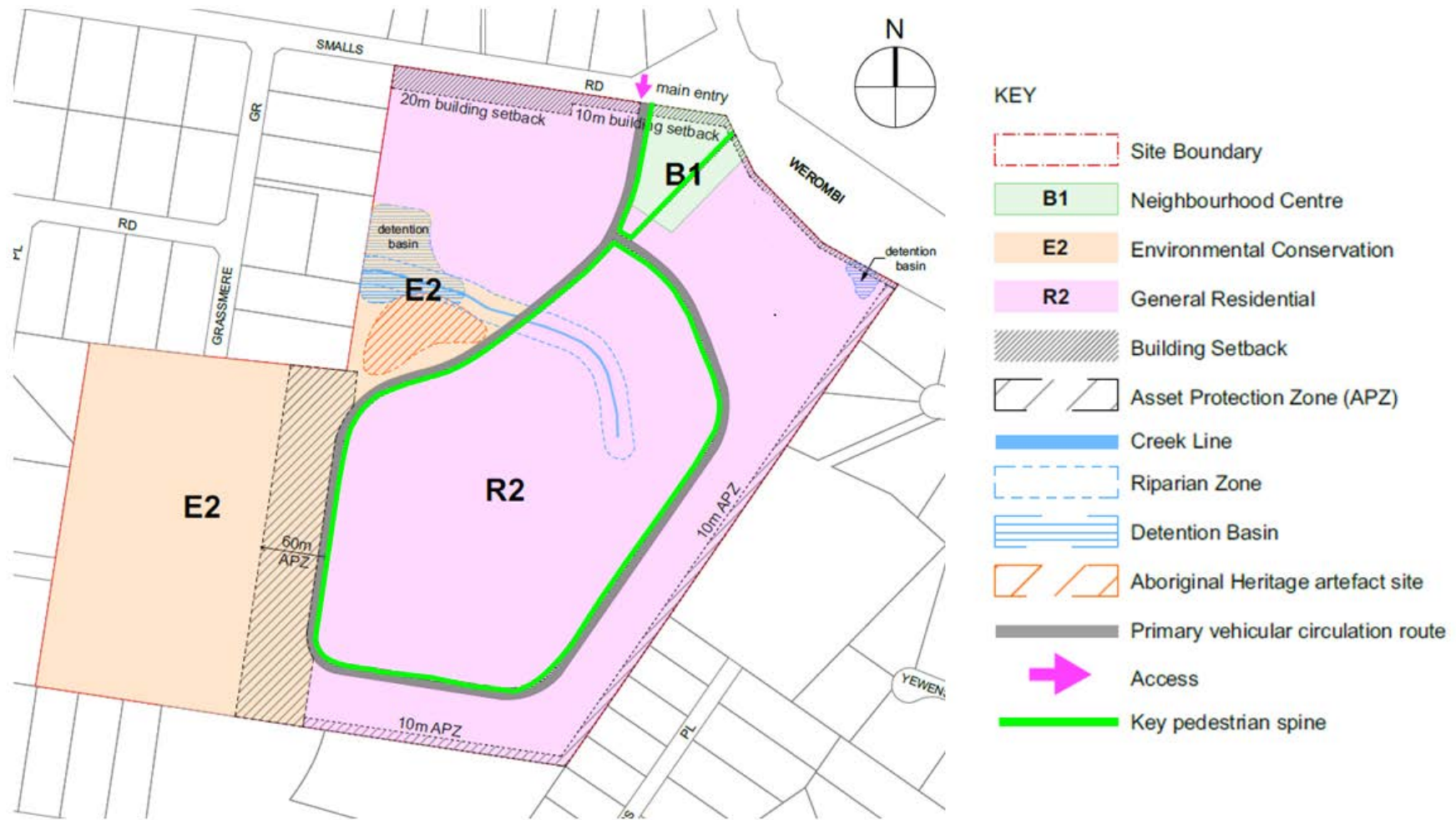


Figure 2: The Smalls Road Rezoning Campus Concept Master Plan

1.6 LEGISLATIVE REQUIREMENTS

The following section provides a brief description of the relevant legislation and outlines how it pertains to the study area.

1.6.1 Environmental Protection and Biodiversity Conservation Act 1999

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) provides a national scheme for protecting the environment and conserving biodiversity values.

The *EPBC Act* stipulates that approval from the Commonwealth Environment Minister is required if a development is likely to have a significant impact on matters considered to be of MNES.

If the proposed action is likely to have a significant impact on the matters of NES, the proponent may make a 'Referral' to the Commonwealth Department of Sustainability, Environment, Water, Population and Communities (SEWPaC). The Department will then determine if the action is a controlled or a non-controlled action. Controlled actions require a full assessment under Part 8 of the *EPBC Act* and approval under Part 9. Non controlled actions may proceed without further assessment or approval by the Commonwealth. (Assessments under the EPBC Act can run concurrently with assessments under the NSW *Environmental Planning and Assessment Act 1979* and NSW *Threatened Species Conservation Act 1995*).

A protected matters search for the site (using a 10km buffer) identified the following endangered ecological communities, endangered or vulnerable or migratory species as potentially occurring or having suitable habitat onsite:

- 2 endangered ecological communities,
- 36 threatened species
- 14 migratory species

The results of this database search (and the NSW BioNet Atlas search) have been combined and presented in **Tables 1** and **Table 3**.

One critically endangered ecological community (CEEC) was identified within the study area, Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest. This community is also listed under the NSW *Threatened Species Conservation Act 1995* (TSC Act) (see below), however, with slightly different vegetation characteristics and criteria for assigning condition codes.

Impact assessment under the EPBC Act differs from the TSC Act in a number of ways. Of particular relevance to this project is the definition of 'offsets'. Offsets under the EPBC Act are compensatory measures located offsite, whereas onsite compensatory measures such as those proposed in this report are considered to be 'mitigation' measures. So whilst the term 'offsets' is used throughout this report to reflect the NSW use of this term, the proposed offsets are onsite and would therefore be considered 'mitigation' measures under the EPBC Act.

When the Commonwealth considers impacts at the referral stage, they consider the quantum and nature of the impact. The positive outcomes afforded through amelioration and offset measures are typically considered at the assessment stage.

1.6.2 Environmental Planning and Assessment Act 1979

The NSW *Environmental Planning and Assessment Act 1979* (EP&A Act) is the principal planning legislation for the state, providing a framework for the overall environmental planning and assessment of development proposals. Various legislative instruments, such as the NSW *Threatened Species Conservation Act*, *Water Management Act 2000* (WM Act) and *Rural Fires Act (2007)* are integrated with EP&A Act and have been reviewed separately.

In determining a development application, the consent authority is required to take into consideration the matters listed under Section 79C of the *EP&A Act* that are relevant to the application. Key considerations include:

- Any environmental planning instrument, including drafts;
- The likely impacts of a development;
- The suitability of the study area to be developed;
- Any submissions made in accordance with the *EP&A Act* or regulations; and
- The public interest.

The *EP&A Act* places a duty on the determining authority to adequately address a range of environmental matters including maintenance of biodiversity and the likely impact to threatened species, populations or ecological communities.

1.6.3 Threatened Species Conservation Act 1995

The *Threatened Species Conservation Act 1995* (TSC Act) aims to protect and encourage the recovery of threatened species, populations and communities listed under the Act. The *TSC Act* is integrated with the *EP&A Act* and requires consideration of whether a development (Part 4 of the *EP&A Act*) or an activity (Part 5 of the *EP&A Act*) is likely to significantly affect threatened species, populations and ecological communities or their habitat. Obligations placed on Councils under Part 3 of the *EP&A Act* when rezoning land include consideration of threatened species, populations, ecological communities and recovery plans.

The schedules of the *TSC Act* list species, populations and communities as endangered or vulnerable. All developments, land use changes or activities need to be assessed to determine if they will have a significant impact on species, populations or communities listed on these schedules.

The potential impact of development of the site on any threatened species, populations or communities is assessed using a Seven Part Test under Section 5A of the *EP&A Act* at the development application stage. If the impacts on the area were found to be 'significant', a Species Impact Statement would be required as would concurrence from the Director General of the NSW Office of Environment & Heritage (OEH).

It is known that the site hosts a critically endangered ecological community (CPW) and may host a number of threatened flora and fauna species. The NSW BioNet Atlas search identified a number of endangered ecological communities and endangered or vulnerable species as potentially occurring or having suitable habitat onsite (See **Table 1**, **Table 3** and **Table 4**).

1.6.4 Water Management Act 2000

The NSW *Water Management Act 2000* (WM Act) has replaced the provisions of the *Rivers and Foreshores Improvement Act 1948*. The *WM Act* and *Water Act 1912* control the extraction of water,

the use of water, the construction of works such as dams and weirs and the carrying out of activities in or near water sources in NSW. 'Water sources' are defined very broadly and include any river, lake, estuary, or place where water occurs naturally on or below the surface and coastal waters.

If a 'controlled activity' is proposed on 'waterfront land', an approval is required under the *WM Act*. The *WM Act* is administered by the NSW Office of Water (NOW), who assess the impact of any proposed controlled activity to ensure that no more than minimal harm will be done to waterfront land as a consequence of carrying out the controlled activity. 'Controlled activities' include:

- The construction of buildings or carrying out of works;
- The removal of material or vegetation from land by excavation or any other means;
- The deposition of material on land by landfill or otherwise; or
- Any activity that affects the quantity or flow of water in a water source.

Stream classification in NSW is now completed according to the Strahler Stream Ordering process and riparian corridors widths assigned based on the relevant stream order. Detailed methodology is provided in Part 3 of the report.

1.6.5 Rural Fires Act (1997)

Bushfire issues are regulated by the *Rural Fires Act, 1997* (RF Act). Both the EP&A Act and the RF Act were modified by the Rural Fires and Environmental Assessment Legislation Amendment Act, in 2002 to enhance bushfire protection through the development assessment process (NSW RFS 2006b). Key requirements of the RF Act include:

- The need for a bushfire safety authority to be issued by the RFS under section 100B of the RF Act for any development applications for subdivision (therefore considered integrated development); and
- All landowners to exercise a duty of care to prevent bushfire from spreading on or from their land under section 63 of the RF Act. This relates to the appropriate provision and maintenance of APZs, landscaping and any retained vegetation when developing land (NSW RFS 2006b).

1.6.6 Planning For Bushfire Protection Guidelines (2006)

Rezoning requires consultation with the NSW RFS as the lead agency for managing bushfire issues. As such, rezoning aims to satisfy the requirements of *Planning for Bushfire Protection* (NSW RFS, 2006) which includes having regard to the planning principles of PBP (NSW RFS 2006b) as follows:

- Provision of a perimeter road with adequate two way access which delineates the extent of the intended development;
- Provision, at the urban bushland interface, for the establishment of adequate asset protection zones for future housing;
- Specifying minimum residential lot depths to accommodate asset protection zones for lots on perimeter roads;
- Minimising the perimeter of the area of land, interfacing the hazard, which may be developed;
- Introduction of controls which avoid placing inappropriate developments in hazardous areas; and
- Introduction of controls on the placement of combustible materials in asset protection zones.

1.6.7 Local Environmental Plans

Camden Council Local Environmental Plan (LEP) 2010

The Camden Council Local Environmental Plan (LEP) 2010 is the principal planning instrument for the Camden Local Government Area (LGA). This LEP sets out the planning framework and establishes the requirements for the use and development of land in the LGA. In the hierarchy of Camden Council's environmental planning documents it stands at the top, providing broad direction. Further detail is provided in the Camden Development Control Plan (DCP) 2011, which outlines specific and comprehensive guidelines for certain types of development within the Camden LGA. Camden LEP 2010 zones the study area as R5 – Large Lot Residential. The objectives for this zone are:

- To provide residential housing in a rural setting while preserving, and minimising impacts on, environmentally sensitive locations and scenic quality.
- To ensure that large residential lots do not hinder the proper and orderly development of urban areas in the future.
- To ensure that development in the area does not unreasonably increase the demand for public services or public facilities.
- To minimise conflict between land uses within this zone and land uses within adjoining zones.

The current planning proposal seeks rezoning of the southern portion of the Carrington Centennial Care estate (known as the rezoning site) to a mix of development and environmental conservation land use zones.

Part 2 – Flora and Fauna Assessment

2 Methods

This section outlines the methods used for the database searches, field survey and ecological constraints assessment. As stated above, the NSW OEH BCAM method has been used to determine the biodiversity value of the site, the residual biodiversity value of the site post rezoning and development and whether the proposed rezoning will deliver an 'improve or maintain' outcome for biodiversity in the long term.

As the methodology associated with conducting a BCAM assessment is extensive and detailed, the information presented in this section is a summary of the main points. The BCAM requirements are technical in nature and relies on a broad understanding of the BCAM to understand the methods applied. Readers should make themselves familiar with the BCAM before reviewing this section of the document.

Literature and Database Review

The Carrington Centennial Care estate has been the subject of previous ecological and planning assessment reports in recent times. Reports of the study area that were reviewed as part of this project include:

- Eco Logical Australia (2011) Planning Proposal – Master Plan Revision. Grasmere Aged Care Development.
- Eco Logical Australia (2012) Centennial Care gateway Site – Ecological Assessment.
- Eco Logical Australia (2012) Gateway Site – Paling Court, Grasmere: Tree Report.
- Eco Logical Australia (2012) Centennial care Paling Court Site – Ecological Assessment
- Eco Logical Australia (2012) Bushfire Protection Assessment: Proposed Residential Accommodation Redevelopment, Paling Court, 90 Werombi Road Grasmere.
- Conacher Travers (2006) Conservation and Land Use Management Plan for Carrington Centennial Care Lands
- Conacher Travers (2005) Flora and Fauna Assessment for Carrington Hospital Site
- Conacher Travers (2006) Bushfire Protection Assessment for Carrington Centennial Care Lands,
- Conacher Travers (2006) Vegetation Management Plan for Carrington Centennial Hospital - Aged Care Facilities
- Michael Brown Planning Strategies (2010) Smalls Road - Planning Process Overview – Seniors Housing Proposal.
- Jackson Teece (2011) Carrington Lifestyle Village: Smalls Road. Urban Design Statement.
- DLWC (2002) The NSW State Groundwater Dependant Ecosystems Policy. NSW Land and Water Conservation, Sydney.
- Dressel et al (2012) Mapping Terrestrial Groundwater Dependant Ecosystems: method Development and Example Output. Victoria Department of Primary Industries, Melbourne VIC.
- Eamus (2009) Identifying Groundwater Dependant Ecosystems – A Guide for Land and water Managers. Land and Water Australia, Canberra.

- Fairfull and Witheridge, (2003) Why do Fish need to cross the road? Fish Passage requirements for waterway crossings. NSW Fisheries, Cronulla.

An audit of digital data was undertaken to assist in locating vegetation communities and potential threatened species that may occur within the study area. The following information and databases were reviewed prior to site surveys:

- BioNet Atlas of NSW Wildlife (TSC Scheduled flora and fauna);
- EPBC Protected Matters Search Tool (EPBC scheduled flora, fauna and ecological communities);
- Vegetation Mapping for the Cumberland Plain (NPWS 2002);
- Threatened Species Profile Database, Biobanking Assessment Tool (OEH 2012).

Vegetation communities present within the study area were reviewed along with aerial photography of the study area prior to field survey.

A search of the online EPBC Protected Matters Search Tool (SEWPaC 2012a) was performed on 5th November 2012, and the BioNet Atlas of NSW Wildlife (OEH 2012a) was performed on 6th November 2012. The search of the EPBC Protected Matters Search Tool used a radius of 10 km around a polygon drawn to match the study area boundary. The search of the BioNet Atlas of NSW Wildlife covered the area from latitude -33.94 to -34.18, and longitude 150.54 to 150.83 (Datum GDA94).

Species from both searches were combined to produce a list of threatened species that may possibly occur within the study area. **Table 3** and **Table 4** identify the threatened species returned by the database searches together with an assessment of the likelihood of occurrence for each species within the study area. Each species' likely occurrence was determined by reviewing records in the area, considering the habitat available and using expert knowledge of the species ecology.

Five terms for the likelihood of occurrence of species are used in this report, as defined below:

- “yes” = the species was or has been observed on the site.
- “likely” = a medium to high probability that a species uses the site.
- “potential” = suitable habitat for a species occurs on the site, but there is insufficient information to categorise the species as likely, or unlikely to occur.
- “unlikely” = a very low to low probability that a species uses the site.
- “no” = habitat on site and in the vicinity is unsuitable for the species.

The results of the literature and data review and the assessment of the likelihood of occurrence for these species and ecosystems resulted in the development of a ‘master list’ of potential species and ecosystems present on site. For the endangered ecological communities, the equivalent Biometric vegetation type has been used, followed by the name given to that vegetation community under the relevant Act (where required). For ease of reference in this report, the vegetation community names used will reflect the NSW Biometric vegetation type.

2.1 FIELD SURVEY OVERVIEW

The following sections outline the survey and assessment methodologies undertaken for this report, which was designed to meet the requirements of the BCAM. The BCAM only requires targeted survey for the species considered to be ‘species credit’ species. Species credits are the class of credits created or required for the impact on particular threatened species that cannot be reliably predicted to use an

area of land based on habitat surrogates. Where targeted survey was utilised, the Draft Threatened Biodiversity Survey and Assessment Guidelines (DEC 2004) were utilised.

Field survey of the study area was conducted on the 29th August and 2nd, 3rd and 5th October 2012. The study area was inspected to assess the broad range of vegetation and habitat types. The survey was undertaken by Danielle Adams-Bennett, Bruce Mullins and Liz Norris of Eco Logical Australia. The weather during the field survey in August was a cold overnight minimum temperature of 0.5°C rising to a maximum of 21.1°C and relative humidity of 85%. Weather conditions during October survey were slightly warmer overnight, with minimum temperatures of 4.1°C but significantly higher maximum temperatures of 35.4°C and relative humidity varying between 12 and 50%. No rain was recorded on any field survey days.

The field survey was designed to target species credit species (specifically threatened in the vicinity of the study area) and migratory fauna regarded as 'known', 'likely' or with the 'potential' to occur in the study area. Field survey from 2012 was supplemented with existing field survey data from previous ELA work on site in 2011 and 2012. Information on the methods and effort employed for surveying vegetation communities, flora and fauna are outlined in detail in the BCAM methodology (Appendix 1 and 4 demonstrate the BCAM survey planning and transect details), but generally the following methods were implemented;

- Flora: transects, traverses, targeted threatened species survey and opportunistic recordings,
- Diurnal birds: habitat assessments and opportunistic recordings
- Nocturnal birds: habitat assessments
- Mammals (not including microbats): habitat assessments and opportunistic recordings,
- Microbat species: Habitat assessments
- Reptiles: Opportunistic observations.

Field surveys were conducted within the Smalls Road Rezoning Campus and the Northern Campus of the Carrington Centennial Care estate and in areas directly adjacent to the study area in order to determine any flora and fauna potentially occurring nearby.

Although some targeted fauna and flora surveys and vegetation condition analyses have previously been completed on site, the BCAM requires a minimum number of Biometric vegetation transects / plots to be completed to satisfy the methodology. The assessment of the entire Carrington Centennial Care estate required the completion of 11 transects /plots (see Appendix 4). A total of eleven (11) transects were completed for the study area, and the location of the plots is shown in **Figure 4**.

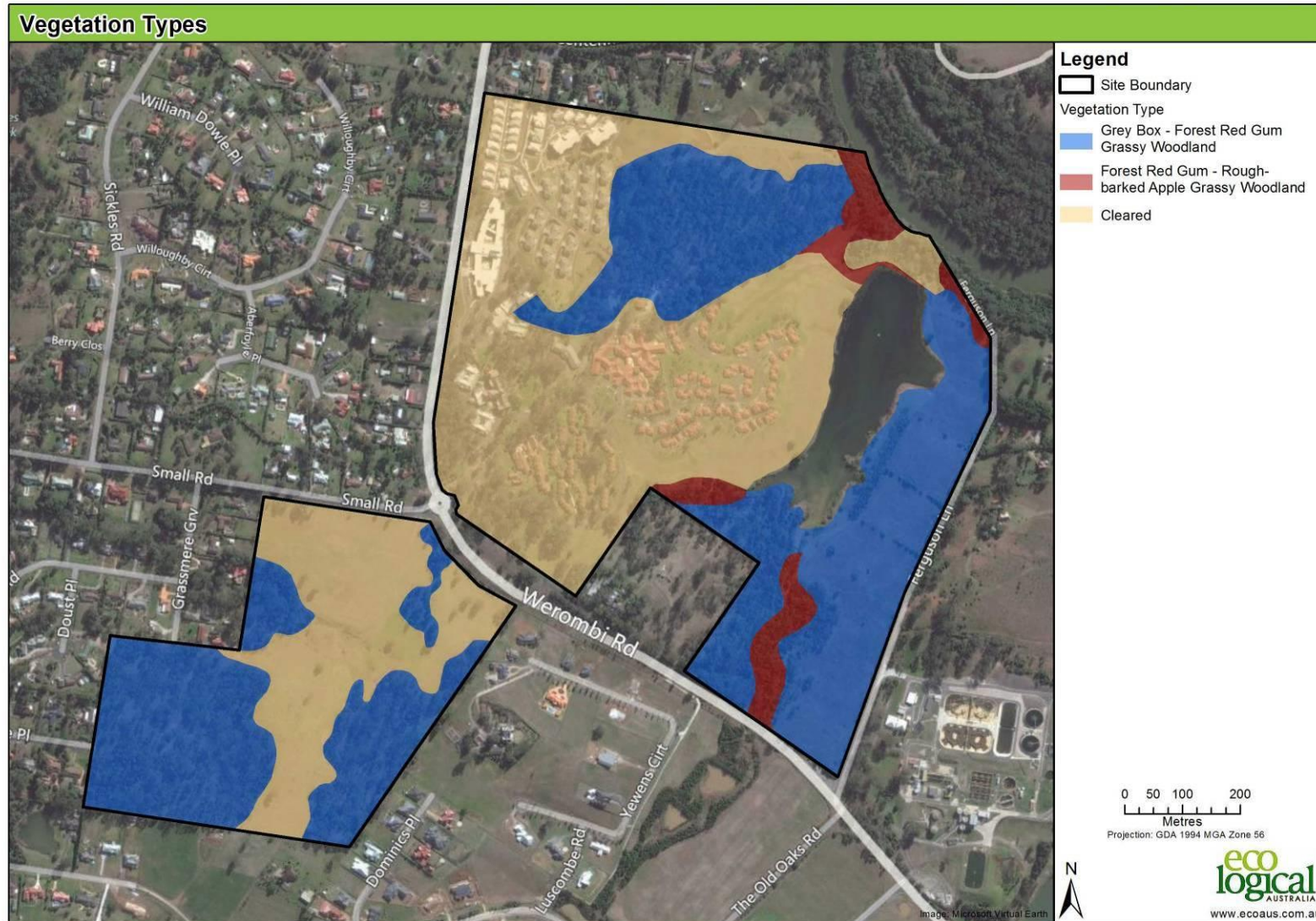


Figure 3: Study Site Vegetation Types (as per BCAM Classifications)

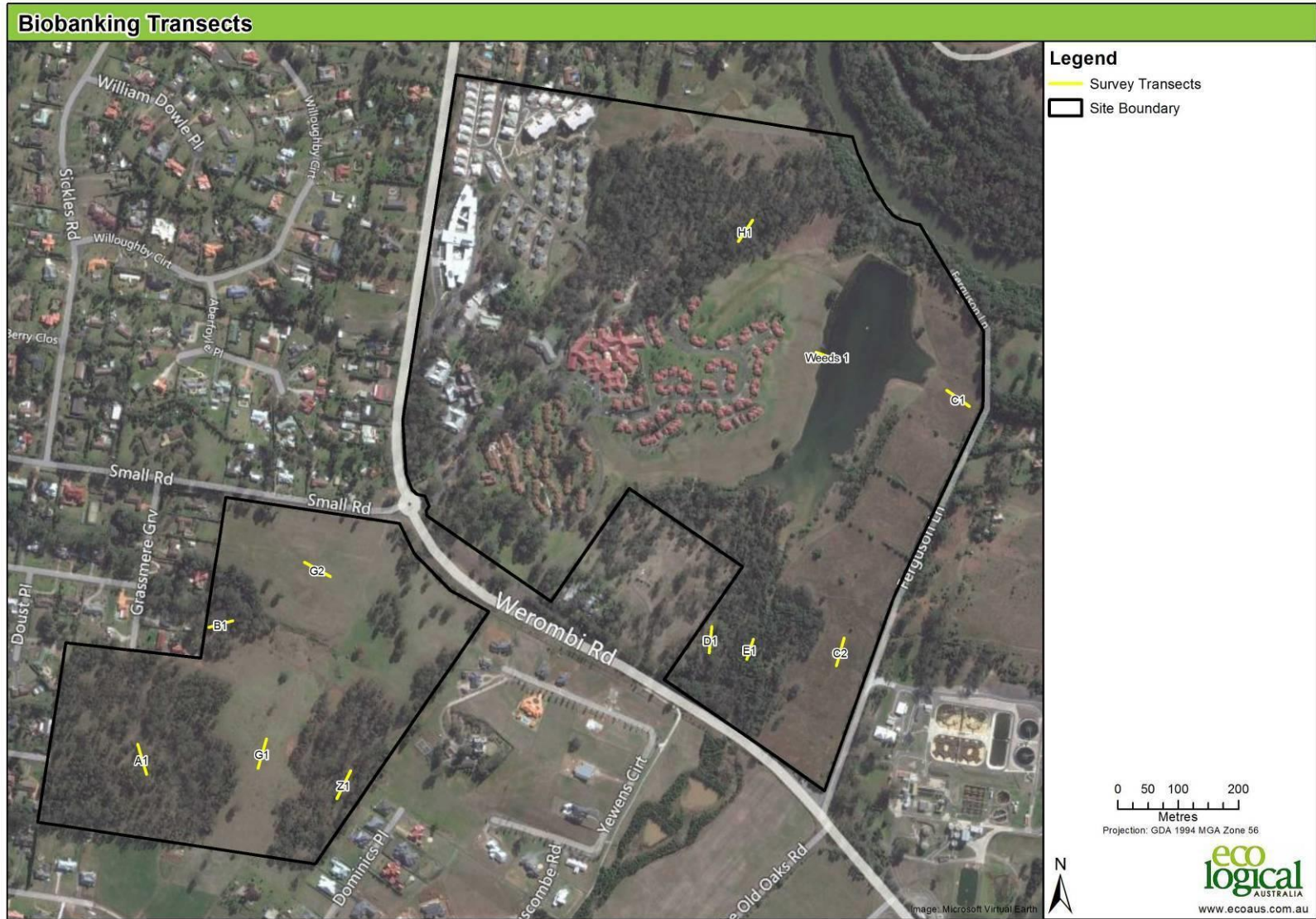


Figure 4: Location of Biocertification Assessment Transects

3 Results

3.1 LITERATURE AND DATABASE REVIEW

Vegetation across the study area has been mapped by various authors (NPWS 2002, Conacher Travers 2005, 2006, ELA 2011 and 2012). A number of threatened species were identified within the Carrington Centennial Care estate from the previous studies and database records.

Table 1: Threatened Species and Endangered Ecological Communities previously recorded in the study area

SPECIES NAME	COMMON NAME	STATUS	
		TSC ACT	EPBC ACT
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipstrelle	V	-
<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing Bat	V	-
<i>Mormopterus norfolkensis</i>	Eastern Freetail Bat	V	-
<i>Myotis macropus*</i>	Southern Myotis	V	-
<i>Pteropus poliocephalus</i>	Grey-headed Flying Fox	V	V
<i>Corneovirens meridolum</i>	Cumberland Plain Land Snail	E	-
<i>Pimelea spicata</i>	Spiked Rice Flower	E	E
<i>Pomaderris brunnea</i>	Brown Pomaderris	V	V
Grey Box- Forest Red Gum (GB-FRG) Grassy Woodland on shales of the southern Cumberland Plain, Sydney Basin Cumberland Plain Woodlands (TEC)		CE	CE
Forest Red Gum – Rough Barked Apple (FRD-RBA) grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin River Flat Eucalypt Forest (TEC)		E	-

*Recorded onsite in 2005 by Conacher Travers but recorded as *Marcopus adversus* (Large Footed Myotis) as it was known at the time.

3.2 BIOMETRIC VEGETATION TYPE AND CONDITION MAPPING

Previous vegetation mapping for the site formed the basis for the Biodiversity Assessment of the entire Carrington Centennial Care estate study area. Within the entire study area, ELA recorded 2 unique vegetation communities. The vegetation communities identified in the study area were converted to

biometric vegetation types through comparison between the vegetation descriptions of NPWS (2002) and the Biometric Vegetation Type Database (DECC 2008). The equivalent Biometric vegetation types for each vegetation community in the study area are shown in **Table 1** above.

Following the conversion of communities to Biometric vegetation types, the existing vegetation mapping was tagged with the corresponding Biometric vegetation types as outlined in **Table 1**. The vegetation mapping within the study area was subsequently updated using high resolution digital imagery and an on-screen digitising approach to capture vegetation which had not previously been mapped or was no longer extant.

The vegetation of the study area comprises two native and one exotic vegetation type: remnant stands of Grey Box – Forest Red Gum (GB-FRG) grassy woodland and Forest Red Gum – Rough Barked Apple (FRG-RBA) grassy woodland plus exotic pasture grass cleared lands. Within the cleared lands, there are areas which retain little to no native canopy cover, while other cleared patches retain numerous native canopy trees.

Given the extensive level of field assessment undertaken to complete the 11 biobanking transects, it has been possible to map these communities to a relatively fine scale. As well as the two native vegetation communities on site, a densely weed infested area (adjacent to the dam and Nepean River) and cleared lands of exotic pasture grasses have also been mapped.

Vegetation Zones

Each vegetation type had varying condition levels due to the influence of weed species, current and previous land management activities and impacts from adjacent urban development activities.

The GB-FRG vegetation type was separated into 4 vegetation zones based on ancillary codes allocated (High, Medium, Poor (Olive) and Other (DNG) while there was only one vegetation zone for the FRG-RBA vegetation type of Poor (Olive) (see **Figure 5**). Areas of cleared land were also mapped.

All vegetation mapped is in moderate to good condition and ancillary codes have been used to further stratify vegetation zones as follows:

GB-FRG Vegetation Zones:

- Good = Remnant has good structure with canopy, mid storey and groundcover levels intact and predominantly native species. Some weed species are present but in low abundance and diversity.
- Moderate = patches have been under-scrubbed and thinned historically, Box Thorn weed is more prevalent as are other weeds species.
- Olive = African Olive completely dominates the mid-storey, eliminating or severely restricting any native groundcover species.
- DNG = Predominantly native grasslands of *Microleana* with little natural recruitment of canopy species currently occurring.

FRG-RBA Vegetation Zone:

Poor (Olive) = few native canopy trees, mid-storey of African Olive at 70 – 80% cover and little to no native groundcover.

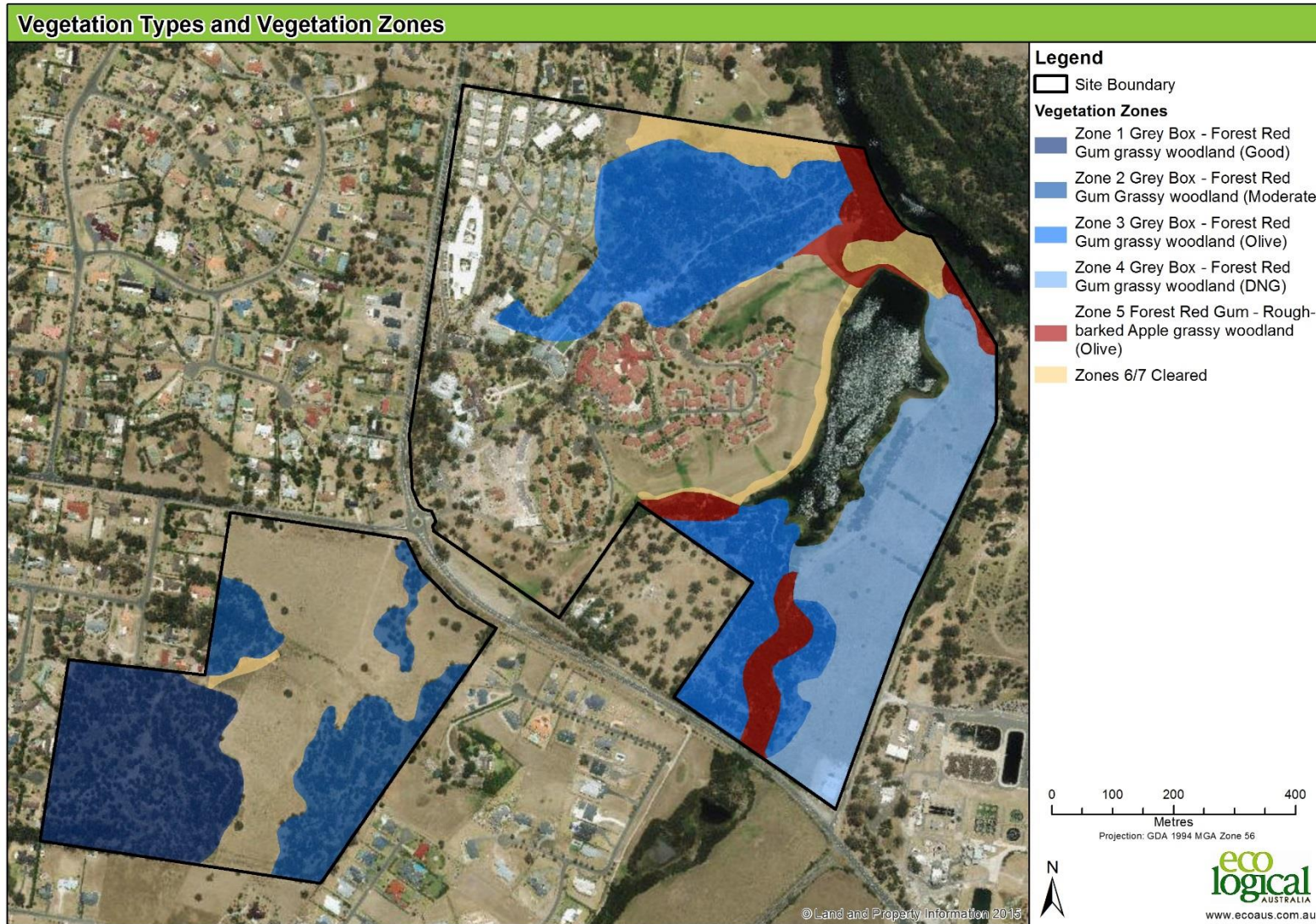


Figure 5: Study Site Vegetation Types and Vegetation Zones

3.3 VEGETATION TYPE DESCRIPTIONS

Vegetation type descriptions are provided below for both Grey Box – Forest Red Gum (GB-FRG) grassy woodland on shales of the southern Cumberland Plain, Sydney Basin and Forest Red Gum – Rough Barked Apple (FRG-RBA) grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin.

3.3.1 Grey Box – Forest Red Gum grassy woodland on shales of the southern Cumberland Plain, Sydney Basin

Description	Occurs on undulating terrain on shale hills of the southern Cumberland Plain at altitudes from 50 to 300m. Woodland with an open shrub layer and grassy groundcover.
Canopy	Grey Box (<i>Eucalyptus moluccana</i>), Forest Red Gum (<i>Eucalyptus tereticornis</i>), Narrow-leaved Ironbark (<i>Eucalyptus crebra</i>), Thin-leaved Stringybark (<i>Eucalyptus eugenioides</i>)
Midstorey	Blackthorn (<i>Bursaria spinosa</i> subsp. <i>spinosa</i>), Native Raspberry (<i>Rubus parvifolius</i>), <i>Clematis glycinoides</i>
Groundcovers	Kidney Weed (<i>Dichondra repens</i>), <i>Brunoniella australis</i> , <i>Desmodium gunnii</i> , <i>Aristida ramosa</i> , <i>Microlaena stipoides</i> var. <i>stipoides</i> , <i>Carex inversa</i> , Kangaroo Grass (<i>Themeda australis</i>), <i>Cyperus gracilis</i> , <i>Dichelachne micrantha</i> , <i>Asperula conferta</i> , <i>Oxalis perennans</i> , <i>Cheilanthes sieberi</i> subsp. <i>sieberi</i> , <i>Desmodium brachypodum</i>
Threatened Species / EEC	Cumberland Plain Woodlands (TSC) Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest (EPBC)
Weeds	African Olive (<i>Olea europaea</i>), African Boxthorn (<i>Lycium ferocissium</i>), African Love Grass (<i>Eragrostis curvula</i>), Kikuyu (<i>Pennisetum clandestinum</i>), Paddys Lucerne (<i>Sida rhombifolia</i>), Lambs Tongue (<i>Plantago lanceolata</i>)



Figure 6: Grey Box – Forest Red Gum grassy woodland on shales of the southern Cumberland Plain, Sydney Basin – Ancillary Code High (Good)



Figure 7: Grey Box – Forest Red Gum grassy woodland on shales of the southern Cumberland Plain, Sydney Basin – Ancillary Code Medium (Moderate)



Figure 8: Grey Box – Forest Red Gum grassy woodland on shales of the southern Cumberland Plain, Sydney Basin – Ancillary Code Poor (Olive)



Figure 9: Grey Box – Forest Red Gum grassy woodland on shales of the southern Cumberland Plain, Sydney Basin Ancillary Code Other (Derived Native Grassland)

3.3.2 Forest Red Gum – Rough Barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin

Description	Occurs on stream banks and alluvial flats on the Cumberland Plain. Restricted to the Hawkesbury-Nepean and Georges River systems on alluvial soils derived from Wianamatta Shale. Woodland with an open shrub layer and a continuous groundcover of grasses and forbs.
Canopy	Forest Red Gum (<i>Eucalyptus tereticornis</i>), Rough-barked Apple (<i>Angophora floribunda</i>), Cabbage Gum (<i>Eucalyptus amplifolia</i> subsp. <i>amplifolia</i>)
Midstorey	<i>Acacia parramattensis</i> , Blackthorn (<i>Bursaria spinosa</i> subsp. <i>spinosa</i>), <i>Sigesbeckia orientalis</i>
Groundcover	<i>Microlaena stipoides</i> var. <i>stipoides</i> , <i>Oplismenus aemulus</i> , Kidney Weed (<i>Dichondra repens</i>), <i>Entolasia marginata</i> , <i>Solanum prinophyllum</i> , <i>Pratia purpurascens</i> , <i>Echinopogon ovatus</i> , <i>Desmodium gunnii</i> , <i>Commelina cyanea</i> , <i>Veronica plebeia</i>
Threatened Species / EEC	River-Flat Eucalypt Forest on Coastal Floodplains of the NSW North Coast, Sydney Basin and South East Corner bioregions (TSC Act)
Weeds	African Olive (<i>Olea europaea</i>), Honey Locust (<i>Gleditsia triacanthos</i>), Broad-Leaved Privet (<i>Ligustrum lucidum</i>), Small-Leaved Privet (<i>Ligustrum sinense</i>), <i>Tradescantia albiflora</i> , <i>Nephrolepis</i> sp.



Figure 10: Forest Red Gum - Rough Barked Apple grassy woodland on the alluvial flats of the Cumberland Plain, Sydney Basin - Ancillary Code Poor (Olive)

Threatened Ecological Community Mapping

Both the GB-FRG and FRG-RBA grassy woodland vegetation types are threatened ecological communities. GB-FRG is listed as the critically endangered ecological community Cumberland Plain Woodland under the TSC Act and as Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest under the EPBC Act. FRG-RBA is listed as River Flat Eucalypt Forest and endangered under the TSC Act. **Table 2** breaks down the two native vegetation types in the study area by their vegetation zone and shows the extent of each vegetation type and zone.

Table 2: Summary of vegetation communities and zones

VEGETATION COMMUNITY	AREA (HA)	% OF SITE
Grey Box – Forest Red Gum (GB-FRG) grassy woodland on shales of the southern Cumberland Plain, Sydney Basin – Good	8.8	8.9
Grey Box – Forest Red Gum (GB-FRG) grassy woodland on shales of the southern Cumberland Plain, Sydney Basin Cumberland Plain Woodland – Moderate	6.2	6.3
Grey Box – Forest Red Gum (GB-FRG) grassy woodland on shales of the southern Cumberland Plain, Sydney Basin – Olive	11.1	11.3
Grey Box – Forest Red Gum (GB-FRG) grassy woodland on shales of the southern Cumberland Plain, Sydney Basin – DNG	14.4	14.6

Forest Red Gum – Rough Barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin River Flat Eucalypt – Olive	3.8	3.9
Cleared (all areas of exotic vegetation or existing development)	54.1	55.0
Total	98.4	100

Approximately 45% or 45 ha of the entire study area consists of an endangered ecological community in various condition classes, while 55% of the site is currently cleared lands. These vegetation zones are mapped in **Figure 5** above.

3.4 FLORA

A total of 128 flora species were recorded in the study area during the vegetation surveys. Of these, 82 were native and 46 were introduced. A full list of these species can be found in Appendix 2.

3.4.1 Threatened Flora

Potential threatened flora species were identified through the literature and database review, including the biobanking tool and BioNet Atlas of NSW Wildlife as well as expert knowledge. Threatened flora species targeted for survey were:

- *Pimelea spicata* – Spiked Rice Flower, listed as endangered under both the TSC Act and EBPC Act,
- *Eucalyptus benthamii* - Camden White Gum, listed as vulnerable under both the TSC Act and EBPC Act.
- *Pomaderris brunnea* – Brown Pomaderris, listed as vulnerable under both the TSC Act and EBPC Act.

Within the Rezoning Site, the areas of remnant CPW vegetation are in relatively good condition and have intact shrub and ground layers due to lower levels of disturbance compared to the existing aged care facility site north of Werombi Road. These patches had the greatest likelihood of containing any threatened flora species, however no individuals were recorded. Previous flora surveys on site did not record threatened flora species either (Conacher Travers 2005, ELA 2011).

Pimelea spicata – Spiked Rice Flower

The Spiked Rice-flower is a shrub to 50 cm tall that may be erect or somewhat prostrate in habit. The leaves are opposite and elliptical, to 20 mm long by 8 mm wide. The white, pink-tinged flowers are tubular, to 10 mm long, with four spreading petals. They may appear at any time of the year, but are mostly seen in summer. Once widespread on the Cumberland Plain, the Spiked Rice-flower occurs in two disjunct areas; the Cumberland Plain (Narellan, Marayong, Prospect Reservoir areas) and the Illawarra (Landsdowne to Shellharbour to northern Kiama) (NSW OEH 2012). Targeted survey for this species was undertaken for a total of 9 person hours, during its peak flowering period however no individuals were recorded on site.

Pimelea spicata has not previously been recorded on site and was not detected during fieldwork.

Eucalyptus benthamii – Camden White Gum

A tall tree to 40 m high with smooth, white bark and numerous long, loose bark ribbons, and a persistent, flaky bark stocking at the base. Flowers in summer. Capsules are small and usually bell-shaped. Occurs on the alluvial flats of the Nepean River and its tributaries. There are two major subpopulations: in the

Kedumba Valley of the Blue Mountains National Park and at Bents Basin State Recreation Area. Several trees are scattered along the Nepean River around Camden and Cobbitty. The species requires a combination of deep alluvial sands and a flooding regime that permits seedling establishment (NSW OEH 2012). No individuals of this species were recorded in the study area.

Eucalyptus benthamii has been previously recorded immediately north of the study area on the northern bank of the Nepean River however was not recorded from the study area during fieldwork.

Pomaderris brunnea – Brown Pomaderris

Brown Pomaderris is a shrub to 3 m tall that has distinctively hairy stems. The stem-hairs comprise long brownish hairs above a thick white hairy under-coat. The leaves are up to 4 cm long and 1.5 cm wide and have toothed margins. The upper leaf surface is hairless; the lower surface is densely hairy like the stem. The leaf veins extend to the margins. The small, yellowish flowers have no petals and form dense clusters at the ends of the branches. Brown Pomaderris is found in a very limited area around the Colo, Nepean and Hawkesbury Rivers, including the Bargo area and near Camden. It also occurs near Walcha on the New England tablelands and in far eastern Gippsland in Victoria.

Brown Pomaderris grows in moist woodland or forest on clay and alluvial soils of flood plains and creek lines. Flowers appear in September and October.

Pomaderris brunnea has been previously recorded immediately north of the study area on the northern bank of the Nepean River but was not recorded during fieldwork.

Table 3 identifies the threatened flora species returned by the database searches together with an assessment of the likelihood of occurrence for each species. Each species likely occurrence was determined by records in the area, habitat availability and knowledge of the species' ecology. Only species which were considered to have the potential, likely or known from the site are presented below.

Table 3: Likelihood of Occurrence Species in the Study Site (Potential, Likely and Known species only)

SCIENTIFIC NAME	COMMON NAME	TSC ACT	EPBC ACT	HABITAT ASSOCIATIONS	LIKELIHOOD OF OCCURRENCE	RECORDED DURING FIELD DURYVEY
<i>Cynanchum elegans</i>	White-flowered Wax Plant	E	E	Clonal climber or twiner with a variable form, flowering August-May, peaking in November (DEC 2005). It occurs in dry rainforest gullies, scrub and scree slopes, and occurs mainly at the ecotone between dry subtropical rainforest and sclerophyll forest/woodland communities (NPWS 2002). The species has also been found in: littoral rainforest; <i>Leptospermum laevigatum</i> – <i>Banksia integrifolia</i> subsp <i>integrifolia</i> coastal scrub; <i>Eucalyptus tereticornis</i> aligned open forest/ woodland; <i>E. maculata</i> aligned open forest/woodland; and <i>Melaleuca armillaris</i> scrub to open scrub (NPWS 2002).	Unlikely	No
<i>Eucalyptus benthamii</i>	Camden White Gum	V	V	<i>Eucalyptus benthamii</i> occurs in wet open forest on sandy alluvial soils along valley floors. It has a restricted but locally abundant distribution. A few scattered individuals have previously been recorded in the Nepean River System (NPWS 2000).	Unlikely	No
<i>Grevillea parviflora</i> <i>subsp. parvifolia</i>	Small-flower Grevillea	V	V	Occurs on sandy clay loam soils, often with lateritic ironstone gravels (DEC 2005). Soils are mostly derived from Tertiary sands or alluvium and from the Mittagong Formation with alternating bands of shale and fine-grained sandstones. Soil landscapes include Lucas Heights and Berkshire Park (DEC 2005). Often occurs in open, slightly disturbed sites such as along tracks. Flowering has been recorded from July to December as well as April-May (DEC 2005).	Unlikely	No
<i>Persoonia bargoensis</i>	Bargo Geebung	E	V	Restricted to catchments of the Cataract, Cordeaux and Bargo Rivers. Species grows in dry sclerophyll eucalypt woodland or forest and occurs on well drained, loamy soils between 100 and 300 m altitude (DSEWPAC 2012).	No	No

SCIENTIFIC NAME	COMMON NAME	TSC ACT	EPBC ACT	HABITAT ASSOCIATIONS	LIKELIHOOD OF OCCURRENCE	RECORDED DURING FIELD DURVEY
<i>Pimelea spicata</i>	Spiked Rice-flower	E	E	In western Sydney, it occurs on an undulating topography of well structured clay soils, derived from Wianamatta shale (DEC 2005). It is associated with Cumberland Plains Woodland (CPW), in open woodland and grassland often in moist depressions or near creek lines (<i>Ibid.</i>). Has been located in disturbed areas that would have previously supported CPW (<i>Ibid.</i>). Occurs on undulating topography on substrates derived from Wianamatta Shale in areas of Cumberland Plain Woodland Vegetation Community. Recorded from open woodlands and grasslands dominated by <i>Eucalyptus moluccana</i> , <i>E. crebra</i> , <i>E. tereticornis</i> , <i>Bursaria spinosa</i> and <i>Themeda triandra</i> , and in the Illawarra occurs on clay soils on coastal headland in <i>Themeda triandra</i> grassland with low native shrubs present (DSEWPAC 2011b).	Unlikely	No
<i>Pomaderris brunnea</i>	Brown Pomaderris	V	V	Associated with open forests (Harden 1990) in association with <i>Eucalyptus amplifolia</i> , <i>Angophora floribunda</i> , <i>Acacia parramattensis</i> , <i>Bursaria spinosa</i> and <i>Kunzea ambigua</i> (Maryott-Brown & Wilks 1993). It is found on the Colo River, the Nepean R. floodplain at Menangle, in creeklines at Wirrumbirra Sanctuary (Bargo) and on the Hawkesbury R. (Harden 1990; Peacock 1996; Fairley & Moore 2000). The distribution may extend into the southern section of Yengo NP along major creeklines and floodplains (Maryott-Brown & Wilks 1993).	Unlikely	No
<i>Thesium australe</i>	Austral Toadflax	V	V	The species is found in small populations in eastern NSW, Tasmania and Queensland. It occurs in grassland on coastal headlands or grassy woodland inland. It is often found in association with <i>Themeda australis</i> , which it is often a root parasite of (DEH 2012).	No – Only 1 previous recording within 10 km of the site from 1803	No

3.5 FAUNA

The study area contains a number of broad habitat elements for flora and fauna. These habitat elements include:

- Remnant vegetation patches with intact canopy layer;
- Derived native grasslands;
- Hollow-bearing trees;
- Ephemeral drainage lines and associated vegetation;
- Large dam with open water and emergent vegetation;
- Woody debris (fallen logs and branches);

Most of the habitat elements were present within the wooded areas of the study area, however, there were habitat elements within the derived grassland, including scattered hollow-bearing trees, drainage lines and associated vegetation and a very large dam (**Figure 11** and **Figure 12**).



Figure 11: Example of Hollow Bearing Trees



Figure 12: Dam on site presenting aquatic habitat

The habitat elements available within the study area potentially provide sheltering, foraging, and roosting habitat for a range of fauna groups, particularly as several canopy trees and stags supported hollows for arboreal mammals, birds and bats to shelter/roost/breed. Intact canopy, shrub layers and derived grassland provide foraging habitat for birds and bats. Woody debris provides potential foraging and sheltering habitat for ground dwelling mammals, frogs and reptiles.

3.5.1 Threatened Fauna

Table 4 identifies the threatened species returned by the database search together with an assessment of the likelihood of occurrence for each species. Each species likelihood of occurrence was determined by records in the area, habitat availability and knowledge of the species' ecology. Only species considered with the potential, likely or known from the site are listed in the table below.

Table 4: Likelihood of Occurrence of Threatened Fauna Species within the study site

SCIENTIFIC NAME	COMMON NAME	TSC ACT	EPBC ACT	HABITAT ASSOCIATIONS	LIKELIHOOD OF OCCURRENCE	RECORDED DURING FIELD SURVEY
DIURNAL BIRDS						
<i>Chthonicola sagittata</i>	Speckled Warbler	V	-	Occupies a wide range of eucalypt dominated communities with a grassy understorey, often on rocky ridges or in gullies (DEC 2005). Typical habitat would include scattered native tussock grasses, a sparse shrub layer, some eucalypt regrowth and an open canopy (DEC 2005). Large, relatively undisturbed remnants are required for the species to persist in an area (DEC 2005). Pairs are sedentary and occupy a breeding territory of about ten hectares, with a slightly larger home-range when not breeding (DEC 2005).	Likely	No
<i>Daphoenositta chrysoptera</i>	Varied Sittella	V		Varied Sittellas are endemic and widespread in mainland Australia. Varied Sittellas are found in eucalypt woodlands and forests throughout their range. They prefer rough-barked trees like stringybarks and ironbarks or mature trees with hollows or dead branches (Birds in Backyards 2011).	Likely	No
<i>Glossopsitta pusilla</i>	Little Lorikeet	V		In NSW, Little Lorikeets are distributed in forests and woodlands from the coast across the Divide, reaching west as far as Albury, Parkes, Dubbo and Narrabri. Occur in dry, open eucalypt forests and woodlands. Recorded from both old-growth and logged forests in the eastern part of their range, and in remnant woodland patches and roadside vegetation on the western slopes. Primarily feed on nectar and pollen in the tree canopy, particularly on profusely-flowering eucalypts, but also on a variety of other species including melaleucas and mistletoes. On the western slopes and tablelands <i>Eucalyptus albens</i> (White Box) and <i>E. melliodora</i> (Yellow Box) are particularly important food sources for pollen and nectar respectively (OEH 2011).	Potential	No
<i>Hieraaetus morphnoides</i>	Little Eagle	V		Utilises open eucalypt, sheoak and acacia forest, woodland or open woodland. Builds a large stick nest in winter, in tall trees within remnant vegetation. Lays eggs in spring, and young fledge in early summer. Primarily preys on birds, reptiles and mammals, and occasionally feeds on large insects or carrion (DEC 2005).	Potential	No

SCIENTIFIC NAME	COMMON NAME	TSC ACT	EPBC ACT	HABITAT ASSOCIATIONS	LIKELIHOOD OF OCCURRENCE	RECORDED DURING FIELD SURVEY
<i>Lathamus discolor</i>	Swift Parrot	E	E	Breeds in Tasmania between September and January. Migrates to mainland in autumn, where it forages on profuse flowering eucalypts (Blakers et al. 1984, Schodde and Tidemann 1986). In this region, autumn and winter flowering eucalypts are important for this species. Favoured feed trees include winter flowering species such as Swamp Mahogany (<i>Eucalyptus robusta</i>), Spotted Gum (<i>Corymbia maculata</i>), Red Bloodwood (<i>C. gummifera</i>), Mugga Ironbark (<i>E. sideroxylon</i>), and White Box (<i>E. albens</i>) (DEC 2005).	Potential	No
<i>Melanodryas cucullata cucullata</i>	Hooded Robin (south-eastern form)	V		Associated with a wide range of Eucalypt woodlands, Acacia shrubland and open forests (Blakers et al. 1984). In temperate woodlands, the species favours open areas adjoining large woodland blocks, with areas of dead timber and sparse shrub cover (OEH 2011). Hooded Robin home ranges are relatively large, and a ground-foraging species that pounces on insect prey (<i>ibid.</i>)	Likely	No
<i>Oxyura australis</i>	Blue-billed Duck	V		The Blue-billed Duck prefers deep water in large permanent wetlands and swamps with dense aquatic vegetation (DEC 2005). The species is completely aquatic, swimming low in the water along the edge of dense cover (DEC 2005). It will fly if disturbed, but prefers to dive if approached (DEC 2005). Blue-billed Ducks are partly migratory, with short-distance movements between breeding swamps and over-wintering lakes with some long-distance dispersal to breed during spring and early summer (DEC 2005). Young birds disperse in April-May from their breeding swamps in inland NSW to non-breeding areas on the Murray River system and coastal lakes (DEC 2005).	Potential	No
<i>Petroica boodang</i>	Scarlet Robin	V		In NSW, occurs from the coast to the inland slopes, with some dispersing to open habitat of lower valleys and plains after breeding in July-January (DEC 2005). In habits dry open eucalypt forest and woodland with a sparse shrub layer. Occasionally occurs in mallee, wet forest, wetlands or tea-tree swamps (DEC 2005).	Potential	No

SCIENTIFIC NAME	COMMON NAME	TSC ACT	EPBC ACT	HABITAT ASSOCIATIONS	LIKELIHOOD OF OCCURRENCE	RECORDED DURING FIELD SURVEY
<i>Petroica phoenicea</i>	Flame Robin	V		Endemic to SE Australia, and ranges from south-east Qld to south-east SA, including Tasmania. In NSW, birds breed from spring to late summer in upland tall moist eucalypt forests and woodlands, often on ridges and slopes, preferring clearings or areas with an open understorey dominated by native grass. Birds migrate to drier, more open forests, woodlands or grasslands in winter (DEC 2005).	Potential	No
<i>Stagonopleura guttata</i>	Diamond Firetail	V		Typically found in grassy woodlands, but also occurs in open forest, mallee, Natural Temperate Grassland and in secondary grassland derived from other communities (DECC 2007). It is often found in riparian areas and sometimes in lightly wooded farmlands (DECC 2007). Appears to be sedentary, though some populations move locally, especially those in the south (DECC 2007)	Potential	No
NOCTURNAL BIRDS						
<i>Ninox strenua</i>	Powerful Owl	V		The Powerful Owl is endemic to eastern and south-eastern Australia, mainly on the coast. In NSW, it is widely distributed throughout the eastern forests, with scattered, mostly historical records on the western slopes and plains. Now uncommon throughout its range where it occurs at low densities. (OEH 2012). The Powerful Owl inhabits a range of vegetation types, from woodland and open sclerophyll forest to tall open wet forest and rainforest. The Powerful Owl requires large tracts of forest or woodland habitat but can occur in fragmented landscapes as well. The species breeds and hunts in open or closed sclerophyll forest or woodlands and occasionally hunts in open habitats.	Potential	No
GASTROPODS						
<i>Meridolum corneovirens</i>	Cumberland Plain Land Snail	E1		Found within Cumberland Plains Woodland and on fringes of River Flat Forest. Typically occurs amongst logs and other debris, amongst leaf and bark accumulations around based of trees and sometimes under grass clumps	Yes	Yes
MAMMALS						
<i>Myotis macropus</i>	Southern Myotis	V		Found in caves, mines, tunnels, culverts, under bridges etc. Forages above water on aquatic insects	Yes	Yes

SCIENTIFIC NAME	COMMON NAME	TSC ACT	EPBC ACT	HABITAT ASSOCIATIONS	LIKELIHOOD OF OCCURRENCE	RECORDED DURING FIELD SURVEY
<i>Pteropus poliocephalus</i>	Grey-headed Flying Fox	✓	✓	Inhabits a wide range of habitats including rainforest, mangroves, paperbark forests, wet and dry sclerophyll forests and cultivated areas (Churchill 1998, Eby 1998). Camps are often located in gullies, typically close to water, in vegetation with a dense canopy (Churchill 1998).	Yes	Yes
<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing Bat	✓		Associated with a range of habitats such as rainforest, wet and dry sclerophyll forest, monsoon forest, open woodland, paperbark forests and open grassland (Churchill 1998). It forages above and below the tree canopy on small insects (AMBS 1995, Dwyer 1995, Dwyer 1981). Will utilise caves, old mines, and stormwater channels, under bridges and occasionally buildings for shelter (Environment Australia 2000, Dwyer 1995).	Yes	Yes
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	✓		Prefers moist habitats with trees taller than 20m (DECC 2007). Roosts in tree hollows but has also been found roosting in buildings or under loose bark (DECC 2007).	Yes	Yes
<i>Mormopterus norfolkensis</i>	Eastern Freetail Bat	✓		Most records of this species are from dry eucalypt forest and woodland east of the Great Dividing Range (Churchill 1998). Individuals have, however, been recorded flying low over a rocky river in rainforest and wet sclerophyll forest and foraging in clearings at forest edges (Environment Australia 2000; Allison & Hoyer 1998). Primarily roosts in hollows or behind loose bark in mature eucalypts, but have been observed roosting in the roof of a hut (Environment Australia 2000; Allison & Hoyer 1998).	Yes	Yes

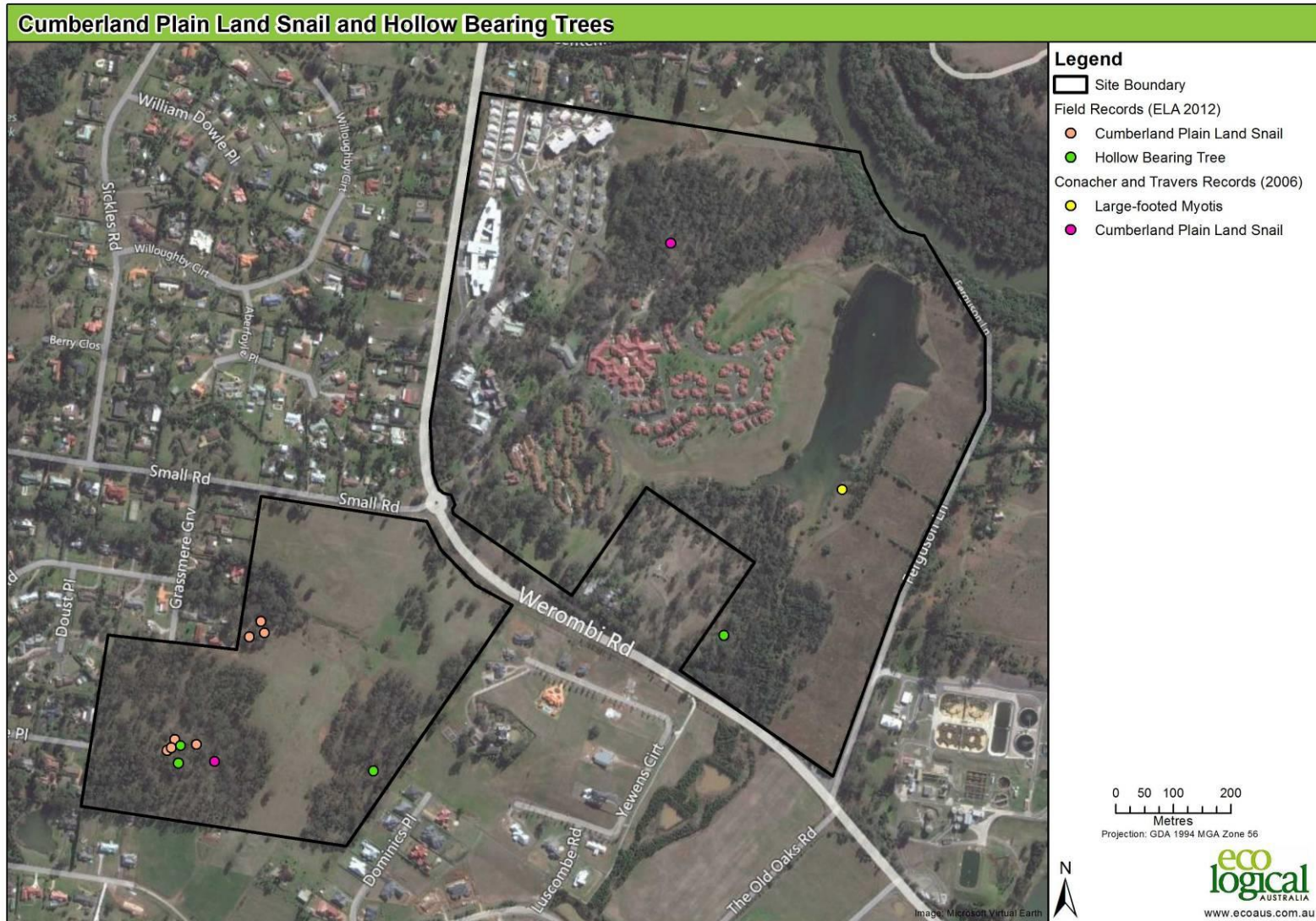


Figure 13: Location of Threatened Species recorded during survey and Hollow Bearing Trees

4 Biodiversity Certification Assessment Results

Provided below are the results of the biodiversity certification assessment conducted to the requirements of the BCAM. The information below is technical in nature, and relies on a broad understanding of the BCAM to understand the methods applied. Readers should make themselves familiar with the BCAM before reviewing this section of the document (available at <http://www.environment.nsw.gov.au/resources/biocertification/110170biocertassessmeth.pdf>).

Assumptions and Limitations in applying the BCAM

The BCAM provides a repeatable and scientifically robust methodology to determine whether a proposal meets an 'improve or maintain' biodiversity outcome. In applying the BCAM to the Carrington Centennial Care estate, however, several assumptions have been made and are provided below. In performing the calculations each dedicated land zone within the Smalls Road Masterplan was also assigned a biodiversity outcome of either:

- Land proposed for development, or
- Land proposed for conservation.

Land proposed for development includes all land proposed for Independent Living Units within the "Creekline" and "Woodland" precincts as well as the Commercial and Community Use and Residential Aged Care Facility (RACF). As part of the rezoning and subsequent DA processes, these areas are to be zoned B1 or R2 and are likely to be largely cleared or modified and replaced with buildings or vegetation which does not meet the definition of a vegetation community (i.e. gardens, lawns).

Land proposed for conservation includes land proposed for environmental conservation zones (E2), including the Aboriginal Heritage artefacts site which will be set aside for conservation purposes. Although the current rezoning proposal only involves land within the Smalls Road rezoning site, additional proposed environmental conservation lands are located in the Northern part of the study area.

The allocation of land use types for the total study area under the BCAM is illustrated in Table 5, based on the Smalls Road Masterplan and the Conservation Lands identified in the Conservation and Land Use Management Plan (ELA 2014).

Table 5: Biocertification Land Use Table

CONCEPT MASTER PLAN LAND USE	LAND USE ALLOCATED
Independent Living Units (Woodland Precinct)	Development
Independent Living Units (Creekline Precinct)	Development
Commercial and Community Uses	Development

CONCEPT MASTER PLAN LAND USE	LAND USE ALLOCATED
Residential Aged care Facility (RACF)	Development
Managed Land (APZ Compliant)	Development
Retained Vegetation - comprising eastern retained vegetation within the rezoning site which will be managed as an APZ	Development
Retained Vegetation – comprising the western retained vegetation on the rezoning site	Land proposed for Conservation
Retained Vegetation – comprising the Aboriginal Heritage artefacts site and associated vegetation	Land proposed for Conservation
Riparian Zone	Land Proposed for Conservation (Northern Campus)

3.55 ha of cleared land occurs within lands proposed for conservation, and has therefore been included in the calculation of potential credit generation for the study area. As the land is currently substantially cleared, original vegetation types were allocated using the surrounding remnant vegetation as a guide.

Indirect impacts have not been calculated during this assessment as it has been assumed that all impacts will be contained within the areas identified for development, a requirement of the BCAM. This includes all roads, associated infrastructure (e.g. water / sewer / stormwater / electricity installations, future Rural Fire Service station), Asset Protection Zones (APZs) and other impacts. Potential increases in flow and volume of stormwater across the site post development due to increased impervious surfaces will be assessed at DA stage and have been assumed to be managed through detailed stormwater management and planning incorporating water sensitive urban design principles.

4.1 BIODIVERSITY CERTIFICATION ASSESSMENT AREA

An assessment consistent with the BCAM was conducted to determine whether the proposed rezoning proposal met the 'improve or maintain' principle required by the methodology. In conducting the assessment the current Smalls Road Masterplan was assigned into two proposed land uses to be assessed:

- Land proposed development - requires biodiversity credits;
- Land proposed for conservation (including E2 conservation areas)- generates biodiversity credits;

The footprint proposed for biodiversity certification (development) is shown in **Table 6** and **Figure 4**.
Table 6: Land Use Breakdown (under rezoning proposal) of Study Area

CARRINGTON CENTENNIAL CARE STUDY AREA	AREA (ha)
Land proposed for Development	21.26
Land proposed or Conservation	34.75

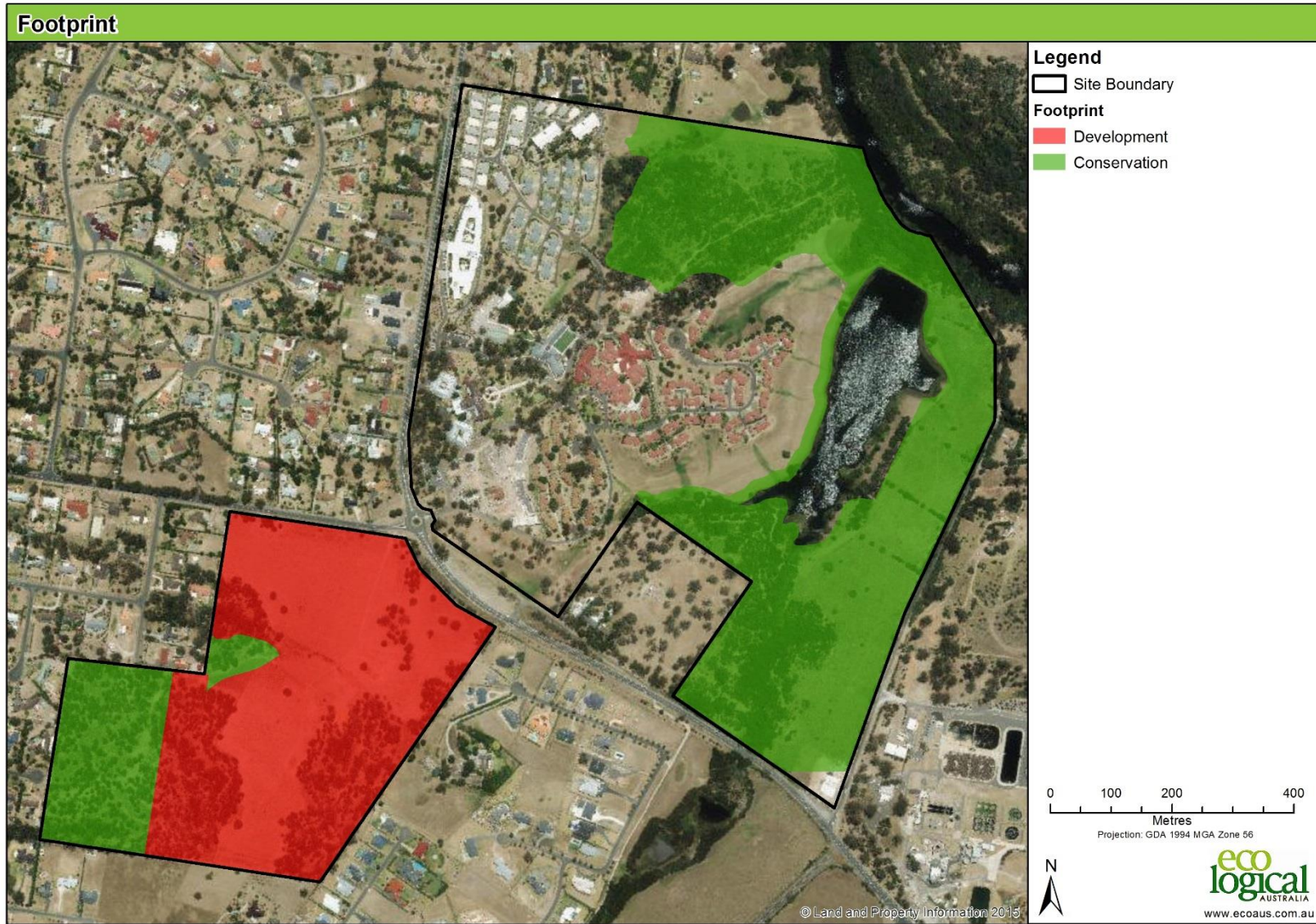


Figure 14: BCAM Assessment Development Lands and Conservation Lands

4.2 BCAM CONSERVATION VALUES

As defined in the BCAM, different levels of conservation security and ongoing management results in the generation of a different number of credits. The credit entitlement for conservation areas are broken into three broad categories, being:

- Areas that are managed and funded in perpetuity (i.e. Biobank sites or national parks)- 100% credit entitlement;
- Areas that are managed in perpetuity (i.e. Voluntary Conservation Agreements)- 90% credit entitlement;
- Areas that are secured through planning instrument (i.e. environmental zoning) - 25% credit entitlement.

A series of options can be selected within a proposal, depending on what management is intended within the site. The credits calculated for this proposal have used the 25% credit entitlement option, as the proposed conservation measures will be applied through planning instrument measures, in this case E2 (Environmental Conservation) zoning.

4.3 VEGETATION MAPPING AND ZONES

Across the entire study area, 2 biometric vegetation types were identified:

- Grey Box – Forest Red Gum (GB_FRG) grassy woodlands on shales of the southern Cumberland Plain, Sydney Basin.
- Forest Red Gum – Rough Barked Apple (FRG-RBA) grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin.

Table 7 below shows the areas of each vegetation zone present across the entire study area and break up of vegetation zones within the two components of the total study area.

Table 7: Area of vegetation within the Carrington Centennial Care estate study area

	TOTAL AREA (HA)	GB-FRG AREA (HA)	FRG-RBA AREA (HA)	CLEARED LAND (HA)
Smalls Road Campus	27.22	14.97	0.0	12.25
Northern Campus	71.40	25.51	3.82	42.07
Total	98.63	40.49	3.82	54.32

The GB-FRG vegetation type was separated into 4 vegetation zones based on ancillary codes allocated (High, Medium, Poor - Olive, Other - DNG) while there was only one vegetation zone for the FRG-RBA vegetation type (Poor - Olive) (**Figure 5**). All vegetation mapped is in moderate to good condition, however ancillary codes have been used to further separate vegetation zones, including the following:

GB-FRG Vegetation Zones:

- Good = Remnant has good structure with canopy, mid storey and groundcover levels intact and predominantly native species. Some weeds species are present but in low abundance and diversity.

- Moderate = patches have been under-scrubbed and thinned historically, Box Thorn weed is more prevalent as are other weeds species.
- Olive = African Olive completely dominates the mid-storey, eliminating or severely restricting any native groundcover species.
- DNG = Predominantly native grasslands of Microleana with little natural recruitment of canopy species currently occurring.

FRG-RBA Vegetation Zone:

- Olive = few native canopy trees, mid-storey of African Olive at 70 – 80% cover and little to no native groundcover.

The proposed footprint consists of 31.21 ha of vegetation to be conserved, and an additional 3.55 ha of cleared land within the conservation footprint that will generate a number of credits. 9.21 ha of vegetation is within the development footprint, and will require credits to offset the impacts of the proposal. 3.88 ha of native vegetation will be 'retained' and will not require nor generate credits. Cleared lands within the development footprint (12.05 ha) are excluded from the assessment as these areas also neither require nor generate credits (**Table 8**).

Table 8: Extents of Vegetation Types and Vegetation Zones within the study area

VEG ZONE ID	BIOMETRIC VEG TYPE	CONDITION	ANCILLARY CODE CONDITION	AREA (HA)			
				LAND PROPOSED FOR DEVELOPMENT	LAND PROPOSED FOR BIODIVERSITY CONSERVATION	RETAINED LAND	TOTAL
1	Grey Box – Forest Red Gum Grassy Woodland on Shales of the southern Cumberland Plain, Sydney Basin	M / G*	Good	3.44	5.31		8.75
2	Grey Box – Forest Red Gum Grassy Woodland on Shales of the southern Cumberland Plain	M / G*	Moderate	5.77	0.45		6.22
3	Grey Box – Forest Red Gum Grassy Woodland on Shales of the southern Cumberland Plain	M / G*	Olive		11.46	.297	14.43
4	Grey Box – Forest Red Gum Grassy Woodland on Shales of the southern Cumberland Plain, Sydney Basin	M / G*	DNG		10.17	0.91	11.08
5	Forest Red Gum – Rough Barked Apple Grassy Woodland on Alluvial Flats of the Cumberland Plain, Sydney Basin	M / G*	Olive		3.82		3.82
6	Grey Box – Forest Red Gum Grassy Woodland on Shales of the southern Cumberland Plain, Sydney Basin	LOW	Cleared		2.00		2.00
7	Forest Red Gum – Rough Barked Apple Grassy Woodland on Alluvial Flats of the Cumberland Plain, Sydney Basin	LOW	Cleared		1.55		1.55
Total				9.21	34.75	3.88	47.85

*M / G = Moderate / Good as defined by BCAM

4.4 LANDSCAPE Tg VALUES

Tg (or threatened species gain) values represent the ability of a species to respond to improvement in Site Value or other habitat improvement at a biobank site with management actions. Tg is based on the lowest value of the following: effectiveness of management actions, life history characteristics, naturally very rare species and very poorly known species (DECC 2008). Landscape Tg values are required to calculate ecosystem credits using the BCAM. The Landscape Tg values are generated for each vegetation type by averaging the Tg values of all species predicted to occur in each vegetation type within the study site (**Table 9**). The Landscape Tg is effectively the offset multiplier for each vegetation type.

ELA calculated the Landscape Tg value for each vegetation type within the study area using the Biobanking Credit Calculator to determine which species were predicted in each vegetation type (**Appendix 3**). The Tg values for these species were then averaged to calculate the Landscape Tg. The table below provides details of the landscape Tg score used for each vegetation type assessed.

Table 9: Landscape Tg assigned to each vegetation type

VEGETATION TYPE	LANDSCAPE Tg
Grey Box – Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin	0.593
Forest Red Gum – Rough Barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin	0.586

4.5 TRANSECT DATA AND SITE VALUE SCORES

Appendix 4 of the BCAM defines the minimum number of transects/plots required per vegetation zone area (DECCW 2011). A total of 11 Biometric vegetation transects were captured across the Carrington Centennial Care estate study site, with a transect/plot requirement of 9 transects/plots calculated from the combined area of conservation and development lands (**Figure 5** and **Table 10**). The transect/plot data captured for this site is provided in **Appendix 4**.

Table 10: Vegetation Zones and transects / plots required

VEG ZONE ID	BIOMETRIC VEG TYPE	ANCILLARY CODE	AREA WITHIN SITE (ha)	TRANSECTS / PLOTS REQUIRED	TRANSECTS COLLECTED
1	Grey Box – Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin	Good	8.75	1	1
2	Grey Box – Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin	Moderate	6.22	1	2
3	Grey Box – Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin	Olive	14.43	2	2
4	Grey Box – Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin	DNG	11.08	2	2
5	Forest Red Gum – Rough Barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin	Olive	3.82	1	1
6	Grey Box – Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin	Cleared	2	1	2
7	Forest Red Gum – Rough Barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin	Cleared	1.55	1	1
Total			43.97	9	11

Current site value and future site value scores were calculated for each vegetation zone using the transect data collected. The Biobanking Credit Calculator was used to produce the current and future site value scores for both development and conservation (**Table 11**).

Any site values score of <34 are defined under the BCAM as being in low condition. After assessing the site values several vegetation zones previously determined to be in moderate/good condition (zones 4 and 5) were found to be in low condition.

Table 11: Site value scores allocated to each vegetation zone

VEG ZONE ID	BIOMETRIC VEGETATION TYPE	ANCILLARY CODE	CURRENT SITE VALUE SCORE	FUTURE SITE VALUE SCORE (DEVELOPMENT)	FUTURE SITE VALUE SCORE (CONSERVATION)
1	Grey Box – Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin	Good	50.52	0	68
2	Grey Box – Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin	Moderate	50.17	0	67
3	Grey Box – Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin	Olive	52.60	0	82
4	Grey Box – Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin	DNG	8.85*	0	22
5	Forest Red Gum – Rough Barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin	Olive	10.94*	0	28
6	Grey Box – Forest Red Gum grassy woodland on shale of the southern Cumberland Plain, Sydney Basin	Cleared	9.90	0	23
7	Forest Red Gum – Rough Barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin	Cleared	13.02	0	28

* Score <34 therefore, under the BCAM, condition is changed to 'Low'

4.6 LANDSCAPE SCORE

4.6.1 Native Cover in Landscape

Native vegetation cover within an assessment circle was calculated for the project. The landscape score calculations were completed with a 1,000 ha circle, thus a scaling factor of 1 was used in the assessment.

The results of the circle assessment are contained in **Table 12** Table 12 :. A pre-certification score of 7 was allocated, and with the minimal amount of clearing within the proposal (9.21 ha) a post certification score of 7 was also calculated.

Table 12 : Native vegetation in assessment circle

CIRCLE	BEFORE CERTIFICATION			AFTER CERTIFICATION		
	AREA OF VEGETATION WITHIN ASSESSMENT CIRCLE (HA)	NATIVE VEGETATION COVER CLASS (%)	SCORE	AREA OF VEGETATION WITHIN ASSESSMENT CIRCLE (HA)	NATIVE VEGETATION COVER CLASS (%)	SCORE
1 (1000 ha)	153	11-20%	7	144	11-20%	7

The land subject to conservation measures (post rezoning) is 35 ha, consisting of 4 ha of cleared land and 31 ha of vegetated land. This represents 3.5% of the 1,000 ha circle used to assess the BCAA. Therefore (using Table 3 of the BCAM) a gain of 2.2 is recorded for the percent native vegetation score after rezoning.

4.6.2 Connectivity Value

The current connectivity value of the site was assessed according to Section 3.7.2 of the BCAM. The BCAM identifies three components of connectivity, being the status of the area as a 'state' or 'regional' biodiversity link, the importance of each of the drainage lines within the BCAA and an assessment of the connectivity of vegetation.

Under the BCAM the highest score is awarded of all connectivity assessments completed for the site. The final results of the assessment are provided in **Table 13**. A description of the scores obtained for each component of the connectivity assessment is provided below.

Table 13: Connectivity scores allocated for the assessment

CONNECTIVITY SCORE	PRE DEVELOPMENT	POST DEVELOPMENT
Development	6	0
Conservation	12	

The land proposed for development has been assessed as containing local biodiversity links, due mainly to the presence of moderate to good vegetation with a width greater than 30m, and areas of moderate to good vegetation being greater than 30 ha. Therefore, a score of 6 was allocated pre-certification, reducing to 0 after development of these lands.

Lands proposed for conservation were also assessed. The conservation areas are within 30 m of the Nepean River, and is therefore allocated a regional biodiversity link status. A score of 12 was therefore allocated for connectivity related to the proposed conservation measures.

4.6.3 Adjacent Remnant Area

The maximum adjacent remnant area (ARA) was calculated for the proposal in order to determine the score to be allocated for this measure. The site predominantly occurs on the Cumberland Plain Mitchell Landscape, which is 89% cleared. The largest patch size in this Mitchell landscape required to meet the highest score for ARA is 50 ha. The vegetation on site is well connected, and as such has an ARA of >50 ha. The pre certification score allocated, therefore, is ten (10) points.

The conservation lands occur within the same Cumberland Plain Mitchell Landscape, and are also well connected, with an ARA of >50 ha. Therefore the score allocated for the conservation lands is also ten (10) points.

4.7 THREATENED SPECIES ASSESSMENT

4.7.1 Potential threatened species in the Development Footprint

Targeted threatened flora survey was undertaken for *Pimelea spicata* (Spiked Rice Flower) however it was not detected on site. Given the species has not been identified on-site, species credits were not calculated, consistent with the BCAM.

The site survey for this assessment in 2012 recorded the presence of Cumberland Plain Land Snail (CLS) (*Meridolum carneovirens*) in several locations across the study area. Significant numbers of CLS were also recorded on site by Conacher Travers in 2005 (see **Section 3.6.4** and **3.6.5**). Due to the predictability of CLS occurring essentially only within the GB-FRG Biometric vegetation types, this species is considered an ecosystem credit and is adequately considered by the calculation of ecosystem credits for the GB-FRG community under the BCAM.

Also recorded by Conacher Travers in 2005 were Southern Myotis (*Myotis macropus*) and Grey Headed Flying Fox (*Pteropus poliocephalus*). These species are considered 'split species credits', whereby areas known as roosting or breeding sites are considered species credits, while general feeding areas considered ecosystem credits. The Conacher Travers report (2005) considered that the study area only provides potential foraging habitat for Grey-headed Flying Fox and hence this species is adequately considered through the use of ecosystem credits.

The Conacher Travers report (2005) states that there is both potential foraging and roosting habitat present in the study area in both the GB-FRG and FRG-RBA vegetation types for the Southern Myotis (*Myotis macropus*), however exact roosting locations have not been confirmed. As these species was not identified during ELA surveys in 2012, species credits have not been calculated for this species, however the ecosystem credits calculated for the loss of vegetation do include the foraging habitat for these species.

4.8 RED FLAGS

The two biometric vegetation types present within the study area have been identified as being Endangered Ecological Communities and overcleared vegetation types (> 70% cleared of regional extent). Where in moderate/good condition, these vegetation types are therefore 'red flagged' under the BCAM.

As discussed previously, zones 4 and 5 are in low condition, and are therefore not red flagged. The total area of moderate/good red flagged vegetation is 29.41 ha. Of the 29.41 ha of red flagged vegetation present, 9.21 ha is present within the area proposed to be zoned for development purposes, representing 31.3% of the total amount present on site. As it is not proposed to formally seek Biocertification for the site, it is not a requirement to seek a red flag variation.

4.9 INDIRECT IMPACTS

The BCAM requires that any application for formal biodiversity certification must demonstrate how the "proposed ownership, management, zoning and development controls of the land proposed to for biodiversity certification is intended to mitigate any indirect impacts on biodiversity values" (DECCW 2011). This assessment has used a precautionary approach and has attempted to include all impacts

from future development activities within the land identified for development. This includes all roads, asset protection zones, infrastructure etc.

4.10 CREDIT CALCULATIONS

4.10.1 Ecosystem Credits

Ecosystem credits have been calculated for the impact caused by the proposed rezoning and the maintenance of biodiversity values through the management of conservation lands. In total, 206 credits are required for the proposed Rezoning Site to be rezoned and developed in the future (**Table 14**). There is no proposed impact on the FRG-RBA vegetation community as stands of this vegetation are completely retained within either the conservation lands or the riparian corridors. All impacts are to the GB-FRG vegetation community within the Smalls Road rezoning site.

As described earlier, different levels of conservation security and management results in the generation of a different number of credits. The credit entitlement for conservation areas are broken into three broad categories:

- Areas that are managed and funded in perpetuity (ie Biobank sites or National Parks) – 100% credit entitlement
- Areas that are managed in perpetuity (ie Voluntary Conservation Agreement) – 90% credit entitlement
- Areas that are secured through planning instruments (i.e. environmental zoning) – 25% credit entitlement.

The management of the lands in the study area that have been identified for conservation have been proposed to be secured through the use of environmental zoning. The results of these calculations are highlighted in bold text in **Table 14**.

Table 14 : BCAM calculations for credits and offsetting

Vegetation to be cleared (ha)	Vegetation to be conserved (ha)	Ecosystem Credits required for certification	Credits Created Biobanking	Credits Created by VCA	Credits Created E2 Zoning	Credit status Biobanking	Credit status VCA	Credit status E2 Zoning
GB-FRG 9.21 ha	GB-FRG 29.39 ha	232	308	277	77	76	45	-155
FRG-RBA 0 ha	FRG-RBA 5.37 ha	0	48	44	12	48	44	12
TOTAL 9.21 ha	34.75 ha	232	356	321	89	76	45	-240
						(8.2 ha)	(4.8 ha)	(-16.7 ha)

Table 14 shows that through the zoning of the conservation areas to E2 (Environmental Conservation) there would be a general reduction in the biodiversity values of the site based on the BCAM methodology. However, this outcome should be considered in the context of the broader environmental outcomes that will be achieved with the implementation of the CLUMP that has been prepared for the site. The CLUMP will not only guide the ongoing management and restoration of the E2 lands within both the Smalls Road and Northern Campus sites, but will be enforced via conditions of consent that will be attached to any future development application within the two areas.

In addition, a very significant proportion of the maintenance of biodiversity values that will be achieved is coming from the protection and management of existing site values. This reduces the influence of the “timelag” between a currently degraded, low biodiversity value area reaching a state of higher biodiversity value after restoration and rehabilitation works. Post-rezoning, a large proportion of the study area will exist in a state that is closer to the study area’s maximum biodiversity value than if the credit calculations were reliant on a greater proportion of credits coming from future site restoration works.

Additionally, the area shown in the Smalls Road Masterplan as “60m APZ” has been included in the area shown as ‘land for development’ and in the calculation of ‘credits required’. However, there will not be a complete loss of biodiversity values in this portion of the site as calculated by the BCAM. The areas of APZ within the site have the capacity to retain some level of biodiversity value due to the ability to retain components of the existing vegetation community in accordance with the standards for maintaining asset protection zones.

No species credit calculations were required for the study area.

4.11 BCAM CONCLUSION

The Biodiversity Certification Assessment Methodology (BCAM) has been used to conduct an analysis of the proposed rezoning of the Smalls Road Site of the broader Carrington Centennial Care estate. The BCAM was used to complete the assessment as it provides a consistent, repeatable, quantifiable and scientifically robust methodology to determine impacts on biodiversity from the current concept master plan.

Whilst it would be ideal to pursue biodiversity certification for the project, due to the interplay of an existing development consent for the site and the lack of any savings provisions within the Biodiversity Certification methodology, it is not practical to pursue biodiversity certification for the site as OEH has indicated that in addition to the offset required under the current development consent an entirely new offset would also be required under Biodiversity Certification. This would in effect require the proposed clearing of vegetation to be offset twice.

As such, this BCAM assessment has been undertaken to demonstrate that the quantum of the proposed offset is reasonable, and consistent with current standards. As demonstrated in the above assessment, the proposed offset is reasonable. The offset will be secured through conditions of consent, a covenant on title under the *Conveyancing Act* and the implementation of the Conservation and Landuse Management Plan.

5 Additional Ecological Issues

The protected matters search conducted under the Commonwealth EPBC Act listed the potential presence of both endangered ecological communities and threatened and migratory species.

The field survey has confirmed the presence, extent and condition of the critically endangered ecological community known variously as Cumberland Plain Woodland. Condition thresholds for this ecological community differ under both the TSC Act and EPBC Act. While calculations of the extent of CPW (GB-FRG) vegetation which meet the various condition classes under the EPBC Act have not been undertaken, it can be reasonably assumed that the area of TSC Act CPW in the study area which also meets the EPBC Act condition classes will be similar. Hence potential impacts of this rezoning proposal will need to be considered in regards to their impact on this matter of national environmental significance. This assessment will take the form of a referral to the Commonwealth Department of Sustainability, Environment, Water, Population and Communities. In addition there is potential for additional migratory species or their habitat to be present on site, the impacts on which must also be considered.

6 Recommendations

This BCAM assessment has validated the extent and condition of native vegetation within the study area as comprising stands of both the Grey Box – Forest Red Gum (GB-FRG) grassy woodland on shales of the southern Cumberland Plain, Sydney Basin and Forest Red Gum – Rough Barked Apple (FRG-RBA) grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin. Both communities are endangered (or critically endangered) ecological communities under the NSW TSC Act with GB-FRG also being listed as critically endangered under the Commonwealth EPBC Act. Additionally, these vegetation communities are also known as potential habitat associations for individually listed threatened flora and fauna.

To ensure that the conservation outcomes proposed under the BCAM assessment are achieved, it is recommended that:

- The conservation lands in the study area are zoned E2 (Environmental Conservation)
- The conservation lands identified within the study area and the adjoining Northern Campus are managed in accordance with the Conservation and Land Use Management Plan, which sets out a range of appropriate land management activities to be undertaken both within the development footprint (to prevent indirect impacts on conserved areas) and conservation areas (to ensure adequate restoration and rehabilitation works).
- The restoration and rehabilitation activities within the conservation lands should be guided by the development of a Vegetation Management Plan. The VMP should consider Recovering bushland on the Cumberland Plain – Best practice Guidelines for the management and restoration of bushland (former DEC 2005), the Cumberland Plain Recovery Plan (former DECCW 2001) and any further relevant guidelines as is currently best practice. The VMP should outline:
 - Aims and objectives for protection and enhancement of the vegetation stands;
 - Details of any site preparations required (i.e. fencing, buffer areas, soil works, etc);

- Methods and program for regeneration activities;
 - Maintenance program (ongoing maintenance works required to manage vegetation and suppress exotic species);
 - Monitoring and reviewing regeneration activities; and
 - Potential time frame and costs associated with the regeneration activities (this can be undertaken for potential funding opportunities that may arise through the local Catchment Management Authority).
- All impacts associated with the subsequent development of the Smalls Road site (ie APZs, roads, infrastructure) must be contained to the areas shown as 'land proposed for development' to ensure that the conclusions of the BCAM analysis remain correct.
 - Retention of canopy trees within the developed area should be maximised through consideration of tree retention in the design and location of roads, pedestrian pathways, communal and private open space etc.

Part 3 – Riparian Assessment

7 Methods

The creeklines on the Smalls Road site have been assessed according to the Strahler-based methodology released by the NSW Office of Water in July, 2012. This methodology tags all 'blue lines' appearing on the 1:25,000 topographic map series, according to their Strahler stream order.

The key outcome of this assessment is to classify watercourses that are to be retained into the stream orders identified below. Drainage lines that are not classified are deemed to be of limited riparian value or do not meet the definition of a river and are therefore suitable for engineered drainage solutions.

The resulting classification of the streams into one of four categories reflects their stream order;

- 1st Order
- 2nd Order
- 3rd Order
- 4th Order and greater

Each stream order has a corresponding recommended Riparian Corridor (RC) width requirement as specified by NOW (**Table 15**). The Vegetated Riparian Zone (VRZ) contains areas formerly referred to as the core riparian zone (CRZ) and the vegetated buffer (VB).

Table 15: NOW Riparian Categories and Buffer Specifications

WATERCOURSE TYPE	VRZ WIDTH (EACH SIDE OF WATERCOURSE)	TOTAL RC WIDTH
1 st order	10 metres	20m + channel width
2 nd order	20 metres	40m + channel width
3 rd order	30 metres	60m + channel width
4 th order and greater (includes estuaries, wetlands and any parts of rivers influenced by tidal waters)	40 metres	80m + channel width

7.1 RESULTS

Two small watercourses have been mapped in the Smalls Road Campus through application of the Strahler based methodology (**Figure 15**).

The main watercourse, which runs east to west through the centre of the site has been mapped as a 1st order stream, which requires a 10m buffer (VRZ) each side of top of bank. At present the western most end of this watercourse contains a reasonable stand of remnant CPW vegetation on each bank. The creek banks appear reasonably stable at present. The central part of this creek has completely cleared banks, exotic pasture grass coverage and unstable banks in parts. There is very little aquatic or riparian habitat along this part of the watercourse at present. As such it is considered that this section of stream has little to no environmental value and appropriate to be removed for urban development. The eastern portion of the watercourse follows a south-north alignment and traverses a patch of moderate condition CPW that will not be retained under the proposed plan.

The 2nd mapped watercourse runs south to north in the western portion of the site is also considered a 1st order stream under the Strahler based classification (Figure 15). A majority of this watercourse will be retained within the proposed conservation zone and additional managed areas which will provide asset protection zones (APZ) to the development.

The Conacher Travers Conservation and Land Use Management Plan (2006) for the site mapped three small watercourses within the site. It is worth noting that the additional watercourse mapped in the Conacher Travers report but not mapped using the Strahler based methodology, will remain undisturbed as it traverses the vegetated south-west corner of the site which is proposed to be retained as a conservation zone. The NOW Strahler methodology is based on the streams as mapped on the 1:25k topographic map sheets, therefore the third small watercourse previously identified on site was not included in this assessment.

Habitat corridors

The watercourses on the site do not provide any strategic links on a regional scale given that the site adjoins residential development in all directions. A minor local corridor can be found running along the central creek to the west through residential backyards to the larger Sickles Creek. The main habitat corridors in the region are associated with the Nepean River to the north of the site.

Riparian Vegetation

The riparian vegetation on the site has been largely modified through historical clearing, pasture improvement and grazing. The western and eastern ends of the central watercourse consist of reasonable stands of CPW. The watercourses in the south west of the site traverse areas of good condition CPW. Retention of existing riparian vegetation and exclusion of grazing is recommended as this will assist with natural regeneration of these areas. Regeneration will also assist with stabilising active erosion points.

Drainage and Geomorphology

The cleared portion of the central watercourse is currently highly disturbed with areas of incised channels and active erosion points. The vegetated sections also show signs of disturbance from stock, but generally had better stability. The 2 watercourses in the south west of the site consist of generally stable banks, with signs disturbance from stock. Future changes to hydrology may lead to increased erosion, particularly from higher density areas where large areas of impervious surfaces will increase peak flows. It is recommended that WSUD and stormwater detention basins are also designed to attenuate high frequency flows (up to 1 in 5 year flows) to reduce the potential for erosion to increase in the future.

Application of the buffers identified in **Table 15** will provide flexibility for the channel to migrate within a broader corridor which will minimise the need to construct hard engineering structures within the channel (eg. Rip-rap, bank armouring etc).

As these are first order streams, online detention basins are permissible. However these must be vegetated dry basins and are not permitted to be for water quality treatment purposes.

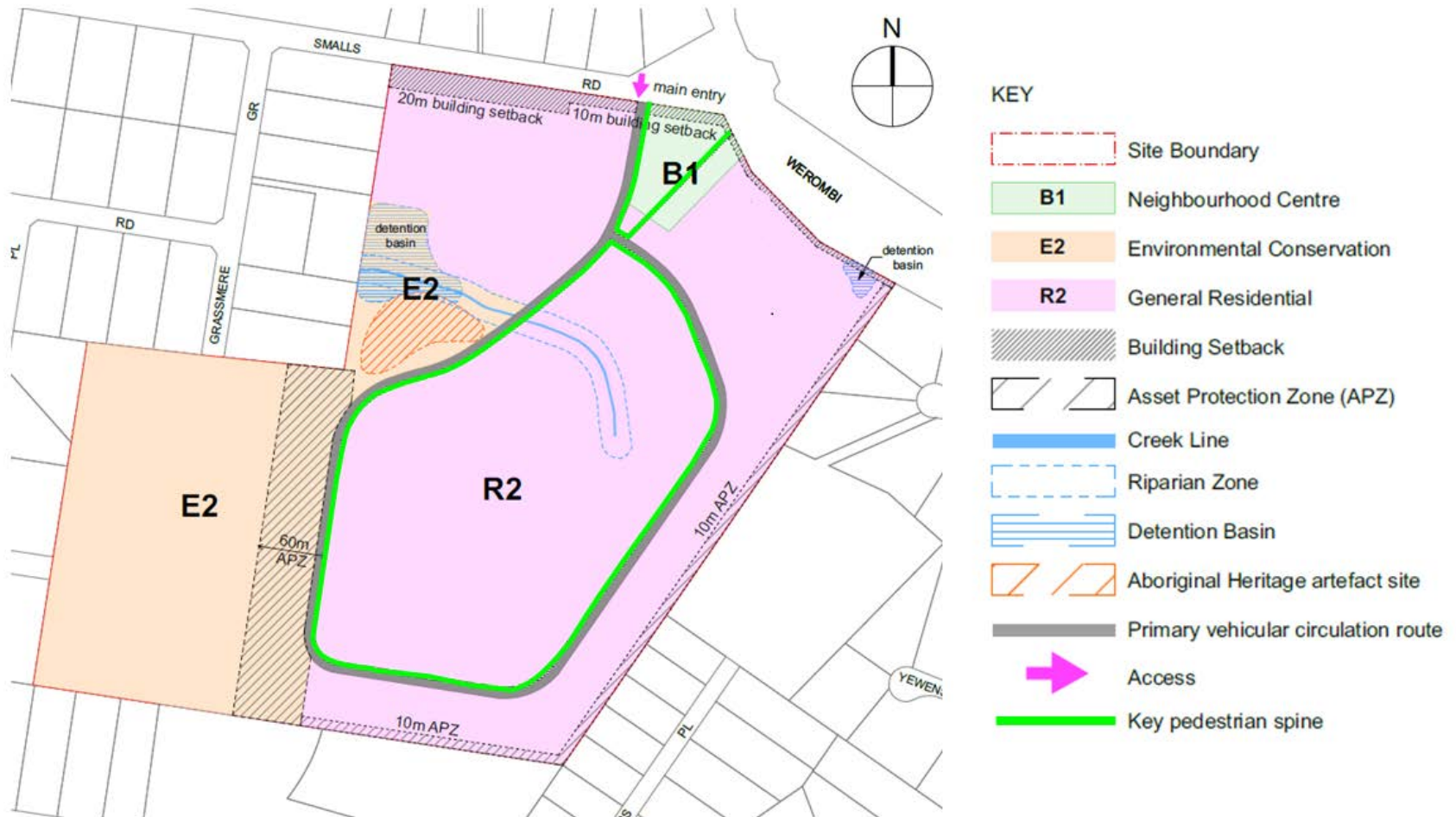


Figure 15: Strahler Stream Order Assessment and Site Concept Plan

8 Recommendations

The proposed Masterplan for the Smalls Road Campus includes a minimum 20m riparian corridor (10m each side of TOB) along the central watercourse excluding the eastern portion where the stream runs south to north. This eastern portion of the watercourse is proposed to be removed as part of the development. The additional two watercourses in the south-west of the Smalls Road site will be largely retained in areas of conservation and managed APZ.

It is recommended that grazing should be excluded from the riparian and APZ areas to encourage natural regeneration and where possible, low density planting of tubestock of local provenance native species should be incorporated into future vegetation management plans. This will assist in establishing an area of riparian habitat as well as contributing to stabilisation of the creek bed and banks. The APZ areas should incorporate well spaced trees and a managed understorey/ground layer. The objectives of these areas are to stabilise the bed and banks of these streams, whilst ensuring that they do not pose a future bushfire hazard.

The overarching objective of the controlled activities provisions of the Water Management Act is to establish and preserve the integrity of riparian corridors. Ideally the environmental functions of riparian corridors should be maintained or rehabilitated by applying the following principles:

- Seek to maintain or rehabilitate a riparian corridor (riparian corridor (RC)/vegetated riparian zone (VRZ) with fully structured native vegetation in accordance with minimum RC widths.
- Seek to minimise disturbance and harm to the recommended RC/VRZ.
- Minimise the number of creek crossings and provide perimeter road separating development from the RC/VRZ.
- Locate services and infrastructure outside of the RC/VRZ. Within the RC/VRZ, provide multiple service easements and/or utilise road crossings where possible.
- Treat stormwater runoff before discharging into the RC/VRZ.

These principles should be considered during design of development applications within the site.

NOW however, does allow for a range of works and activities on waterfront land and in riparian corridors to better meet the needs of the community, so long as they have minimal harm as outlined the Riparian Corridor Matrix (**Table 16**). For further detail refer to the *NOW Controlled Activity Riparian Corridor Guidelines*.

Non riparian corridor works and activities can be authorised within the outer riparian corridor so long as the average width of the vegetated riparian zone can be achieved over the length of the watercourse within the development site. That is, where appropriate 50% of the outer vegetated riparian zone width may be used for non-riparian uses including asset protection zones, cycleways, paths, roads and development.

An equivalent area is required to be offset on the site and must be connected to the riparian corridor. The inner 50% of the vegetated riparian zone is required to be fully protected and vegetated with native endemic riparian plant species in order to satisfy the minimum setback requirements to maintain bed and bank stability and minimal harm (**Figure 16**).

The averaging rule should generally be applied to cleared waterfront land. Development proposals involving waterfront lands that contain existing native vegetation should seek to preserve that riparian vegetation in accordance with the minimum RC requirements. Development proposals involving waterfront land will need to obtain controlled activity approval (CAA) under the Water Management Act.

Table 16: Controlled Activity Riparian Corridor Matrix

Stream order	Vegetated Riparian Zone (VRZ)	RC off-setting for non RC uses	Cycleways & paths	Detention basins		Stormwater outlet structures & essential services	Stream realignment	Road crossings		
				Only within 50% outer VRZ	Online			Any	Culvert	Bridge
1 st	10m	•	•	•	•	•	•			
2 nd	20m	•	•	•	•	•		•		
3 rd	30m	•	•	•		•			•	•
4 th +	40m	•	•	•		•			•	•

Diagram 1 - Averaging Rule²

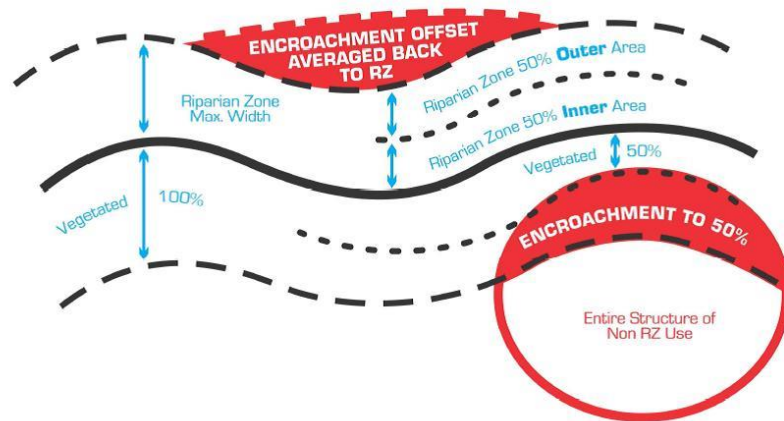


Figure 16: Riparian Corridor Averaging Rule. (Source: NOW Controlled Activity Riparian Corridor Guidelines)

Part 4 – Bushfire Assessment

9 Methods

This assessment applies to the Smalls Road site only and has considered the current masterplan proposed for the site as shown in **Figure 2**.

The bushfire hazard affecting the study area was assessed during site inspections and using recent aerial photographs for at least a distance of 140m from the perimeters of the subject site (in line with PBP 2006). This assessment identifies the potential bushfire threat from within and outside of the study area and allows for a prediction of required asset protection zones for future development. The method used for this assessment relies on consideration of vegetation and slope and is outlined below along with results.

10 Results

10.1 VEGETATION

Vegetation was assessed according to Keith (2004) and the vegetation class as specified in PBP 2006. Intact bushfire prone vegetation on the study site currently consists of small patches of woodland and large areas of grassland, with one larger area proposed for retention within the South West Corner of the Smalls Road site. According to the vegetation formations for the purposes of determining hazard levels of vegetation communities, the main hazard affecting the site was considered as “Grassland” whilst the smaller areas of woodland were assessed as “Woodland (Grassy)”.

In addition to the vegetation within the study area, most of the surrounding areas are residential and managed. Existing properties to the south of the site and the east may continue to contain unmanaged grassland. Urban design will need to ensure that Asset Protection Zones and perimeter roads are located within the Study Area and provide adequate protection from the offsite hazard. Refer to Figure 17 for existing hazard on site.

Most of the vegetation on site will be cleared, or retained and managed in a fuel reduced, APZ compliant state. With respect to the proposed masterplan, all vegetation on site which is to be retained, except the south-west remnant will be managed in an APZ compliant state (refer to **Figure 18** for the full masterplan with legend).

The remnant vegetation on site in the south-west corner is comprised of Cumberland Plain Woodland, considered to be a “Woodland (Grassy)” community according to Keith (2004), for the purposes of determining APZs. Restoration of the core riparian zone will utilise suitable species and planting densities to avoid creating an undue future fire hazard and emulate the alluvial woodland vegetation historically would have occurred on site. This vegetation type is considered to be “Forested Wetland” according to

Keith (2004). The remnant vegetation in the eastern part of the site is proposed to be managed as a *Managed Landscape* which is “APZ compliant” in terms of overall fuel load, canopy separation and no fuel connectivity.

Through careful design of the riparian corridor, it is envisaged that the restoration of a natural and vegetated outcome can be achieved whilst maintaining APZ compliant vegetation. This will remove the need for APZ setbacks for planned surrounding aged care facilities.

10.2 SLOPE

Slope was assessed via a desktop analysis across the site using contour data. Given the size of the site and early stage of the planning process, slope measurements were not field validated.

Slope was generally less than 5 degrees across the entire site, except for the steeper portion of the site in the south west corner was up to 10 degrees downslope of the proposed development.

10.3 BUSHFIRE HAZARD SUMMARY

In comparing the assessed bushfire hazard for the study area with other vegetated environments across the state, the study area is considered to have a low relative hazard rating. However the remnant bushland located to the west of the study area is considered to be a moderate bushfire hazard area, reflecting the density of the vegetation, steeper slopes and the location on the western and south-western flanks of the development.



Figure 17: Existing Vegetation, Slope and Hazard

11 Planning for Bushfire Protection (2006) Assessment

11.1 SPECIAL FIRE PROTECTION PURPOSE (SFPP)

Development is considered Special Fire Protection Purposes (SFPP) where the development includes one of the following:

- a school;
- a child care centre;
- a hospital (including a hospital for the mentally ill or mentally disordered);
- a hotel, motel or other tourist accommodation;
- a building wholly or principally used as a home or other establishment for mentally incapacitated persons;
- housing for older people or people with disabilities within the meaning of State Environmental Planning Policy No 5— housing for Older People or People with a Disability (now SEPP (Seniors Living));
- a group home within the meaning of State Environmental Planning Policy No 9—Group Homes [SEPP 9 no longer exists and its replacement, SEPP Infrastructure, only defines Group Homes within a correctional centre];
- a retirement village; or
- any other purpose prescribed by the regulations.

The specific objectives for SFPP developments are:

- Provide for the special characteristics and needs of occupants. Unlike residential subdivisions, which can be built to a construction standard to withstand the fire event, enabling occupants and firefighters to provide property protection after the passage of fire, occupants of SFPP developments may not be able to assist in property protection. They are more likely to be adversely affected by smoke or heat while being evacuated.
- Provide for safe emergency evacuation procedures. SFPP Developments are highly dependent on suitable emergency evacuation arrangements, which require greater separation from bushfire threats. During emergencies, the risk to firefighters and other emergency services personnel can be high through prolonged exposure, where door-to-door warnings are being given and exposure to the bushfire is imminent

The nature of SFPPs is such that the occupants may be more vulnerable to bushfire attack for a variety of reasons including a reduced capacity to evaluate risk and to respond to the bush fire threat, and the fact that the logistical arrangements for the numbers of occupants may be complicated. Consequently, SFPPs need to meet a more stringent set of bushfire protection requirements than residential development.

The proposed rezoning and subsequent development are considered to be SFPP, accordingly the new facilities will need to comply with the provisions which apply to SFPP developments. A masterplan has been developed for the site and this has been considered as part of this assessment (refer to Figure 2 and Figure 18).

11.2 BUSHFIRE PROTECTION MEASURES

The bushfire protection measures described in PBP are an effective way to design developments to minimise the risks from bushfire and to ensure that the aims and objectives of PBP are met.

The following key elements are required to be addressed in bushfire assessments;

1. Asset Protection Zones (APZs)
2. Emergency access/egress
3. Supply of services
4. Building construction standards

11.2.1 Asset Protection Zones (APZs)

APZs are areas located between bushfire hazards and development to provide a defensible space in which to undertake emergency operations and to provide a buffer from direct flame contact, radiant heat, smoke and embers.

The width of APZs is based on a combination of;

- Vegetation formation
- Slope
- Topographic position (i.e. if the asset is above, or below the hazard)
- Fire Danger Index

The appropriate fire (weather) area for the site was assessed, according to Table A2.3 in PBP. An FDI rating of 100 has been applied to the Greater Sydney Region of NSW, including this Precinct. The FDI index is a relative number (1 to 100) providing an evaluation of suppression difficulty or rate of spread for specific combinations of wind speed, fuel and fuel moisture.

PBP has been used to determine the width of the APZ using the vegetation and slope data identified in the results. The APZ's specified in Table 17 can be accommodated within the current Masterplan for the Smalls Road site, as shown in Figure 18.

Table 17: Minimum specifications for Asset protection Zones for SFPPs to achieve <math><10\text{kW/m}^2</math>

Direction from development	Slope ¹	Vegetation ²	PBP required APZ ³	Comment
South-west	5-10 downslope	Grassy woodland	60 m	APZ can be contained within the Masterplan.
South	0-5 downslope	Unmanaged grassland	10m	APZ can be contained within the Masterplan.
East	0-5 downslope	Unmanaged grassland	10m	APZ can be contained within the Masterplan.
All other directions	Managed land			

¹ Slope most significantly influencing the fire behaviour of the site having regard to vegetation found. Slope classes are according to PBP.

² Predominant vegetation is identified, according to PBP and “Where a mix of vegetation types exist the type providing the greater hazard is said to be predominate”.

³ Assessment according to PBP.

It is important to note that the APZ calculations quoted in this assessment are indicative only and have been determined at a landscape scale. This level of detail is suitable for the development of a rezoning plan whereby the aim is to demonstrate whether a parcel of land can accommodate the bushfire hazard, the expected APZ and future development. The final APZ dimensions for any future development depend on the accuracy of a site-specific level. The APZ dimensions quoted in this assessment should not be relied on to approve a future development; they may be used as a guide only.

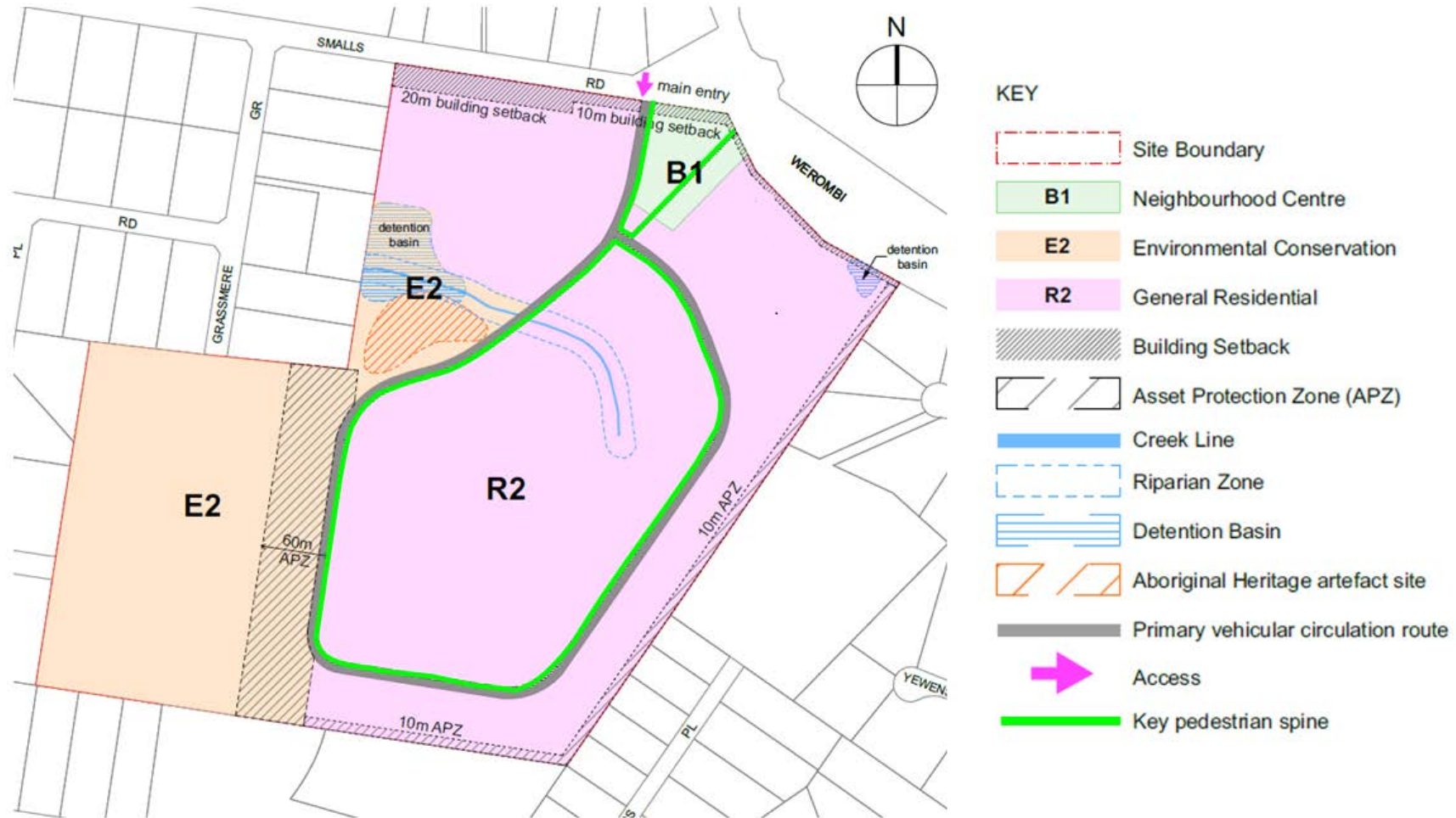


Figure 18: Asset Protection Zones within the Proposed Masterplan

11.2.2 Emergency Access/Egress

Emergency access/egress relates to the provision of safe access, egress and defensible spaces during bushfire events. It also relates to emergency management arrangements such as procedures, routines and routes for evacuation and consideration of safe havens.

Specific management and evacuation plans will be required at a later stage in accordance with the RFS Guide to Develop a Bushfire Evacuation Plan' (RFS 2004). The evacuation/emergency plan should include the following:

- An evacuation plan (including the decision-making process to determine if onsite refuge or offsite evacuation is required);
- A bushfire response plan; and
- Annual audit procedures.

Additionally, emergency management arrangements may need to be discussed with the RFS specifically in regard to the capacity of existing resources (stations, tanker appliance types and numbers) to service the study area.

The current road alignment proposed for the Smalls Road site shows a ring road, connecting directly to Smalls Road and Werombi Road, servicing the majority of the southern end of the site. This proposed road forms a perimeter road between most of the southern end of the development and the bushfire hazard in the south west corner, however there are a number of independent living units at the southernmost end which do not currently have a perimeter road between them and the surrounding unmanaged grassland areas offsite.

The access for the site will be further defined through the future development stages of the site, and will be required to comply with the following criteria from PBP 2006 (Table 18).

Table 18 : Performance criteria for internal roads within SFPP Developments

PERFORMANCE CRITERIA	ACCEPTABLE SOLUTIONS
The intent may be achieved where:	
<ul style="list-style-type: none"> ▪ Internal road widths and design enable safe access for emergency services and allow crews to work with equipment about the vehicle. 	<ul style="list-style-type: none"> ▪ internal roads are two-wheel drive, sealed, all-weather roads; ▪ internal perimeter roads are provided with at least two traffic lane widths (carriageway 8 m minimum kerb to kerb) and shoulders on each side, allowing traffic to pass in opposite directions; ▪ roads are through roads. Dead end roads are not more than 100 metres in length from a through road, incorporate a minimum 12 metres outer radius turning circle, and are clearly sign posted as a dead end; ▪ traffic management devices are constructed to facilitate access by emergency services vehicles; ▪ a minimum vertical clearance of four metres to any overhanging obstructions, including tree branches, is provided; ▪ curves have a minimum inner radius of six metres and are minimal in number to allow for rapid access and egress; ▪ the minimum distance between inner and outer curves is six metres; ▪ maximum grades do not exceed 15 degrees and average grades are not more than 10 degrees; ▪ crossfall of the pavement is not more than 10 degrees; ▪ roads do not traverse through a wetland or other land potentially subject to periodic inundation (other than flood or storm surge); ▪ roads are clearly sign-posted and bridges clearly indicate load ratings; ▪ the internal road surfaces and bridges have a capacity to carry fully-loaded firefighting vehicles (15 tonnes).

11.2.3 Supply of Services

The purpose of this measure is to provide adequate and dependable supply of water for the protection of buildings before, during and after the passage of a bushfire, and to locate gas and electricity services so that they do not contribute to the risk of fire to a building.

Water supply to the site will be provided via a ring main system for the majority of the study area. The ring main system must be of sufficient pressure and fire hydrants located to comply with *AS 2419.1-2005 Fire Hydrant Installations (SAI Global, 2005)*.

If the reticulated water supply is unable to attain the required pressure or tank water is used, then a dedicated static water supply reserve must be created and maintained. The quantity of water required is shown in Table 19.

Table 19: Static Water Requirements

DEVELOPMENT TYPE	WATER REQUIREMENTS
Residential Lots (<1,000m ²)	5,000 l/lot
Rural-residential Lots (1,000m ² - 10,000 m ²)	10,000 l/lot
Large Rural/Lifestyle Lots (>10,000m ²)	20,000 l/lot

Electricity and gas services should be located such that they do not pose a hazard to surrounding bushland and buildings, or provide an obstacle or hazard for emergency service personnel. Ideally they will be located underground. Overhead powerlines must undergo regular inspection to ensure that no part of a tree is closer than the distances set out in 'Vegetation safety clearances' issued by Energy Australia (NS179, April 2002).

11.2.4 Building Construction Standards

The proposed development will incorporate the adequate setbacks from bushfire prone vegetation as set by the APZ requirements of PBP. These APZ setbacks equate to achieving a construction standard of BAL 12.5 under the Australian Standard 3959-2009 'Construction of buildings in bushfire-prone areas' (Standards Australia 2009). Therefore all buildings within 100m of from any remaining bushfire hazard will be required to comply with the requirements of AS 3959-2009 construction for bushfire attack level 12.5.

For proposed development which will be located greater than 100 m from the nearest bush fire prone vegetation will require BAL-LOW under Australian Standard 3959-2009 'Construction of buildings in bushfire-prone areas' (Standards Australia 2009). BAL-LOW has no specific bushfire construction requirements.

11.3 MANAGEMENT REQUIREMENTS

The best bushfire mitigation measures and design can be undone by poor landscaping and property maintenance. It is recommended that the measures described in Appendix 5 of PBP 2006 be adopted in all land within 100m of bushland. A summary of these measures is described below.

11.3.1 APZ Creation/Maintenance

The site is currently dominated by Woodland (Grassy) vegetation and grassland. Vegetation within the APZ area and any remnants or landscaping within the development area should be managed by the owner of the land in line with the following:

- Tree canopy separation (by at least 2 metres where possible);
- Discontinuous shrub layer (clumps or islands of shrubs not rows);
- Vertical separation between vegetation strata;
- Tree canopies not overhanging structures;
- Management and trimming of trees and other vegetation in the vicinity of power lines and tower lines in accordance with the specifications in "Vegetation Safety Clearances" issued by Energy Australia (NS179, April 2002);
- Retain low ground covers:
- Mowing / brush cutting / slashing during the summer months;
- Use of non-combustible mulch e.g. stones.

Where landscaping is to include plantings, local provenance stock is recommended. Emphasis should be placed on species that are less flammable, particularly in close proximity to any buildings.

Any natural revegetation works, particularly along riparian zones should take into account management requirements to ensure that revegetation works do not introduce an unwanted (or unplanned) bushfire hazard to the site.

11.3.2 Vegetation Management

Landscaping around buildings should adhere to the following:

- maintaining a clear area of low cut lawn or pavement adjacent to the house;
- keeping areas under fences, fence posts and gates and trees raked and cleared of fuel;
- utilising non-combustible fencing and retaining walls
- breaking up the canopy of trees and shrubs with defined garden beds;
- organic mulch should not be used in bush fire prone areas and non flammable material should be used as ground cover, eg Scoria, pebbles, recycled crushed bricks.
- planting trees and shrubs such that:
 - the branches will not overhang the roof;
 - the tree canopy is not continuous; and
 - there is a windbreak in the direction from which fires are likely to approach.

11.3.3 Building Maintenance

Maintenance of buildings should incorporate:

- removal of material such as litter from the roof and gutters;
- ensure painted surfaces are in good condition with decaying timbers being given particular attention to prevent the lodging of embers within gaps;
- check pumps and water supplies are available and in working order;
- driveways are in good condition with trees not being too close and forming an obstacle during smoky conditions;
- check roof lines for broken tiles or dislodged roofing materials;
- screens on windows and doors are in good condition without breaks or holes in flyscreen material and frames are well fitting into sills and window frames;
- drenching or spray systems are regularly tested before the commencement of the fire season;
- hoses and hose reels are not perished and fittings are tight and in good order;
- doors are fitted with draught seals and well maintained; and
- woodpiles, chemical storage, sheds and other combustible materials are located downslope and well away from buildings.

11.3.4 Protected Vegetation

Vegetation occurring within the riparian corridor, the south western remnant, and potentially within other portions of the Precinct, will be retained and in some cases revegetated. Vegetation that is retained or regenerated in the south western remnant is to be managed for biodiversity protection, and as such APZs are not permitted within this area. Fire is an important ecological process, and as such must be integrated with long term environmental management. As such, it is recommended that a conservation and bushfire management plan be prepared for these areas prior to any construction.

The main factors contributing to bushfire management relate to;

- Fire frequency
- Fire seasonality
- Fire intensity

It is important to ensure that fire regimes are varied spatially across the site, and temporally at any one point, the objectives being;

- Ensuring a variety of fire interval periods are present across the site
- Ensuring that the season, intensity and frequency of burns are varied at any one area

This is referred to as mosaic management and is aimed at ensuring a diversity of life cycles are present across the site and that a homogenous fire regime is avoided that may benefit certain species at the expense of others.

11.3.5 Fire Frequency

Fire frequency is usually presented as fire interval periods. The minimum fire interval period is the minimum amount of time between fires that will enable sufficient recruitment and recharge of seed banks. Maximum fire interval period refers to the maximum amount of time between fires before senescence may begin. **Table 20** below provides the recommended maximum and minimum fire intervals for the vegetation communities within the study area. Successive fires at the minimum recommended fire interval

may have a severe impact on species diversity, therefore, fire regimes erring towards the maximum interval are recommended.

Any areas within the Precinct that will be actively regenerated should be excluded from fire for a minimum of 15 years to allow for the development of a soil seed bank.

Table 20: Recommended Inter-fire Periods

KEITH (2004) CLASSIFICATION	MINIMUM FIRE INTERVAL	MAXIMUM FIRE INTERVAL	SOURCE
Grassy Woodland	5 years	40 years	DEC 2004 "Guidelines for Ecologically Sustainable Fire Management. NSW NP&WS
Shrubby Dry Sclerophyll Forests	7 years	30 years	DEC 2004 "Guidelines for Ecologically Sustainable Fire Management. NSW NP&WS
Wet Sclerophyll Forests	25 years	60 years	DEC 2004 "Guidelines for Ecologically Sustainable Fire Management. NSW NP&WS

11.3.6 Fire Seasonality

Fire seasonality needs to integrate with the lifecycles of native species, and preferably be counter to the requirements of exotic species. As such ecological burns are recommended between the periods of August and January to coincide with native plant life cycles (DEC 2005). However, due to bushfire danger periods it may not be practical to burn over the summer months, hence the window of opportunity narrows to August – November. Occasional autumn burns may also be implemented.

Burning may also be complemented with slashing of grasses, preferably immediately prior to flowering of exotic annual grasses.

11.3.7 Fire Intensity

Hotter burns are preferable as they may encourage native species over exotic species. However, this will be significantly limited by the amount of fuel available for burning and constraints on burning during the hotter months. More moderate burns are recommended for steeper slopes to reduce the potential for exposure of mineral earth and subsequent erosion.

11.4 EMERGENCY RESPONSE

An assessment of the NSW Rural Fire Service (RFS) and NSW Fire & Rescue brigade stations surrounding the site was completed in order to determine their proximity and emergency response and capability to the subject site (see Table 7 below).

Table 21: Local Fire Stations

NAME	LOCATION	DISTANCE*
Camden West (RFS)	Ellis Lane, Ellis Lane NSW	500m
Mt Hunter (RFS)	160 Burragorang Road, Mt Hunter NSW	5.6km
Camden (Fire & Rescue)	126 Macarthur Rd, Elderslie NSW	6.5km

Cawdor (RFS)	Cawdor Road, Cawdor NSW	7.1km
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The location of fire stations in relation to the study site is indicated in **Table 21**. In the current emergency response situation the Camden West and Mt Hunter NSW RFS Brigades are likely to be the first stations to reach the site.

Consultation with the RFS and NSW Fire and Rescue may be required to confirm whether existing stations can adequately service the proposed development site (or otherwise) as well as the need for additional resources at these existing stations.

It is understood that a new RFS station will be built in the south east corner of existing aged care facility; however the date of construction/operation is not currently known.

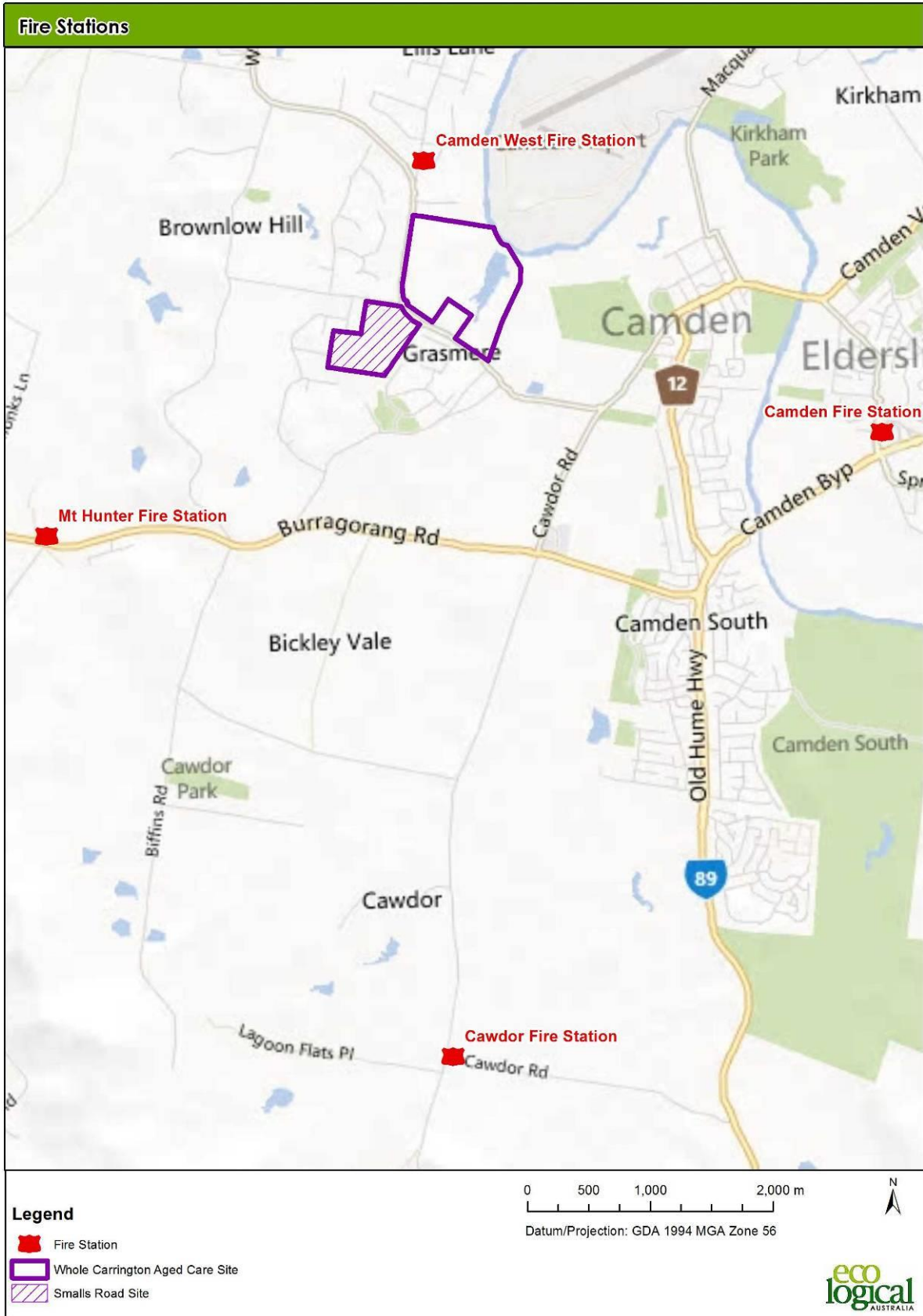


Figure 19: Fire Stations within close proximity to study area

11.5 PLANNING CONTROLS

Based on the recommendations contained within PBP 2006 the following planning principles are recommended for the development of the potential future rezoning of the site:

- Provision of a perimeter road with two way access which delineates the extent of the intended development
- Provision, at the interface, for the establishment of adequate Asset Protection Zones for future housing
- Specifying minimum residential lot depths to accommodate Asset Protection Zones for lots on perimeter roads
- Minimising the perimeter of the area of land, interfacing the hazard which may be developed
- Introduce controls which avoid placing inappropriate developments in hazardous areas; and
- Introduce controls on the placement of combustible materials in Asset Protection Zones

It is recommended that LEP or DCP clauses relating to bushfire provide direct links to PBP 2006 rather than duplicating bushfire planning requirements. Note that a new version of PBP is due for release in 2013.

11.6 DEVELOPMENT STAGING

The staging of any development should be considered from a bushfire perspective such as to minimise the risks to the development during construction. Ideally, buildings fronting the bushland interface would be developed first and Asset Protection Zones established upfront.

Where relevant (i.e. adjacent to bushland), temporary APZs should be established around each stage of the development and identified in a section 88b instrument (in accordance with the *Conveyancing Act 1919*), which would then cease once the adjacent stage of the development is undertaken. APZ widths could be identified on a site basis, based on the APZ requirements (**Figure 18**) which corresponds directly with the APZ categories identified in **Table 17**.

As the bushfire hazard will change during various stages of development, due to the creation of new vegetation and removal of old vegetation 'Bushfire Prone Land' mapping (BPL mapping), the trigger for assessment under the EP&A Act and the RF Act will also change. It is recommended that Council review BPL mapping following development stages.

12 Recommendations

The site is considered capable of meeting the requirements of PBP 2006, subject to appropriate urban design and provision of required infrastructure, particularly reticulated water. It is recommended that future urban development incorporates a perimeter road adjacent to any residual hazards and particularly the south west remnant vegetation within the proposed conservation area.

The buildings at the western end of the site may require an access trail or similar to be established between the homes and the adjacent grasslands. The ability to evacuate to a safe place, places increased importance on well-formed spine roads that should be constructed to the standard of perimeter roads.

All APZs should have a management requirement placed on title, as neighbouring buildings may be dependent on each other for provision of bushfire safety.

Provision of water supplies to the standard required in PBP 2006 is paramount. Future building construction will also need to meet the requirements of AS3959-2009.

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NSW OEH 2012 – BioNet Atlas of NSW Wildlife

Appendix A: Species Predicted and Requiring Survey

SPECIES PREDICTED

SCIENTIFIC NAME	COMMON NAME
<i>Burhinus grallarius</i>	Bush Stone-curlew
<i>Climacteris picumnus victoriae</i>	Brown Treecreeper (eastern subspecies)
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle
<i>Glossopsitta pusilla</i>	Little Lorikeet
<i>Lathamus discolor</i>	Swift Parrot
<i>Melithreptus gularis gularis</i>	Black-chinned Honeyeater (eastern subspecies)
<i>Meridolum corneovirens</i>	Cumberland Land Snail
<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing-bat
<i>Mormopterus norfolkensis</i>	Eastern Freetail-bat
<i>Myotis macropus (formally Myotis adversus)</i>	Large-footed Myotis
<i>Neophema pulchella</i>	Turquoise Parrot
<i>Ninox connivens</i>	Barking Owl
<i>Petroica boodang</i>	Scarlet Robin
<i>Phascolarctos cinereus</i>	Koala
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat
<i>Stagonopleura guttata</i>	Diamond Firetail
<i>Tyto novaehollandiae</i>	Masked Owl
<i>Xanthomyza phrygia</i>	Regent Honeyeater

SPECIES REQUIRING SURVEY

SCIENTIFIC NAME	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
<i>Acacia pubescens</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<i>Callocephalon fimbriatum</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<i>Callocephalon fimbriatum</i> population in the Hornsby and Ku-ring-gai Local Government Areas	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<i>Circus assimilis</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<i>Cynanchum elegans</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<i>Eucalyptus benthamii</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<i>Grevillea juniperina</i> subsp. <i>juniperina</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<i>Hieraaetus morphnoides</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<i>Litoria aurea</i>	Yes	Yes	Yes	No	No	No	No	Yes	Yes	Yes	Yes	Yes
<i>Lophoictinia isura</i>	Yes	Yes	Yes	No	No	No	No	No	Yes	Yes	Yes	Yes
<i>Marsdenia viridiflora</i> subsp. <i>viridiflora</i> - endangered population	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<i>Miniopterus schreibersii oceanensis</i>	Yes	Yes	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes	Yes
<i>Myotis macropus</i> (formally <i>Myotis adversus</i>)	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<i>Persicaria elatior</i>	Yes	Yes	Yes	Yes	Yes	No	No	No	No	No	No	Yes
<i>Pimelea spicata</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<i>Pomaderris brunnea</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<i>Pteropus poliocephalus</i>	Yes	Yes	Yes	Yes	Yes	No	No	No	Yes	Yes	Yes	Yes
<i>Pultenaea pedunculata</i>	No	No	No	No	No	No	No	No	Yes	Yes	Yes	No
<i>Wahlenbergia multicaulis</i> - endangered population	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Appendix B: Field Survey Results Flora and Fauna Species List

FLORA

			PLOT NUMBER		A1	B1	Z1	D1	H1	C1	C2	G1	G2	E1	WEED
			BIOMETRIC VEGETATION TYPE		GREY BOX - FOREST RED GUM GRASSY WOODLAND										
			ANCILLARY CODE		MODERATE - GOOD HIGH	MODERATE TO GOOD MEDIUM	MODERATE TO GOOD POOR (OLIVE)	MODERATE TO GOOD OTHER (DNG)	LOW CLEARED	MODERATE - GOOD POOR (OLIVE)	LOW - CLEARED				
FAMILY	GENUS	SPECIES	EXOTIC / NATIVE	COMMON NAME											
Fabaceae (Mimosoideae)	<i>Acacia</i>	<i>falcata</i>	N	Kangaroo Thorn											
Fabaceae (Mimosoideae)	<i>Acacia</i>	<i>parramattensis</i>	N	Parramatta Wattle		x									
Loranthaceae	<i>Amyema</i>	<i>sp.</i>	N		x										
Poaceae	<i>Aristida</i>	<i>ramosa</i>	N	Purple Wiregrass	x	x	x								
Poaceae	<i>Aristida</i>	<i>vagans</i>	N	Threeawn Speargrass		x	x		x						
Rubiaceae	<i>Asperula</i>	<i>conferta</i>	N	Common Woodruff	x	x	x	x	x		x				
Asteraceae	<i>Senecio</i>	<i>sp.</i>	N												
Poaceae	<i>Austrodanthonia</i>	<i>sp.</i>	N	Wallaby Grass	x	x	x					x			
Poaceae	<i>Bothriochloa</i>	<i>macra</i>	N	Red Grass	x		x	x			x		x		
Malvaceae	<i>Brachychiton</i>	<i>populneus</i>	N	Kurrajong		x								x	
Acanthaceae	<i>Brunoniella</i>	<i>australis</i>	N	Blue Trumpet	x	x	x		x						
Pittosporaceae	<i>Bursaria</i>	<i>spinosa</i>	N	Native Blackthorn	x	x	x	x	x				x		
Cyperaceae	<i>Carex</i>	<i>breviculmis</i>	N			x			x						
Cyperaceae	<i>Carex</i>	<i>inversa</i>	N							x					
Cyperaceae	<i>Carex</i>	<i>sp.</i>	N											x	
Euphorbiaceae	<i>Chamaesyce</i>	<i>drummondii</i>	N	Caustic Weed			x								
Adiantaceae	<i>Cheilanthes</i>	<i>sieberi</i>	N			x	x	x	x						
Poaceae	<i>Chloris</i>	<i>ventricosa</i>	N	Tall Windmill Grass	x		x	x	x						
Asteraceae	<i>Chrysocephalum</i>	<i>apiculatum</i>	N	Common Everlasting		x									
Ranunculaceae	<i>Clematis</i>	<i>aristata</i>	N	Old Man's Beard		x									
Convolvulaceae	<i>Convolvulus</i>	<i>erubescens</i>	N	Blushing Bindweed						x					
Asteraceae	<i>Cotula</i>	<i>australis</i>	N	Carrot Weed	x		x	x							
Asteraceae	<i>Cymbonotus</i>	<i>lawsonianus</i>	N	Bears-ear			x								
Poaceae	<i>Cymbopogon</i>	<i>refractus</i>	N	Barbed Wire Grass		x									
Poaceae	<i>Cynodon</i>	<i>dactylon</i>	N	Common Couch						x	x	x			
Apiaceae	<i>Daucus</i>	<i>glochidiatus</i>	N	Native Carrot			x	x							
Fabaceae (Faboideae)	<i>Desmodium</i>	<i>brachypodum</i>	N	Large Tick-trefoil					x						
Fabaceae (Faboideae)	<i>Desmodium</i>	<i>varium</i>	N	Slender Tick-trefoil	x	x	x	x	x						
Phormiaceae	<i>Dianella</i>	<i>longifolia</i>	N	Blue Flax-lily		x			x						

				PLOT NUMBER		A1	B1	Z1	D1	H1	C1	C2	G1	G2	E1	WEED		
				BIOMETRIC VEGETATION TYPE		GREY BOX - FOREST RED GUM GRASSY WOODLAND										FOREST RED GUM - ROUGH BARKED APPLE GRASSY WOODLAND		
				ANCILLARY CODE		MODERATE - GOOD HIGH	MODERATE TO GOOD MEDIUM	MODERATE TO GOOD POOR (OLIVE)	MODERATE TO GOOD OTHER (DNG)	LOW CLEARED	MODERATE - GOOD POOR (OLIVE)	LOW - CLEARED						
FAMILY	GENUS	SPECIES	EXOTIC / NATIVE	COMMON NAME														
Poaceae	<i>Dichelachne</i>	<i>sp</i>	N								x	x						
Convolvulaceae	<i>Dichondra</i>	<i>repens</i>	N	Kidney Weed	x	x	x	x	x						x			
Sapindaceae	<i>Dodonaea</i>	<i>viscosa</i>	N					x										
Chenopodiaceae	<i>Einadia</i>	<i>nutans</i>	N	Climbing Saltbush	x		x											
Poaceae	<i>Entolasia</i>	<i>marginata</i>	N	Bordered Panic		x				x								
Poaceae	<i>Eragrostis</i>	<i>leptostachya</i>	N	Paddock Lovegrass		x				x								
Myoporaceae	<i>Eremophila</i>	<i>debilis</i>	N	Winter Apple	x	x	x											
Myrtaceae	<i>Eucalyptus</i>	<i>amplifolia</i>	N	Cabbage Gum				x	x									
Myrtaceae	<i>Eucalyptus</i>	<i>tereticornis</i>	N	Forest Red Gum		x		x	x						x			
Myrtaceae	<i>Eucalyptus</i>	<i>crebra</i>	N	Narrow-leaved Ironbark		x		x	x									
Myrtaceae	<i>Eucalyptus</i>	<i>moluccana</i>	N	Grey Box	x	x	x											
Asteraceae	<i>Euchiton</i>	<i>sphaericus</i>	N			x		x										
Rubiaceae	<i>Galium</i>	<i>gaudichaudii</i>	N	Rough Bedstraw		x		x										
Geraniaceae	<i>Geranium</i>	<i>solanderi</i>	N									x						
Fabaceae (Faboideae)	<i>Glycine</i>	<i>cladestina</i>	N						x	x								
Fabaceae (Faboideae)	<i>Glycine</i>	<i>microphylla</i>	N	small-leaf glycine		x												
Fabaceae (Faboideae)	<i>Glycine</i>	<i>tabacina</i>	N		x	x	x	x	x									
Fabaceae (Faboideae)	<i>Goodenia</i>	<i>hederacea</i>	N	Ivy Goodenia														
Hydrophoraceae	<i>Hymenantha</i>	<i>dentata</i>	N	Tree Violet												x		
Asteraceae	<i>Lagenophora</i>	<i>stipitata</i>	N	Common Lagenophora	x	x												
Liliaceae	<i>Liliaceae</i>	<i>sp.</i>	N		x		x											
Lomandraceae	<i>Lomandra</i>	<i>filiformis</i>	N		x	x	x		x									
Chenopodiaceae	<i>Maireana</i>	<i>microphylla</i>	N	Small-leaf Bluebush							x							
Poaceae	<i>Microlaena</i>	<i>stipoides</i>	N	Weeping Grass		x	x	x	x	x	x				x	x		
Poaceae	<i>Microlaena</i>	<i>sp</i>	N												x			
Myoporaceae	<i>Myoporum</i>	<i>montanum</i>	N	Western Boobialla	x													
Rubaiceae	<i>Opercularia</i>	<i>sp</i>	N							x								
Poaceae	<i>Oplismenus</i>	<i>aemulus</i>	N	Australian Basket Grass												x		
Poaceae	<i>Oplismenus</i>	<i>sp</i>	N															
Oxalidaceae	<i>Oxalis</i>	<i>perennans</i>	N		x		x	x					x	x	x			
Oxalidaceae	<i>Ozothamnus</i>	<i>diosmifolius</i>	N	Rice Flower						x								
Poaceae	<i>Panicum</i>	<i>sp</i>	N				x			x								
Phyllanthaceae	<i>Phyllanthus</i>	<i>hirtellus forma A</i>	N			x												
Pittosporaceae	<i>Plantago</i>	<i>debilis</i>	N		x	x	x											
Plantaginaceae	<i>Plectranthus</i>	<i>parviflorus</i>	N	Cockspur Flower		x												
Rubaiceae	<i>Richardia</i>	<i>sp</i>	N			x												
Polygonaceae	<i>Rumex</i>	<i>brownii</i>	N	Swamp Dock							x	x						

				PLOT NUMBER		A1	B1	Z1	D1	H1	C1	C2	G1	G2	E1	WEED	
				BIOMETRIC VEGETATION TYPE		GREY BOX - FOREST RED GUM GRASSY WOODLAND										FOREST RED GUM - ROUGH BARKED APPLE GRASSY WOODLAND	
				ANCILLARY CODE		MODERATE - GOOD HIGH	MODERATE TO GOOD MEDIUM	MODERATE TO GOOD POOR (OLIVE)	MODERATE TO GOOD OTHER (DNG)	LOW CLEARED		MODERATE - GOOD POOR (OLIVE)	LOW - CLEARED				
FAMILY	GENUS	SPECIES	EXOTIC / NATIVE	COMMON NAME													
Cyperaceae	<i>Schoenus</i>	<i>apogon</i>	N	Common Bog-rush									x				
Cyperaceae	<i>Schoenus</i>	<i>sp</i>	N					x						x			
Malvaceae	<i>Sida</i>	<i>corrugata</i>	N	Corrugated Sida		x	x	x	x								
Solanaceae	<i>Solanum</i>	<i>prinophyllum</i>	N	Forest Nightshade		x			x	x							
Asteraceae	<i>Solenogyne</i>	<i>dominii</i>	N				x										
Asteraceae	<i>Solenogyne</i>	<i>gunnii</i>	N					x									
Poaceae	<i>Sporobolus</i>	<i>creber</i>	N	Slender Rat's Tail Grass								x					
Stackhousiaceae	<i>Stackhousia</i>	<i>sp</i>	N				x										
Poaceae	<i>Themeda</i>	<i>australia</i>	N	Kangaroo Grass					x			x					
Anthericaceae	<i>Tricoryne</i>	<i>elatior</i>	N	Yellow-rush Lily			x										
Scrophulariaceae	<i>Veronica</i>	<i>sp</i>	N							x							
Asteraceae	<i>Vittadinia</i>	<i>cuneata</i>	N	Fuzzweed		x		x									
Campanulaceae	<i>Wahlenbergia</i>	<i>sp</i>	N			x		x									
Poaceae	<i>Austrostipa</i>	<i>sp.</i>	N	Spear Grass													
Sapindaceae	<i>Acer</i>	<i>negundo</i>	E	Box-elder Maple													x
Primulaceae	<i>Anagallis</i>	<i>arvensis</i>	E	Scarlet/Blue Pimpernel					x	x		x	x				
Asclepiadaceae	<i>Araujia</i>	<i>sericifera</i>	N	Moth Plant			x										
Asparagaceae	<i>Asparagus</i>	<i>asparagoides</i>	E	Bridal Creeper			x	x		x					x		
Poaceae	<i>Briza</i>	<i>subaristata</i>	E								x	x		x			
Poaceae	<i>Bromus</i>	<i>sp</i>	E			x							x	x			
Gentianaceae	<i>Centaurium</i>	<i>sp</i>	E				x										
Poaceae	<i>Chloris</i>	<i>gayana</i>	E	Rhodes Grass			x										
Asteraceae	<i>Cirsium</i>	<i>vulgare</i>	E	Spear Thistle		x	x		x	x	x	x	x	x			
Asteraceae	<i>Conyza</i>	<i>sp</i>	E			x	x	x	x	x		x	x	x			x
Poaceae	<i>Eleusine</i>	<i>tristachya</i>	E	Goose Grass													x
Poaceae	<i>Eragrostis</i>	<i>curvula</i>	E	African Love Grass		x	x	x	x	x	x	x	x	x			
Rubiaceae	<i>Galium</i>	<i>sp.</i>	E							x							
Asteraceae	<i>Gamochaeta</i>	<i>sp</i>	E						x				x	x			
Fabaceae (Faboideae)	<i>Gleditsia</i>	<i>triacanthos</i>	E	Honey Locust													x
Asteraceae	<i>Hypochaeris</i>	<i>radicata</i>	E	Catsear		x	x	x									
Clusiaceae	<i>Hypericum</i>	<i>perforatum</i>	E	St. Johns Wort										x			
Brassicaceae	<i>Lepidium</i>	<i>sp.</i>	N			x											
Oleaceae	<i>Ligustrum</i>	<i>sinense</i>	E	Small Leaved Privet						x							x
Oleaceae	<i>Ligustrum</i>	<i>lucidum</i>	E	Large Leaved privet Japanese											x		x
Caprifoliaceae	<i>Lonicera</i>	<i>japonica</i>	E	Honeysuckle													x
Solanaceae	<i>Lycium</i>	<i>ferocissimum</i>	E	African Boxthorn		x		x		x			x				
Malvaceae	<i>Modiola</i>	<i>caroliniana</i>	E	Red-flowered Mallow				x	x			x					
		<i>Nephrolepis sp.</i>	E												x		
Oleaceae	<i>Olea</i>	<i>europaea</i>	E	African Olive		x	x	x	x	x		x			x		x

					PLOT NUMBER										
					A1	B1	Z1	D1	H1	C1	C2	G1	G2	E1	WEED
					BIOMETRIC VEGETATION TYPE										
					GREY BOX - FOREST RED GUM GRASSY WOODLAND										
					ANCILLARY CODE										
					MODERATE - GOOD HIGH	MODERATE TO GOOD MEDIUM	MODERATE TO GOOD POOR (OLIVE)	MODERATE TO GOOD OTHER (DNG)	LOW CLEARED	MODERATE - GOOD POOR (OLIVE)	LOW - CLEARED				
FAMILY	GENUS	SPECIES	EXOTIC / NATIVE	COMMON NAME											
Cactaceae	<i>Opuntia</i>	<i>stricta</i>	E	Common Pirckly Pear	x				x						
	<i>Osteospermum</i>		E			x									
Caryophyllaceae	<i>Paronychia</i>	<i>brasiliana</i>	E	Chilean Whitlow Wort			x								
Poaceae	<i>Paspalum</i>	<i>dilatatum</i>	E	Paspalum						x	x	x	x		
Poaceae	<i>Pennisetum</i>	<i>clandestinum</i>	E	Kikuyu Grass							x	x			
Pittosporaceae	<i>Plantago</i>	<i>lanceolata</i>	E	Lamb's Tongues*	x	x	x		x	x	x	x	x		
Poaceae	<i>Poa</i>	<i>annua</i>	E	Winter Grass											x
Rubiaceae	<i>Richardia</i>	<i>stellaris</i>	E					x							
Rubiaceae	<i>Richardia</i>	<i>sp</i>	E				x								
Iridaceae	<i>Romulea</i>	<i>rosea</i>	E	Onion Grass											x
Asteraceae	<i>Senecio</i>	<i>madagascariensis</i>	E	Fireweed	x	x	x	x		x	x	x	x		
Asteraceae	<i>Setaria</i>	<i>sp</i>	E			x	x	x	x		x	x	x		
Malvaceae	<i>Sida</i>	<i>rhubifolia</i>	E	Paddy's Lucerne	x		x	x		x	x	x			
Solanaceae	<i>Sonchus</i>	<i>oleraceus</i>	E	Common Sowthistle		x	x	x	x						
Solanaceae	<i>Sonchus</i>	<i>asper</i>	E	Prickly Sowthistle			x				x				
Commelinaceae	<i>Tradescantia</i>	<i>fluminensis</i>	E	Wandering Jew											x
Fabaceae	<i>Trifolium</i>	<i>arvense</i>	E	Haresfoot Clover				x			x				
Fabaceae	<i>Trifolium</i>	<i>repens</i>	E	White Clover											x
Verbenaceae	<i>Verbena</i>	<i>bonariensis</i>	E	Purpletop				x		x	x	x	x		
Poaceae	<i>Phalaris</i>	<i>sp</i>	E	Canary Grass											

FAUNA

COMMON NAME	SCIENTIFIC NAME	NATIVE/EXOTIC
Australasian Grebe	<i>Tachybaptus novaehollandiae</i>	N
Australian Raven	<i>Corvus coronoides</i>	N
Black-faced Cuckoo-shrike	<i>Coracina novaehollandiae</i>	N
Bell Miner	<i>Manorina melanophrys</i>	N
Little Black Cormorant	<i>Phalacrocorax sulcirostris</i>	N
Crested Shrike-tit	<i>Falcunculus frontatus</i>	N
Common Eastern Froglet	<i>Crinia signifera</i>	N
Cumberland Plain Land Snail	<i>Meridolum corneovirens</i>	N
Double-barred Finch	<i>Taeniopygia bichenovii</i>	N
Dusky Moorhen	<i>Gallinula tenebrosa</i>	N
Eastern Rosella	<i>Platycercus eximius</i>	N
Eastern Grey Kangaroo	<i>Macropus giganteus</i>	N
Eurasian Coot	<i>Fulica atra</i>	N
Eastern Yellow Robin	<i>Eopsaltria australis</i>	N
Fairy Martin	<i>Petrochelidon ariel</i>	N
Galah	<i>Eolophus roseicapillus</i>	N
Golden Whistler	<i>Pachycephala pectoralis</i>	N
Grey Butcherbird	<i>Cracticus torquatus</i>	N
Grey Fantail	<i>Rhipidura albiscapa</i>	N
Grey Teal	<i>Anas gracilis</i>	N
Grey Shrike-thrush	<i>Colluricincla harmonica</i>	N
Jacky Winter	<i>Microeca fascinans</i>	N
King Parrot	<i>Alisterus scapularis</i>	N
Kookaburra	<i>Dacelo novaeguineae</i>	N
Little Lorikeet	<i>Glossopsitta pusilla</i>	N
Australian Magpie	<i>Cracticus tibicen</i>	N
Masked Lapwing	<i>Vanellus miles</i>	N
Noisy Miner	<i>Manorina melanocephala</i>	N
Olive-backed Oriole	<i>Oriolus sagittatus</i>	N
Pacific Black Duck	<i>Anas superciliosa</i>	N
Magpie-lark	<i>Grallina cyanoleuca</i>	N
Pelican	<i>Pelecanus conspicillatus</i>	N
Pied Currawong	<i>Strepera graculina</i>	N
Rainbow Lorikeet	<i>Trichoglossus haematodus</i>	N
Red-browed Finch	<i>Neochmia temporalis</i>	N
Red-rumped Parrot	<i>Psephotus haematonotus</i>	N
Restless Flycatcher	<i>Myiagra inquieta</i>	N
Satin Bowerbird	<i>Ptilonorhynchus violaceus</i>	N
Spotted Pardalote	<i>Pardalotus punctatus</i>	N
Striated Pardalote	<i>Pardalotus striatus</i>	N
Sulphur-crested Cockatoo	<i>Cacatua galerita</i>	N
Superb Fairy-wren	<i>Malurus cyaneus</i>	N

COMMON NAME	SCIENTIFIC NAME	NATIVE/EXOTIC
Swamp Wallaby	<i>Wallabia bicolor</i>	N
Eastern Whipbird	<i>Psophodes olivaceus</i>	N
Weebil	<i>Smicrornis brevirostris</i>	N
Welcome Swallow	<i>Hirundo neoxena</i>	N
White-faced Heron	<i>Egretta novaehollandiae</i>	N
White-winged Chough	<i>Corcorax melanorhamphos</i>	N
Willie Wagtail	<i>Rhipidura leucophrys</i>	N
Australian Wood Duck	<i>Chenonetta jubata</i>	N
Yellow Thornbill	<i>Acanthiza nana</i>	N
Yellow-faced Honeyeater	<i>Lichenostomus chrysops</i>	N
Yellow-tailed Black-Cockatoo	<i>Calyptorhynchus funereus</i>	N
Rabbit	<i>Oryctolagus cuniculus</i>	E
Cow	<i>Bos sp.</i>	E
Indian Myna	<i>Acridotheres tristis</i>	E
Horse	<i>Equus caballus</i>	E
Starling	<i>Sturnus vulgaris</i>	E

Appendix C: Landscape TG

Grey Box – Forest Red Gum Grassy Woodland on Shales of the southern Cumberland Plain,

SCIENTIFIC NAME	COMMON NAME	TG VALUE
<i>Burhinus grallarius</i>	Bush Stone-curlew	0.4
<i>Climacteris picumnus victoriae</i>	Brown Treecreeper (eastern subspecies)	0.5
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	0.35
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	0.45
<i>Glossopsitta pusilla</i>	Little Lorikeet	0.58
<i>Lathamus discolor</i>	Swift Parrot	0.75
<i>Melithreptus gularis gularis</i>	Black-chinned Honeyeater (eastern subspecies)	0.75
<i>Meridolum corneovirens</i>	Cumberland Land Snail	0.75
<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing-bat	0.75
<i>Mormopterus norfolkensis</i>	Eastern Freetail-bat	0.45
<i>Myotis macropus (formally Myotis adversus)</i>	Large-footed Myotis	0.4
<i>Neophema pulchella</i>	Turquoise Parrot	0.55
<i>Ninox connivens</i>	Barking Owl	0.33
<i>Petroica boodang</i>	Scarlet Robin	0.6
<i>Phascolarctos cinereus</i>	Koala	0.83
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	0.93
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	0.45
<i>Stagonopleura guttata</i>	Diamond Firetail	0.75
<i>Xanthomyza phrygia</i>	Regent Honeyeater	0.75
Landscape TG		0.595

Forest Red Gum – Rough Barked Apple Grassy Woodland on Alluvial Flats of the Cumberland Plain

SCIENTIFIC NAME	COMMON NAME	TG VALUE
<i>Burhinus grallarius</i>	Bush Stone-curlew	0.4
<i>Climacteris picumnus victoriae</i>	Brown Treecreeper (eastern subspecies)	0.5
<i>Dasyurus maculatus</i>	Spotted-tailed Quoll	0.35
<i>Falsistrellus tasmaniensis</i>	Eastern False Pipistrelle	0.45
<i>Glossopsitta pusilla</i>	Little Lorikeet	0.58
<i>Lathamus discolor</i>	Swift Parrot	0.75
<i>Melithreptus gularis gularis</i>	Black-chinned Honeyeater (eastern subspecies)	0.75
<i>Meridolum corneovirens</i>	Cumberland Land Snail	0.75
<i>Miniopterus schreibersii oceanensis</i>	Eastern Bentwing-bat	0.75
<i>Mormopterus norfolkensis</i>	Eastern Freetail-bat	0.45
<i>Myotis macropus (formally Myotis adversus)</i>	Large-footed Myotis	0.4
<i>Neophema pulchella</i>	Turquoise Parrot	0.55
<i>Ninox connivens</i>	Barking Owl	0.33
<i>Petroica boodang</i>	Scarlet Robin	0.6
<i>Pteropus poliocephalus</i>	Grey-headed Flying-fox	0.93
<i>Scoteanax rueppellii</i>	Greater Broad-nosed Bat	0.45
<i>Stagonopleura guttata</i>	Diamond Firetail	0.75
<i>Tyto novaehollandiae</i>	Masked Owl	0.33
<i>Xanthomyza phrygia</i>	Regent Honeyeater	0.75
Landscape TG		0.57

Appendix D: Transect Data

Zone 1: Grey Box – Forest Red Gum Grassy Woodland on Shales of the southern Cumberland Plain, Sydney Basin M / G* Good

PLOTNAME	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL	EASTING	NORTHING	ZONE
A1	25	13	1	20	6	10	52	1	1	3	284458	6228944	56

Zone 2: Grey Box – Forest Red Gum Grassy Woodland on Shales of the southern Cumberland Plain M / G* Moderate

PLOTNAME	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL	EASTING	NORTHING	ZONE
B1	39	16	7	16	26	12	64	0	0.66	0	284601	6229199	56
Z1	32	30	8	28	0	14	32	1	0.66	6.8	284797	6228950	56

Zone 3: Grey Box – Forest Red Gum Grassy Woodland on Shales of the southern Cumberland Plain M / G* Olive

PLOTNAME	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL	EASTING	NORTHING	ZONE
D1	21	6	0	70	10	12	59	1	0.66	15	285396	6229189	56
H1	27	14	3	32	4	6	75	1	0.66	52	285464	6229863	56

Zone 4: Grey Box – Forest Red Gum Grassy Woodland on Shales of the southern Cumberland Plain, Sydney Basin M / G* DNG

PLOTNAME	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL	EASTING	NORTHING	ZONE
C1	7	0	0	96	0	0	72	0	0	0	285824	6229554	56
C2	9	0	2	74	4	2	48	0	0	0	285616	6229170	56

Zone 5: Forest Red Gum – Rough Barked Apple Grassy Woodland on Alluvial Flats of the Cumberland Plain, Sydney Basin M / G* Olive

PLOTNAME	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL	EASTING	NORTHING	ZONE
E1	7	2	0	0	0	0	74	0	0	40	285454	6229135	56

Zone 6: Grey Box – Forest Red Gum Grassy Woodland on Shales of the southern Cumberland Plain, Sydney Basin LOW Cleared

PLOTNAME	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL	EASTING	NORTHING	ZONE
G1	4	0	0	0	0	0	100	0	0	0	284643	6228954	56
G2	0	0	8	4	0	2	94	0	0	0	284763	6229272	56

Zone 7 Forest Red Gum – Rough Barked Apple Grassy Woodland on Alluvial Flats of the Cumberland Plain, Sydney Basin LOW Cleared

PLOTNAME	NPS	NOS	NMS	NGCG	NGCS	NGCO	EPC	NTH	OR	FL	EASTING	NORTHING	ZONE
Weed	3	0	0	0	0	0	98	0	0	75	285608	6229631	56



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Note:

The following Conservation and Land Use Management Plan (CLUMP) covers 5 Smalls Road, Grasmere (subject site) and the Carrington main campus at 90 Werombi Road. However the Planning Proposal only deals with the 5 Smalls Road, Grasmere site. It was originally proposed to offset vegetation clearance on the subject site with the existing vegetation on the main Carrington Campus. The vegetation offset on the main campus is now not being pursued. The proponent, the Office of Environment and Heritage (OEH) and Council have been investigating a range of options to ensure conservation of the vegetation, including Bio-banking, however there is no agreed position at this time.



CARRINGTON CENTENNIAL CARE

Conservation and Land Use Management Plan

Prepared for
Michael Brown Planning Strategies

27 May 2016



DOCUMENT TRACKING

ITEM	DETAIL
Project Name	Carrington Centennial Care – Conservation and Land Use Management Plan and Vegetation Management Plan
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Approved by	Steve House
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Contents

1	Introduction	6
1.1	Background.....	6
1.2	Gateway Determination & Director Generals Requirements.....	6
1.3	Context, Scope & Application of CLUMP	7
1.4	Aims & Objectives	8
1.5	Site Description	9
1.6	Key Values of the Carrington Site	13
1.7	Key Threats to the Carrington Site	14
1.8	Statutory Context.....	17
2	Management Framework	22
2.1	Carrington Centennial care.....	22
2.2	Implementation & Delivery.....	22
2.3	Enforcement	23
2.4	Funding.....	23
2.5	Review	24
3	Management Areas	25
3.1	Development Lands.....	26
3.2	Conservation Lands.....	43
3.3	Overarching Management principles.....	47
4	Monitoring and reporting	58
4.1	Photo monitoring points	58
4.2	Bush regeneration & Revegetation reporting	59
4.3	Performance criteria	59
	References	63
	Appendix 1	65
	Appendix 2	84
	Appendix 3	85

List of Figures

Figure 1: Smalls Road Campus Masterplan 10

Figure 2: Carrington Centennial Care estate and the Smalls Road Campus and Northern Campus components of the study area 11

Figure 3: The study site broken into Development Lands and Conservation Lands 12

Figure 4: Process and Outcomes of the Smalls Road Campus Rezoning 23

Figure 5: CLUMP Management Structure 25

Figure 6: Management Units within Development Lands 27

Figure 7: Fuel Accumulation patterns in Cumberland Plain Woodland (Watson 2005) 35

Figure 8: Typical APZ Cross Section (*Source: Hassell & Associates*) 36

List of Tables

Table 1: Weed Species, their status and abundance.....	14
Table 2: EPBC Act Key Aims and CLUMP Approach	18
Table 3: Development and Conservation Lands Breakdown	26
Table 4: Management Treatments / Tasks required within Management Units of the Development Lands	28
Table 5: Management Unit breakdown	47
Table 6: Inter-fire Periods.....	48
Table 7: Treatments and tasks required in the Conservation Lands Management Units	50
Table 8: Performance Criteria for Treatments / Tasks carried out in Conservation Lands Management Units	61
Table 9: Indicative tree species for revegetation of Grey Box-Forest Red Gum grassy woodland	74
Table 10: Indicative Shrub and Groundcover species for revegetation of Grey Box- Forest Red Gum Grassy Woodland.....	74
Table 11: Indicative Tree Species list for Forest Red Gum - Rough Barked Apple grassy woodland.....	74
Table 12: Indicative shrub and groundcover species list for Forest Red Gum - Rough Barked Apple grassy woodland	75
Table 13: Species to be used in revegetation of the channel base	75
Table 14: Preparation, establishment and maintenance costs for each zone	81
Table 15: Biometric vegetation condition classes	85

Terms and Abbreviations

ABBREVIATION	DESCRIPTION
APZ	Bushfire Asset Protection Zone – where fuel levels are reduced surrounding an asset to reduce fire intensity and damage to assets
CLUMP	Conservation and Land Use Management Plan
Conservation Lands	All land identified as Conservation lands in Figure 3
DA	Development Application
DEC	(Former) Department of Environment and Conservation (NSW) (currently OEH)
DECCW	(Former) Department of Environment, Climate Change and Water (NSW) (currently OEH)
Development Lands	All land identified as Development land in Figure 3
ELA	Eco Logical Australia Pty Ltd
IPA	Inner Protection Area – defines the standard of fuel management to be met within the APZ
Local Provenance	Refers to plant material collected from within a range (distance) of the site within which natural genetic exchange is likely to occur
LMZ	Land Management Zones
Management Area	<p>The Carrington Centennial Care site has been broken into two Management Areas:</p> <ol style="list-style-type: none"> 1) Development Lands 2) Conservation Lands. <p>These management areas are further broken into Management Units.</p>
Management Unit	An on-ground area of the site within which all land is to be managed in the same way.
OEH	NSW Office of Environment and Heritage
RFS	NSW Rural Fire Service

1 Introduction

1.1 BACKGROUND

Carrington Centennial Care own two large portions of land within the suburb of Grasmere, within Camden Local Government Area in south-west Sydney. Carrington Centennial Care are seeking the rezoning of one portion of their landholdings (the Smalls Road campus) through the Gateway Process with NSW Department of Planning and Infrastructure and Camden Council. Subsequent to an approved rezoning, the Smalls Road campus is proposed to be developed into a Lifestyle Village which is a key component of the Carrington's growth strategy for the next 10 – 15 years, the objectives of which are to increase the variety and amenity of services offered to aged persons within the District.

In order to ensure that the rezoning proposal (and subsequent development) lead to no overall loss of biodiversity values from the Carrington Centennial Care estate, in perpetuity conservation of the parts of the estate with high biodiversity value has been proposed. These high conservation areas exist on both portions of the estate and are to be managed in accordance with the regime and prescriptions of this Conservation and Land use Management Plan (incorporating a Vegetation Management Plan).

The Conservation and Land Use Management Plan (CLUMP) sets out the overall framework and objectives for the management of the Conservation Lands and its effective implementation is to be guaranteed through Consent Conditions attached to subsequent development approvals for the proposal. The CLUMP also provides a background to the site and its ecological and other values. The CLUMP provides the detailed information on the management units within both the development and conservation lands, provides prescriptions for the management activities to be undertaken within the zones and provides a mechanism and timeframe for achievement of the plan's objectives.

1.2 GATEWAY DETERMINATION & DIRECTOR GENERALS REQUIREMENTS

Camden Council requested a Gateway Determination from the NSW Department of Planning and Infrastructure in April 2012 for the rezoning of the Smalls Road portion of Carrington Centennial Care estate. The site is currently zoned R5 – Large Lot Residential and the proposed rezoning of the site seeks to include areas zoned for residential development, commercial development and environmental conservation (see **Figure 2**).

The proposed development would accommodate aged care accommodation in a variety of forms and would be supported by a village centre incorporating community facilities, commercial uses and a Wellness Centre. These service not just the proposed Lifestyle Village, but are also intended to be an asset to the surrounding existing Grasmere community outside of the Carrington estate.

The NSW Department of Planning and Infrastructure (DP & I) has indicated support for the rezoning proposal, subject to the conditions stipulated in the Gateway Determination. In regards to the ecological values and ongoing environmental management of the Carrington Centennial Care site, the Gateway Determination requires:

- Consultation with the Commonwealth Department of Sustainability, Environment, Water, Population and Communities in regards to the environmental sensitivity of the site and the potential implications for threatened species,

- Demonstration that the proposal is consistent with the S117 Direction 2.1 Environment Protection Zones,
- Updating of the environmental studies completed for assessment of the planning proposal and ongoing management of the site.

This combined Conservation and Land Use Management Plan (CLUMP) (incorporating a vegetation Management Plan (VMP) have been completed to meet Condition 4 of the Gateway Determination. In addition, the Flora and Fauna (including offsetting), Riparian and Bushfire Study (ELA 2012) have also been completed to address the other component of Conditions 4, 10, 11 of the Gateway Determination.

1.3 CONTEXT, SCOPE & APPLICATION OF CLUMP

The Conservation and Land Use Management Plan (CLUMP) has been developed to document the commitments for protection and ecological management of the Carrington Centennial Care estate, in particular the Conservation Lands within the estate. The CLUMP applies to both the Smalls Road Campus and the Northern Campus portions of the Carrington Centennial Care estate.

The CLUMP delineates the areas of the site as:

- “Development Lands” which includes all areas of existing and proposed urban development as well as bushfire asset protection zones, infrastructure facilities and ‘urban’ riparian zones, and
- “Conservation Lands” as those parts of the site whereby ecological restoration and rehabilitation works will be undertaken.

The CLUMP also establishes criteria against which all subsequent development applications (within the development lands) should be assessed by Camden Council in order to ensure that the aims and objectives of the CLUMP, in particular in regards to the conservation lands, will not be compromised. The first part of the CLUMP (Sections 1 and 2) set out the scope, objectives and management framework for the CLUMP while the second part (Sections 3 and 4 and Appendix 1) provides the detailed management prescription for the various management units onsite, the performance criteria to be achieved and the monitoring and evaluation framework to be used to measure performance against targets.

The CLUMP does not provide detailed prescriptions for site management activities which are more readily dealt with at the subsequent Development Application (DA) stage, such as detailed tree protection requirements or sediment and erosion techniques. These issues are specific to the exact nature (type, location and extent) of development works and will be covered by the development and approval of Construction Environmental Management Plans (CEMPs) for individual DAs lodged in the future.

This CLUMP will be implemented via Development Consent Conditions that will be attached by council to the approval for the proposal, consistent with the provisions of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The conditions of consent will require that the CLUMP be implemented in accordance with the requirements of this document and the outcomes of implementation activities, together with the condition of the sites broader biodiversity values reported to council annually (Section 4). In this context, responsibility for the implementation of the CLUMP will lie ultimately with the Carrington Centennial Trust.

An adaptive management approach will be taken in applying the CLUMP because of the size of the site, the variable condition of the ecosystems present, the varying nature and extent of current site threats and impacting processes, and the different future outcomes desired for different parts of the site. The adaptive management approach places an emphasis on encouraging the natural resilience of the site and integration with existing and desired natural processes to restore the ecological values of the site. In this

manner, direct planting will be minimised and only implemented where natural resilience is low, or environment/land use requires immediate responses (e.g. on steeper slopes, riparian areas susceptible to erosion).

1.4 AIMS & OBJECTIVES

The overarching aim of the CLUMP is to provide an effective management framework for the Development Lands and Conservation Lands within Carrington Centennial Care estate and ensure that the current levels of biodiversity value and ecological integrity are improved over time. The CLUMP addresses the range of activities to be undertaken with the Conservation Lands and also addresses appropriate management of the 'built areas' on site so as to prevent indirect impacts in the Conservation Lands. While extensive disturbance has taken place on parts of the estate in the past and will occur in the future post rezoning, the proposed development and conservation footprint will enable the retention of significant ecological values across the estate.

Effective implementation of this CLUMP will deliver the following conservation objectives:

- The protection, rehabilitation and restoration of 17.29 ha of Cumberland Plain Woodland and 3.82 ha of Alluvial Woodland and 10.17 ha of Derived Native Grasslands within E2 zoned conservation lands,
- The use of appropriate ecological tools and methods (fire, rehabilitation, regeneration, use of local provenance species) within the various management units to ensure maximum effectiveness, sustainability and cost efficiency,
- The retention and increased availability of vital habitat resources throughout the estate such as hollow bearing trees, winter flowering Eucalypts, fallen logs, leaf litter and onsite dam,
- Control and eradication of pest plant and animal species onsite and minimisation of the effects of other key threatening processes currently affecting the site,
- The integration of biodiversity management with the protection of the other values on site such as the areas Aboriginal cultural significance, historical buildings and land uses, visual amenity and community recreation,
- The management of the 'built' areas on the estate so as to eliminate short term or ongoing impacts on the conservation lands,
- Improved connectivity to the stands of remnant native vegetation on the adjacent Sydney Water lands and Bicentennial Equestrian Park to the east and the Camden Airport Lands to the north as well as improving connectivity along the Nepean River,
- Delineated and consistently managed bushfire asset protection zones surrounding development nodes which will increase occupant safety and reduce the level of bushfire threat posed by the Carrington Centennial Care estate to adjoining lands and residences and the endangered ecological communities onsite,
- The monitoring of activities against specific performance targets to ensure that works are adequate and effective and to achieve the most cost effective long term management of the Conservation Lands and compliance with the voluntary conservation agreement.

The CLUMP outlines how the strategic objectives for each management unit will be achieved through defining specific management objectives, outlining the required management activities, determining implementation targets, timeframes and responsibilities.

1.5 SITE DESCRIPTION

This Conservation and Land Use Management Plan (CLUMP) applies to both portions of land which make up the Carrington Centennial Care estate (**Figure 2**). The CLUMP designates all land with the Carrington Centennial Care estate as within either the “Development Land” or “Conservation Lands” management area, whereby Development Lands and Conservation Lands have the same meaning as for the Biodiversity Certification assessment of the site (**Figure 3**).

The Smalls Road Campus is 27ha in size, while the Northern Campus is 71.41ha in size. Carrington is located in the suburb of Grasmere, within Camden LGA approximately 2.5km west of the suburb of Camden.

The Smalls Road rezoning site currently contains no existing development but retains two moderately sized areas of remnant bushland as well as areas of open exotic pasture grass. The land is fringed by low density residential and rural residential housing. The Northern Campus contains a mix of existing aged care, assisted living and hospital facilities with significant stands of vegetation predominantly around the edges of the site.

The landscape of the study area is typical of the surrounding area, with gentle to moderate slopes and rolling hills, pockets of remnant native vegetation interspersed with large expanses of exotic pasture grasses reflecting the recent low intensity agricultural former uses of the area.

A ridge runs through the centre of the Smalls Road Campus from north to south, with slopes ranging up to 10° but generally in the order of 0 - 5°. The north-east corner of the site drains to a small watercourse running from east to west while the south-west portion of the site drains towards the west into a different watercourse. Both watercourses are tributaries of Sickles Creek, which feeds into the Nepean River approximately 3km north. Within the Northern Campus, a large dam exists in the eastern portion and much of the site drains to this dam, however the north-west corner of this site drains to a small tributary of the Nepean River.

The vegetation across the Smalls Road Campus is dominated by open exotic grasslands, interspersed with several medium sized patches of remnant native vegetation. The native vegetation remaining on site is generally in good condition, however it has little connectivity to stands of vegetation in adjacent areas. On the Northern Campus, several medium sized stands of native vegetation exist, with varying levels of condition reflecting the differing length and intensity of disturbance from landscape maintenance and urban development onsite.

The previous Camden LEP (2009) highlighted significant portions of the Carrington Centennial Care estate as containing environmentally sensitive land of a ‘regional’, ‘local’ and ‘support’ level of significance due to the stands of remnant native vegetation existing on site. However the current LEP (Camden Council LEP 2010) has not mapped the site as containing significant Natural Resources.

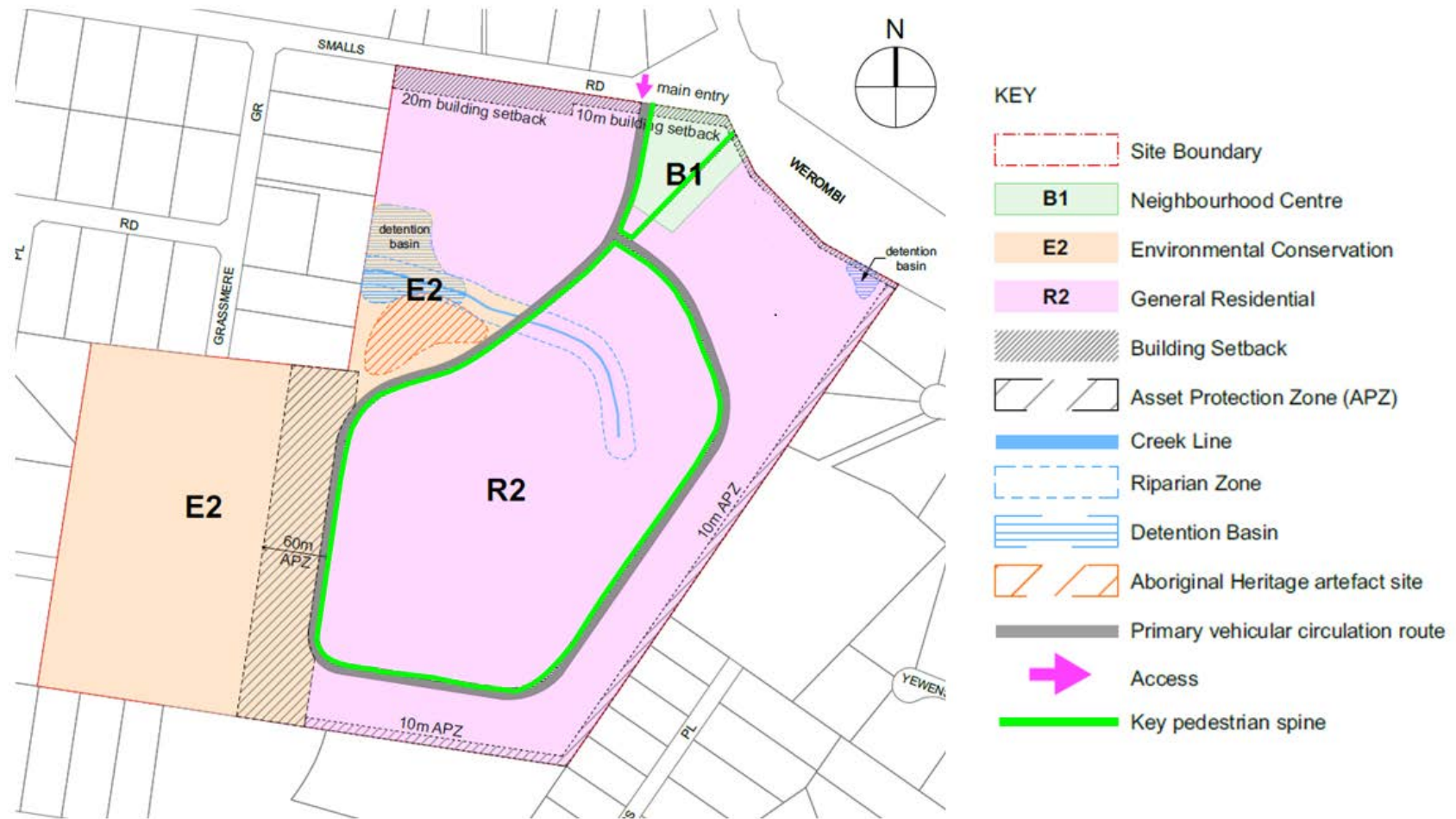


Figure 1: Smalls Road Campus Masterplan



Figure 2: Carrington Centennial Care estate and the Smalls Road Campus and Northern Campus components of the study area

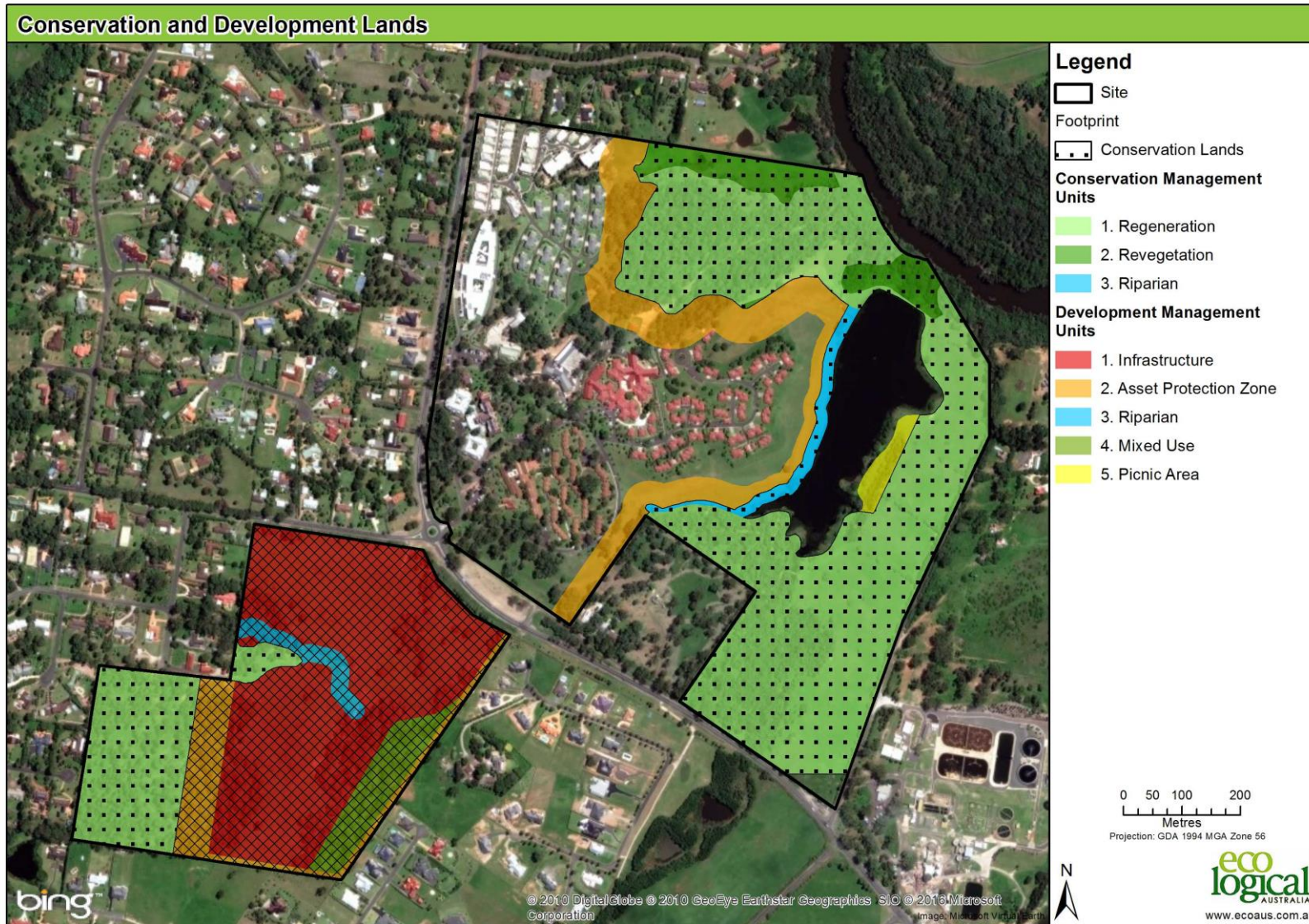


Figure 3: The study site broken into Development Lands and Conservation Lands

1.6 KEY VALUES OF THE CARRINGTON SITE

1.6.1 Key Ecological Values of the Carrington Site

The key ecological values of the Carrington Centennial Care estate, confirmed through current and previous field survey work, include:

- Medium sized and moderately to good condition patches of Cumberland Plain Woodland critically endangered ecological community, listed under both the NSW Threatened Species Conservation (TSC) Act (1995) and the Commonwealth Environment Protection and Biodiversity Conservation (EPBC) Act (1999);
- Small, linear stands of poor condition River Flat Eucalypt Forest (Alluvial Woodland sub-community) endangered ecological community listed under the NSW TSC Act;
- Provision of known habitat for the vulnerable species, Cumberland Plain Land Snail (*Meridolum comeovirens*);
- Provision of potential habitat for a range of threatened flora and fauna species;
- Provision of known habitat for a range of (non listed) native flora and fauna species, through habitat resources such as hollow bearing trees, fallen logs, leaf litter, decorticating bark, exposed rocks, riparian areas native grasslands;
- Protection of onsite and adjacent surface water resources though the existence of vegetated riparian zones.

1.6.2 Other Key Values of the Carrington Site

Carrington Centennial Hospital for Convalescents was the first of its kind in NSW and officially opened on 20th August 1890. The hospital owes its existence to the generosity of Mr. William Henry Paling (of Palings Music Stores) a Dutchman who arrived in Sydney in 1853 and gave his farm "Grasmere", together with 10,000 pounds, as a Centennial gift to the people of NSW. The estate contains a number of built assets which have existing heritage value, including:

- Carrington Convalescent Hospital,
- Masonic Cottage Hospital,
- Former Morgue,
- Grasmere Villa,
- River Cottage.

The site is adjacent (to the west) to the Sydney Water Camden West sewage treatment plant. Similar to the Carrington site, the treatment plant is situated on a large area of land with built infrastructure concentrated within limited portions of the site so that expansive open vistas views to the Nepean River remain. Part of the Carrington site also adjoins the Bicentennial Equestrian Park owned by Camden Council which is a very large area of open space used for a variety of open space uses. Environmental restoration works are occurring within the site in order to re-establish areas of native vegetation cover, with a particular focus on restoring connectivity along the Nepean River.

The very south-east corner of the Northern Campus of the site contains land which is to be used for the future Werombi Rural Fire Service Brigade Station. This area of the site therefore contains a functional / operational value in terms of maintaining and increasing levels of community safety and providing an avenue for community connection through volunteering.

The CLUMP identifies and protects the various site values through a combination of allocating appropriate management areas, which are further broken into management units, and the development of a suite of management activities and impact controls.

1.7 KEY THREATS TO THE CARRINGTON SITE

No targeted native or introduced fauna surveys have been undertaken in the Carrington Centennial Care estate, however field survey undertaken on site in 2011/12 and 2005/06 have identified the presence of a variety of introduced fauna onsite as well as several environmental and noxious weeds and weeds of national significance (WONS). The weed presence on site ranges from very high weed density in some patches to moderate weed density in others.

1.7.1 Environmental and Noxious Weeds

Environmental weeds are those that pose a risk to the biodiversity value of the area by invading and altering the composition of native vegetation communities.

Table 1: Weed Species, their status and abundance

SPECIES NAME	COMMON NAME	STATUS	FREQUENCY OF OCCURRENCE
<i>Acer negundo</i>	Box-elder Maple		
<i>Anagallis arvensis</i>	Scarlet Pimpernel		
<i>Araujia sericifera</i>	Moth Vine		
<i>Asparagus asparagoides</i>	Bridal Creeper	Class 4, WONS, EW	
<i>Briza subaristata</i>			Dominant in groundlayer
<i>Bromus sp.</i>			Dominant in groundlayer
<i>Centaurium sp.</i>			
<i>Chloris gayana</i>	Rhodes Grass		
<i>Cirsium vulgare</i>	Spear Thistle		Dominant in groundlayer
<i>Conyza sp.</i>			
<i>Eleusine tristachya</i>	Goose Grass		
<i>Eragrostis curvula</i>	African Lovegrass	EW	Dominant in groundlayer
<i>Galium sp.</i>			
<i>Gamochaeta sp.</i>			
<i>Gleditsia triacanthos</i>	Honey Locust		
<i>Hypericum perforatum</i>	St John's Wort	Class 4, EW	
<i>Hypochaeris radicata</i>	Cats Ear		Dominant in groundlayer
<i>Lepidum sp</i>			

<i>Ligustrum lucidum</i>	Large Leaved Privet	Class 4, EW	
<i>Ligustrum sinense</i>	Small Leaved Privet	Class 4, EW	
<i>Lonicera japonica</i>	Japanese Honeysuckle	WONS	Dominant in groundlayer
<i>Lycium ferocissimum</i>	African Boxthorn	Class 4	Dominant in midstorey
<i>Modiola caroliniana</i>	Red-flowered Mallow		Dominant in groundlayer
<i>Nephrolepis sp.</i>			
<i>Olea europaea</i>	Common / African Olive	Class 4	Dominant in midstorey
<i>Opuntia stricta</i>	Common Prickly Pear	Class 4, WONS	
<i>Osteospermum</i>			
<i>Paronychia brasiliana</i>	Chilean Whitlow Wort		
<i>Paspalum dilatatum</i>	Paspalum		Dominant in groundlayer
<i>Pennisetum clandestinum</i>	Kikuyu Grass	Class 4	
<i>Plantago lanceolata</i>	Plantain		Dominant in groundlayer
<i>Poa annua</i>	Winter Grass		
<i>Richardia sp.</i>			
<i>Richardia stellaris</i>			
<i>Romulea rosea</i>	Onion Grass		
<i>Senecio madagascariensis</i>	Fireweed	WONS	
<i>Setaria sp.</i>			
<i>Sida rhombifolia</i>	Paddy's Lucerne		
<i>Sonchus asper</i>	Prickly Sowthistle		
<i>Sonchus oleraceus</i>	Common Sowthistle		
<i>Tradescantia albiflora</i>	Wandering Jew		
<i>Trifolium arvense</i>	Harefoot Clover		
<i>Trifolium repens</i>	White Clover		
<i>Trifolium sp.</i>			
<i>Verbena bonariensis</i>	Purpletop		
<i>Phalaris sp.</i>	Canary Grass		

EW= Environmental Weed as per Sustainability Blitz Fact Sheet from Camden Council, Class = Class of Noxious Weed. WONS = Weed of National Significance

Parts of the remnant Grey Box – Forest Red Gum grassy woodland community to be retained and restored are heavily infested with African Boxthorn (*Lycium ferocissimum*) and African Olive (*Olea europaea*) to the complete exclusion of any other mid storey species and groundcover species. Removal of these species and effective prevention of their re-establishment will remove a significant current threat to the biodiversity values of the site.

1.7.2 Pest Animals

Field surveys within the Carrington Centennial Care estate by ELA and others have recorded the following introduced fauna species onsite:

- Cattle (*Bos taurus*)
- Rabbit (*Oryctolagus cuniculus*)
- Indian Myna (*Acridotheres tristis*)
- Horse (*Equus caballus*)
- Starling (*Sturnus vulgaris*)

Introduced fauna pose a significant risk to biodiversity through (Austecology 2009):

- Physical degradation of habitat and alteration of natural ecological processes (e.g. Cattle, Horse and Rabbits)
- Predation on native fauna (e.g. likely by feral cats, European red fox)
- Competition for habitat resources
- Transmission of pathogens (feral cats)
- Spreading environmental and noxious weeds through droppings and seed carriage on fur.

All of these species are considered to pose a moderate risk to biodiversity and require control as part of the overall management of the Carrington Centennial Care estate and particularly within the Conservation Lands.

The cattle and horses present on site are in low numbers and will be removed as the construction of future residential facilities begins. Their permanent exclusion from the site will be enabled through the use of temporary and permanent site fencing. Rabbits present on site can impact existing areas through damage by burrow construction and also impact on natural regeneration and revegetation attempts through grazing on young plants. A rabbit control program will need to be developed to reduce the current level of impact on retained bushland areas and to ensure maximum success of restoration works.

1.7.3 Key Threatening Processes

The NSW TSC Act and Commonwealth EPBC Act provide for the identification and listing of key threatening processes (KTPs). The following KTP's (summarised from both Acts) are considered relevant to the Carrington Centennial care estate and the surrounding locality:

- Competition and land degradation by Rabbits
- Land clearance
- Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants.
- Anthropogenic climate change and its impacts on habitat
- Predation by European Red Fox
- Predation by Feral Cats
- Forest Eucalypt dieback associated with over-abundant psyllids and bell miners

- High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition
- Invasion of native plant communities by African Olive *Olea europaea* L. subsp. *Cuspidate*
- Invasion of native plant communities by exotic perennial grasses
- Loss of hollow-bearing trees
- Removal of dead wood and dead trees.

Of particular concern at the site are the over-abundant psyllids on trees remnant canopy trees within the Northern Campus and the subsequent attraction of a large number of Bell Miner birds to the woodland patch and their impacts on the canopy species. The impact of this and other key threatening processes will be mitigated through the completion of the treatments and tasks outlined in this CLUMP.

1.7.4 Other Threats

Habitat Fragmentation

Habitat fragmentation is defined as the division of a single area of habitat into two (or more) smaller areas, with a new habitat type (e.g. cleared) occurring in the area between the fragments. The process of fragmentation can create barriers to movement, which may result in genetic isolation of populations should both flora and fauna be unable to successfully cross barriers, and by introducing edge effects. Edge effects can be particularly detrimental to flora and fauna species that are 'core sensitive' rather than 'edge' species if habitats are heavily fragmented by a series of new habitat types (Forman et al. 2003).

Due to the history of clearing for development and low intensity grazing activities, the vegetation within the Carrington Centennial Care estate has been heavily fragmented in the past. Stands of remnant vegetation onsite at present have no real connectivity to each other or to patches of remnant bushland on adjacent lands. The future development of the Smalls Road Campus will concentrate development activity within the northern and eastern parts of the Campus, and the retained bushland will exist in two consolidate portion in the southwest corner and along the eastern boundary. Within the Northern Campus the retained Conservation Lands provide a valuable opportunity to create habitat connectivity within the site through consolidation and restoration of remnant bushland patches and also connectivity beyond the site, particularly along the banks of the Nepean River.

1.8 STATUTORY CONTEXT

1.8.1 Commonwealth Environment Planning and Biodiversity Conservation Act (1999)

Where a proposed activity is likely to have a significant impact on a Matter of National Environmental Significance, the activity must be referred to the Commonwealth Department of Sustainability, Environment, Water, Population and Communities (SEWPaC).

Under this Act, rezoning is not considered an activity, and hence a referral to SEWPaC is not strictly required. Rezoning of the Smalls Road site will enable the subsequent development of the land, which would involve clearance of a vegetation community protected under this Act and therefore it is considered prudent to consider the potential EPBC Act implications in this CLUMP.

The current and previous flora and fauna assessments undertaken at the site have confirmed the presence of a critically endangered ecological community (Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest), the presence of an individually listed threatened fauna species (Grey

headed Flying Fox) and the potential presence (or suitable habitat) of several individually listed threatened flora and fauna species.

A referral under the EPBC Act will be made by Carrington Centennial Care in the future for the proposed rezoning and subsequent development works. This CLUMP has been designed to meet the requirements of the *Commonwealth Environment Protection and Biodiversity Conservation Act (1999)* Environmental Offsets Policy (October 2012). The EPBC Act Environmental Offsets Policy has 5 key aims: the key aims and the way that this CLUMP responds to those aims is presented in **Table 2**.

Table 2: EPBC Act Key Aims and CLUMP Approach

Key Aim	Approach in CLUMP
Ensure the efficient, effective, timely, transparent, proportionate, scientifically robust and reasonable use of offsets	The NSW OEH BCAM approach is a scientific, quantifiable and repeatable approach to determining the biodiversity values of the site pre-and post development.
Provide proponents, the community and other stakeholders with greater certainty and guidance on how offsets are determined and when they may be considered	The CLUMP will provide certainty for Carrington Centennial Care, NSW OEH and Camden Council with a definitive plan of what conservation outcomes are to be achieved through its implementation.
Deliver improved environmental outcomes by consistently applying the policy	The CLUMP has an inbuilt review period to ensure that its approach and methodologies remain consistent with the EPBC Offsets (and other) policies.
Outline the appropriate nature and scale of offsets and how they are determined	The nature and scale of offsets required for this rezoning and subsequent development works have been determined in accordance with the BCAM methodology which has focused on the assessment of ecosystem credits to offset the impacts to CPW vegetation.
Provide guidance on acceptable delivery mechanisms for offsets	The CLUMP will be enacted through Development Consent Conditions in accordance with the provision of the EP&A Act. The Act also contains mechanism that enable the legal enforcement of Consent Conditions which, if required can be applied by council to ensure the complete and ongoing implementation of the CLUMP. Further consideration of this aim of the policy may be required during the formal EPBC referral process.

As the Matter of National Environmental Significance (MNES) most impacted by the current rezoning proposal is the loss of Cumberland Plain Shale Woodlands and Shale-Gravel Transition Forest (CPW), the focus of the ecological management works in the Conservation Lands is the regeneration and restoration of this critically endangered ecological community.

Re-creation of new CPW and improving the condition of existing CPW retained onsite as well as other environmental management works undertaken will also lead to the following ecological outcomes:

- Increase the area of vegetation which provides potential suitable habitat for microbat species,
- Increase the area of potential migratory bird habitat through the retention of the large onsite dam, riparian restoration works within the Development and Conservation Lands and the retention and improvement in condition of the areas of derived native grassland,

- Retention of significant canopy trees within the Development Lands wherever possible and within the Conservation Lands which provide winter flowering Eucalypt species beneficial to the Swift Parrot and Regent Honeyeater which have potential to utilise the site.

1.8.2 NSW Threatened Species Conservation Act (1995)

The specific requirements of the *NSW TSC Act* have been addressed in the Carrington Centennial Care Flora and Fauna, Riparian and Bushfire Study (ELA 2012) which assessed the impact of the rezoning and subsequent development proposals on the Smalls Road Campus through the use of the Biodiversity Certification Assessment Methodology (BCAM), developed by NSW OEH under the *NSW TSC Act*.

The BCAM method has been used to determine the biodiversity value of the current site, the residual biodiversity value of the site post rezoning and development and whether the proposed rezoning will deliver an 'improve or maintain' outcome for biodiversity in the long term, with particular emphasis on threatened species and ecological communities.

The assessment demonstrated that the post rezoning and development and carrying out of the restoration activities (as nominated by the CLUMP), the Carrington Centennial Care estate will have higher biodiversity value than the current site. The BCAM assessment showed the proposed preservation and management of the conservation lands will result in a surplus of 45 (ecosystem) credits, which is equivalent to an area of approximately 4.8ha.

Effectively by consolidating the smaller distinct patches of remnant native bushland on site, containing all direct and indirect impacts of development within the 'development lands' and the completion of ecological restoration works within the conservation lands, a better conservation outcome is being achieved over the longer term. This outcome is in keeping with the objects of the *NSW TSC Act* which include the conservation of biodiversity, ensuring that the impact of any action affecting threatened species, populations and ecological communities is properly assessed and encouraging the conservation of biodiversity through the adoption of measures involving co-operative management.

The majority of the credit generation in the biodiversity certification assessment comes from the retention and protection of existing stands of CPW vegetation. Essentially this means that a very significant proportion of the maintenance of biodiversity values is coming from the protection of existing site biodiversity values and resources. Additionally, this reduces the influence of the "timelag" between a currently degraded, low biodiversity value area reaching a state of higher biodiversity value after restoration and rehabilitation works. So that post-rezoning, a greater proportion of the entire study area will exist in a 'state' that is closer to the study area's maximum biodiversity value than if the credit calculations were reliant on a greater proportion of credits coming from future site restoration works.

Additionally, the area shown in the Smalls Road Masterplan as "Eastern Retained Vegetation" has been included in the area shown as 'land for development' and in the calculation of 'credits required'. To reduce the bushfire threat posed by this area of vegetation, it is proposed that the mid-storey and ground cover vegetation in this portion of the Smalls Road site be continually managed, however the canopy layer will essentially remain untouched. Therefore there will not be a complete loss of biodiversity values in this portion of the site as calculated by the BCAM. Similarly the large areas of APZ within the western portion of the Smalls Road Campus development lands will retain some level of biodiversity value due to the ability to retain components of the existing vegetation community in accordance with the standards for maintaining asset protection zones. Accordingly, the actual level of biodiversity value on site post development will be greater than the BCAM calculations suggest.

1.8.3 NSW Environmental Planning and Assessment Act (1979) and NSW Environmental Planning and Assessment Regulation (2000)

The NSW EP & A Act regulates the effective assessment of new development activities in regards to (amongst other things) their impact on the natural environment and regulates the development and revisions of environmental planning documents such as Local Environmental Plans (LEPs) and Development Control Plans (DCPs). The Act also enables Consent Conditions to be attached to development approvals made under the Act, as well as providing a mechanism for their legal enforcement.

The CLUMP will be submitted to support the Smalls Road Campus rezoning proposal submitted by Camden Council. Subsequent Development Applications and approvals during the development phase of the proposal will also receive Conditions of Consent from council as the local consent authority requiring the implementation of this CLUMP.

1.8.4 Camden Local Environment Plan (2010) & Camden Development Control Plan (2011)

Under Camden Local Environment Plan (CLEP 2010) both portions of the Carrington Centennial Care estate are currently zoned R5 – Large Lot Residential. The objectives of the R5 zone are to:

- Provide residential housing in a rural setting while preserving, and minimising impacts on environmentally sensitive locations,
- Ensure that large residential lots do not hinder the proper and orderly development of urban areas in the future,
- Ensure that development in the area does not unreasonably increase the demand for public services or public facilities,
- Minimise conflict between land uses within this zone and land uses within adjoining zones.

The Smalls Road Masterplan proposes a range of future land use zones for the Smalls Road Campus including residential and commercial development and environmental conservation.

The Camden Development Control Plan (DCP) 2011 aims to ensure that:

- Camden retains its valued heritage qualities and scenic landscapes,
- New communications are planned and developed in an orderly, integrated and sustainable way,
- Any impacts on the natural environment are minimised and overall improvements to the natural systems within Camden are achieved,
- Appropriate housing choices are provided for existing and future residents,
- New development is designed and located so as to ensure the health, safety and security of people and property, and
- New developments are planned and constructed to contribute to the social, economic and environmental sustainability of the LGA.

In addition to the construction and building controls within the DCP, various environmental controls will apply to future development activities on site and will be addressed through the Development Application (DA) process, such issues include: Erosion and Sedimentation; Earthworks; Salinity Management; Water Management; Trees and vegetation; Environmentally Sensitive Land; Riparian Corridors; Environmental and Declared Noxious Weeds

2 Management Framework

2.1 CARRINGTON CENTENNIAL CARE

Carrington Centennial Care Ltd was established in 2004 to operate on behalf of the Carrington Centennial Trust which was established in 1890. In accordance with Trust Deed, the assets and property of Carrington Centennial Care are vested in four (4) Trustees who are supported in the management of the organisation by an elected Board.

The Board is responsible for the overseeing of policy, performance, quality of care and strategies to be implemented by Management. The operational management of Carrington is vested in the management team headed by the Chief Executive Officer.

The proposed development is to be administered under the provisions of a Trust agreement. Land retained in shared ownership by members of the Carrington Centennial Trust is known as Trust property. The Trust Management Statement binds the Carrington Centennial Trust with any subsidiary schemes and also with each owner / occupier / mortgagee in possession and / or lessee of a Lot.

Consequently, the Carrington Centennial Trust is ultimately responsible for ensuring delivery of the CLUMP.

2.2 IMPLEMENTATION & DELIVERY

Various options have been considered for the implementation and delivery of the CLUMP including a voluntary Conservation Agreement (CA) established under the National Parks and Wildlife Act (1974) (NPW Act), and implemented as a component of a Voluntary Planning Agreement (VPA) linked to the rezoning of the site. However, following consultation with both the Office of Environment and Heritage, which is responsible for implementing the NPW Act and council, a more appropriate mechanism in the form of Consent Conditions linked to the development approvals for the proposal, was identified. In this regard, the Consent Conditions will require, amongst other things, the full implementation of the CLUMP as a condition of development consent.

Carrington Centennial Care will be responsible for ensuring the delivery of the works programs described in the CLUMP. As the work activities involved with ecological restoration are specialised tasks, it is recommended that work activities within the Conservation Lands management units are undertaken by personnel with a minimum training qualification of Certificate III in Bush Regeneration.

The process to be followed with regard to the Smalls Road Campus rezoning proposal and the implementation of the CLUMP is presented in **Figure 4**.



Figure 4: Process and Outcomes of the Smalls Road Campus Rezoning

2.3 ENFORCEMENT

The EP&A Act provides for the enforcement of Consent Conditions under s.123 and s.125 of the Act. Under s.123 council can initiate civil proceedings in the Land and Environment Court to address a breach in the Act and the court make orders to remedy the breach. Criminal proceedings can also be commenced under s.125, however, the breach must be proved beyond reasonable doubt and not on the balance of reasonable probabilities as is the case under the s.123. Moreover, the Act does not include provisions that enable the court to make remedial orders under s.125. This being the case, any potential breach of the Act in relation to the CLUMP and its implementation would most likely be pursued under s.123 of the Act.

Nevertheless these elements of the Act provide an appropriate avenue through which the requirements of the CLUMP can be appropriately enforced, should there be any breach of relevant Conditions of Consent associated with future development consents for the proposal.

2.4 FUNDING

Carrington Centennial Care have committed to funding the delivery of the CLUMP through their annual recurrent budget. Indicative costings for the implementation of the CLUMP are provided in **Appendix 1**.

2.5 REVIEW

As the CLUMP is based on an adaptive management framework, it will need to be reviewed on a regular basis (every 5 years) to ensure the accurate allocation of portions of land into the various management units, that the work activities for each management unit continue to represent the nature and priority of activities required and that the activities and principles recommended reflect current best practice in ecological management and restoration.

It is recommended that the 5 yearly reviews be completed by a suitably qualified environmental or ecological consultant, engaged by Carrington Centennial Trust and include a consultative process with Camden Council.

3 Management Areas

The Conservation Land Use Management Plan is divided into two broad Management Areas:

- Development Lands (28.83ha) (Figure 6), and
- Conservation Lands (34.85ha) (Figure 3).

These two (2) Management Areas are further sub-divided into eight (8) Management Units (**Figure 5**). All land within each management unit will be managed in the same way, subject to minor local variations in physical environmental factors (e.g. slope, aspect, position in the landscape etc.) and biological factors (degree of natural resilience, degree of weed invasion etc.).

For each Management Unit, a unit description, objectives, activities and targets are set. Over-arching performance criteria are then derived for the two Management Areas of Development Lands and Conservation Lands, based on the objectives, activities and targets of the management units. Monitoring and evaluation applies to the whole CLUMP based on the performance criteria identified.

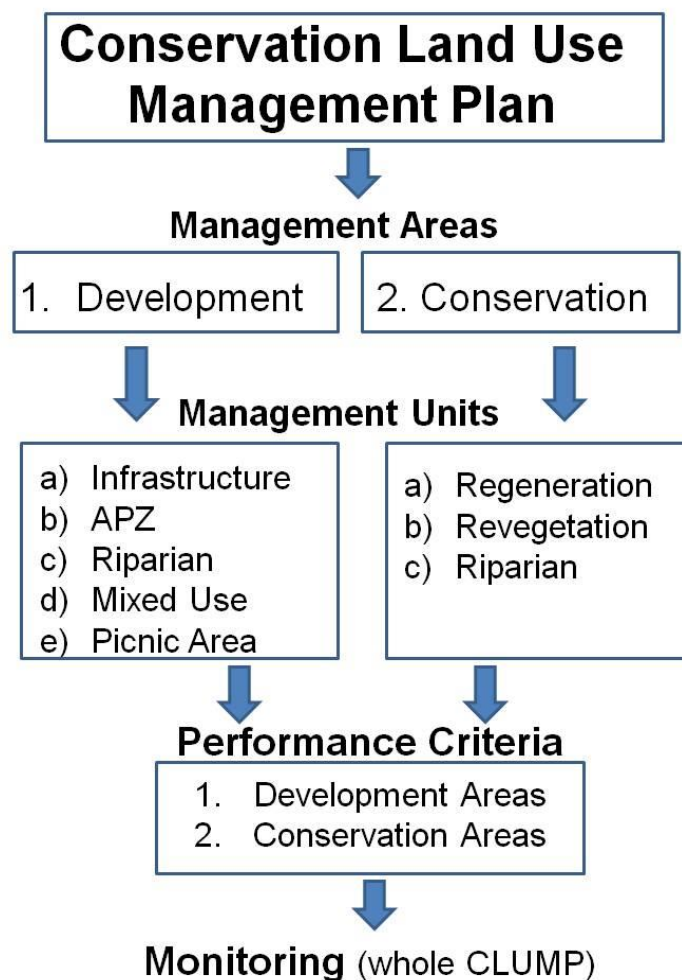


Figure 5: CLUMP Management Structure

The area of land within each management area type and management unit is presented in Table 3 below.

Table 3: Development and Conservation Lands Breakdown

MANAGEMENT UNIT	Area
Infrastructure	16.08ha
Asset Protection Zone	9.39ha
Riparian	0.83ha
Mixed Use	1.92ha
Picnic Area	0.59ha
Development Lands Total	28.83ha
Regeneration	31.26ha
Revegetation	2.55ha
Riparian	0.99ha
Conservation Lands Total	34.85ha

3.1 DEVELOPMENT LANDS

Development Lands cover lands within the Northern Campus of the Carrington Centennial Care estate as well as the Smalls Road Campus. Within these areas, there are five (5) different management units mapped in Figure 6.

Within the Development Lands Management Area, most land falls into the Infrastructure Management Unit which reflects the concentration of all current and future urban development and construction works within this zone.

The APZ management unit runs between the two areas of infrastructure management unit and 'unmanaged' (from a bushfire perspective) bushland within the Conservation Lands management area. A small area of a Riparian Zone exists within the Smalls Road campus as does an area designated as mixed use given the multitude of functions it will perform. Additionally a small area of land has been set aside for formal picnic and recreation activities within the Northern Campus. The areas of land within each management unit are outlined below in **Figure 6**.

As the treatments required in several management units will be common, the following table (**Table 4**) presents a summary of the treatments required in each unit, with the detailed prescription for the treatments provided in **Appendix 1**.

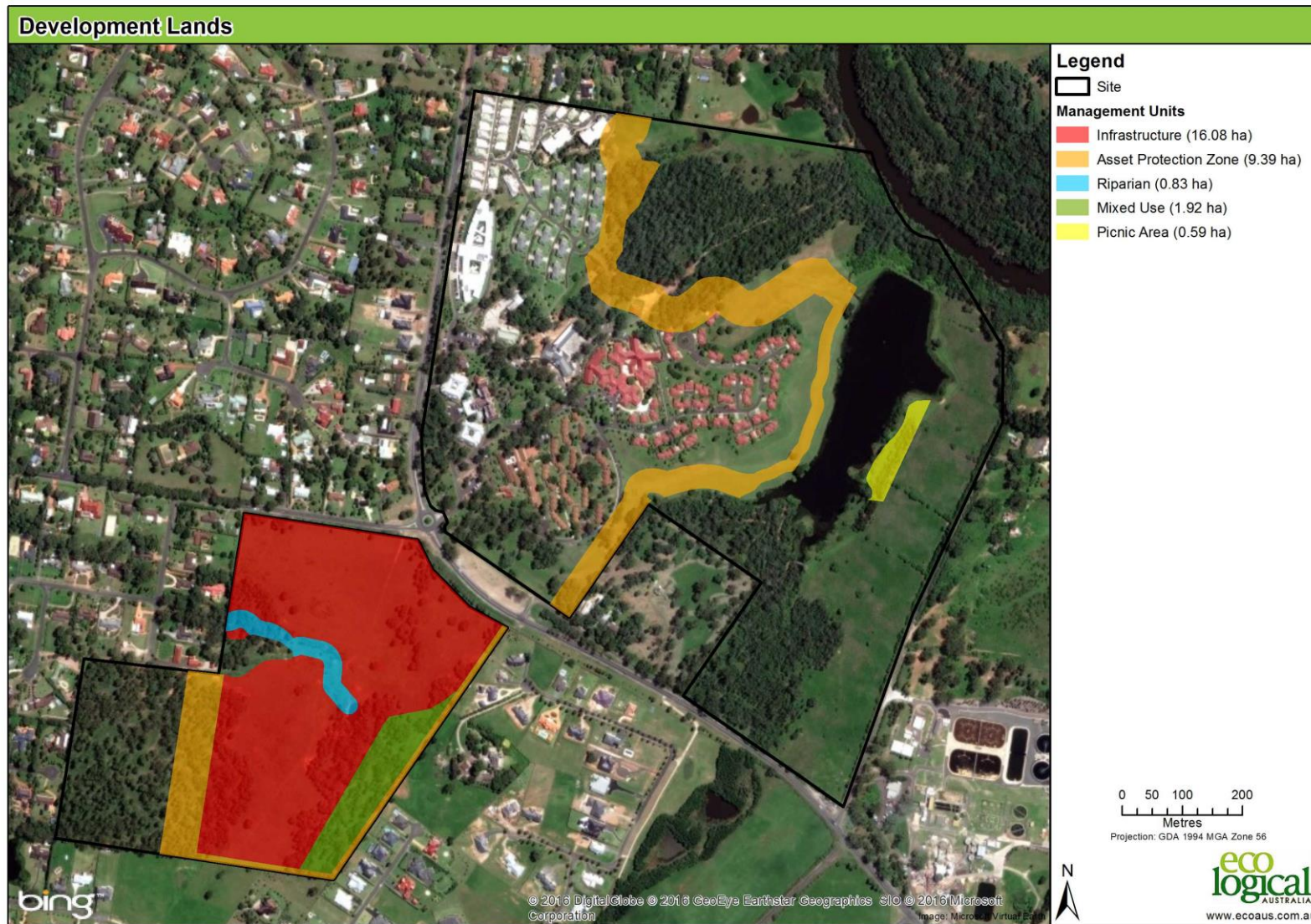


Figure 6: Management Units within Development Lands

Table 4: Management Treatments / Tasks required within Management Units of the Development Lands

Management Unit	Treatments (refer to Appendix 1)	Preliminary Works	Establishment	Maintenance
1. INFRASTRUCTURE 16.08ha	Identification of Clearing Limits	✓		
	Control of Human Disturbance Management of construction vehicles and materials transport and storage Management of access and illegal dumping	✓ ✓	✓ ✓	✓
	Pre-clearing Survey	✓		
	Fencing	✓	✓	✓
	Seed Collection	✓		
	Clearing of Vegetation	✓		
	Weed Management Primary Weed Control Secondary Weed Control Maintenance Weed Control	✓	✓ ✓	✓
	Pest Animal Management	✓	✓	✓
	Litter Management	✓	✓	✓
	2. ASSET PROTECTION ZONES 9.39ha	Identification of Clearing Limits	✓	
Control of Human Disturbance Management of construction vehicles and materials transport and storage Management of access and illegal dumping		✓ ✓	✓ ✓	✓
Pre-clearing Survey		✓	✓	

	Fencing	✓		
	Seed Collection	✓		
	Weed Management			
	Primary Weed Control	✓		
	Secondary Weed Control	✓	✓	✓
	Maintenance Weed Control	✓	✓	✓
	Pest Animal Management	✓	✓	✓
	Litter Management	✓	✓	✓
3. RIPARIAN 0.83ha	Identification of Clearing Limits	✓	✓	
	Control of Human Disturbance			
	Management of construction vehicles and materials transport and storage	✓	✓	
	Management of access and illegal dumping	✓	✓	✓
	Pre-clearing Survey	✓		
	Fencing	✓	✓	✓
	Seed Collection	✓	✓	✓
	Soil Preparation	✓	✓	
	Soil Rehabilitation	✓	✓	
	Weed Management			
	Primary Weed Control	✓	✓	
Secondary Weed Control	✓	✓	✓	
Maintenance Weed Control			✓	
Re-vegetation				
Brush Matting		✓		

	Direct Seeding		✓		
	Hand Planting		✓	✓	
	Tube Stock planting		✓	✓	
	Pest Animal Management	✓	✓	✓	
	Litter Management	✓	✓	✓	
4. MIXED USE 1.92ha	Identification of Clearing Limits	✓	✓		
	Control of Human Disturbance Management of construction vehicles and materials transport and storage Management of access and illegal dumping				
	Pre-clearing Survey	✓	✓		
	Fencing	✓	✓	✓	
	Weed Management Primary Weed Control Secondary Weed Control Maintenance Weed Control	✓ ✓	✓ ✓	✓ ✓	
	Re-vegetation Brush Matting/mulching Direct Seeding Hand Planting Tube Stock Planting	✓ ✓ ✓ ✓	✓ ✓ ✓		
	Pest Animal Management	✓	✓	✓	
	Litter Management	✓	✓	✓	
	5. PICNIC AREA 0.59ha	Weed Management Primary Weed Control Secondary Weed Control	✓ ✓	✓	✓

	Maintenance Weed Control		✓	✓
	Re-vegetation			
	Hand Planting	✓	✓	✓
	Tube Stock Planting	✓	✓	✓
	Pest Animal Management	✓	✓	✓
	Litter Management	✓	✓	✓

3.1.1 Infrastructure Management Unit

Environmental management opportunities in Infrastructure management unit include:

- taking natural resources (topsoil, habitat features etc) from the development land prior to construction and earthworks activities and re-using them in the conservation lands,
- managing conditions in the development land prior to construction so that adverse impacts to the conservation land are avoided, and
- managing environmental conditions in the development land in the short and long term to generate additional ecological outcomes.

The lands within the Infrastructure management unit will be utilised for a variety of development purposes including detached aged housing, mixed commercial / community uses such as proposed medical centre and community centre and residential aged (high degree) care facilities.

The exact nature of the environmental impacts from these activities will be dealt with during assessment of the Development Applications (DAs) for these works, and the subsequent development of Construction Environmental Management Plans. However the CLUMP has set out the aims and objectives for the environmental management aspects of these development works by which they should be assessed and conditioned at the DA stage.

The residential community will be responsible for the predominant environmental conditions of the infrastructure zone in the long term, including impacts from urban land use on the conservation land from such activities as escape of garden plants, pets accessing conservation lands, rubbish dumping and littering. This will need to be managed by community education, involvement in environmental management and regulation.

Some landscape plantings may be proposed within the Infrastructure management unit. Where other (non-endemic) native species are used, there must be no adverse effect on the ecology of the surrounding Conservation Lands and all species must be managed to ensure no spread of non-indigenous individuals into the surrounding community. For example, large flowering hybrid Grevilleas are not part of the endemic CPW community but are commonly used in 'native landscaping'. These plants provide an abundant food source for Common Myna (introduced), miner birds (native) and wattlebirds (native) which are aggressive and drive away smaller, less aggressive native birds such as wrens.

Aims

- To avoid and eliminate all potential for construction and other activities within the Infrastructure lands to impact on the conservation lands;
- To minimise the total area of disturbed land at any one time;
- To maximise the potential to retain significant ecological features on the site (such as habitat / forage / hollow bearing trees) by considering these issues in detailed design and layout of building, roads, stormwater and other infrastructure;
- To maximise opportunities for re-use of materials on site such as clean fill, fallen logs;
- To minimise the impacts of residential activities in the area over the longer term (such as programs which restrict pet ownership, limit opportunities for informal access through conservation lands etc);
- To ensure that any threatened species utilising resources present within the infrastructure zones have adequately replacement or compensatory habitat with the conservation lands;

- To ensure that landscaped areas provide some level of habitat for native animals typical of the Camden area and do not adversely affect the purpose, functioning and maintenance of the Conservation Lands.

Description

- The Infrastructure Management Unit is where all future development activities in the Smalls Road Campus.
- It is the largest Management Unit within the Development Lands and will also experience the greatest degree of disturbance to current site conditions.
- All land within the Smalls Roads Campus is as yet undeveloped but has been impacted by previous vegetation clearance activities as well as low intensity agricultural activities.

Infrastructure Management Unit Prescription

- All development activities are to be guided by Construction Environmental Management Plan (CEMP); submitted, assessed and approved by Camden Council as development activities proceeds within both Campuses.
- Post construction of the various stages and facilities, all maintenance and ongoing management activities are to be guided by an Operational Environmental Management Plan (OEMP).
- Any water quality and quantity treatments required must be located in the Infrastructure Management Unit.
- Key components of the CEMP and OEMP should be as follows:
 - Identification of clearing limits: clearing limits need to be surveyed and pegged by surveyors prior to any other activity being undertaken on site. All Conservation Lands are to be fenced to prevent unauthorised access.
 - Pre-clearance site survey: survey for and translocation of Cumberland Plain Land Snail (*Meridolum corneovirens*) is to be undertaken immediately prior to proposed tree clearance activities, by a suitably qualified and experienced ecologist.
 - Pre-clearance site survey: any trees with hollows must be surveyed immediately prior to clearance activities. Any native mammals or birds using the hollows are to be relocated by appropriately qualified and experienced ecologists or WIRES.
 - Contingency plan for threatened flora and fauna discoveries: if any previously unknown / unrecorded threatened flora or fauna are discovered during preclearance surveys, they must be dealt with accordance with the contingency plan.
 - Flora and fauna recording system: A recording system must be developed to allow the recording of any injured birds, reptiles, frogs or mammals found during any stage of construction and include a procedure for reporting WIRES. The system should enable recording of the species name, threatened status, type of habitat found in (e.g. under bark, in hollow, etc.), and fate (e.g. injured, death, escaped, or GPS location of where relocated to). These records must form part of the reporting requirements in the CEMP / OEMP.
 - Management of construction vehicle traffic and transport and storage of materials.
 - Log recovery: large trees which are to be removed are to be felled and stored for use in conservation lands and riparian zones.
 - Top soil recovery: ordered removal of the soil layers starting with the leaf litter and groundcover plants, followed by removal of the A horizon soils, followed by removal of the B horizon soils.

- Top soil storage: soils are to be stockpiled in their separate horizons in stockpile configurations which retain the viability of the stored seed bank and continued functioning of soil micro-organisms.
- Stockpiles location: stockpiles are to be located on the Conservation Lands and located in areas with low natural resilience and regeneration. Stockpiles are to be protected from unintentional impacts by erection of exclusion fencing such as sediment and erosion fencing. Alternatively topsoil can be removed and reused immediately onsite and must be re-laid with the B horizon soils laid on the current ground surface, followed by the A horizon soils and the leaf litter.
- Erosion and sediment control: exposed surfaces are to be kept to the bare minimum at any one time. Where possible, areas to be left bare without activity for longer than 3 months should be stabilised through the use of sterile cover crops. Adequate silt fencing must be installed and maintained as per the “Blue Book” requirements.
- Management of access and illegal dumping.
- Post construction site stabilisation, remediation and landscaping works.

3.1.2 Asset Protection Zones (APZs) Management Unit

Bushfire Asset Protection Zones (APZs) are required along several interfaces of the lands within the Infrastructure management unit to reduce the level of residual bushfire threat from the bushland retained on site to the existing and future dwellings and facilities as well as the existing and future dwellings on adjacent lands. An Asset Protection Zone (APZ) is a fuel reduced area surrounding a built asset or structure. Effectively managed APZs reduce the threat to life, property and the natural environment from unplanned wildfire events and increase the safety for emergency service personnel engaged in fire suppression activities.

As per the requirement of the Biodiversity Certification Assessment Methodology performed for the ecological assessment of the rezoning works, all APZs are to be located within “Development Lands” so as not to introduce an additional (uncalculated) impact on the areas of vegetation to be retained within the Conservation Lands.

The APZs are the interface between the areas of retained bushland (in the Conservations Lands) and the buildings and facilities existing and to be constructed in the Infrastructure management unit. The width of the APZs has been calculated in accordance with the requirement of the NSW Rural Fire Service Planning for Bushfire Protection Guidelines 2006 (see ELA 2012 and the Smalls Road Masterplan **Figure 1**).

Vegetation occurring within the riparian corridor, the south western corner and the eastern edge of the Smalls Road Campus will be retained and revegetation works will occur within the Riparian Corridor. Vegetation that is retained or regenerated in the south western corner is to be managed for biodiversity conservation and APZ establishment and maintenance will not impact on this conservation area. Fire is an important ecological process and will be one of the environmental management tools used periodically in that area and within other conservation lands. The APZ areas will form important fuel reduced edges to these conservation lands essentially forming a naturalised fuel break.

The management prescription for the APZs is based on the NSW RFS “Standard for Asset Protection Zones” and relevant information in regards to fuel accumulation, arrangement and management of Cumberland Plain Woodland and Alluvial Woodland vegetation communities.

Analysis of fuel accumulation in Cumberland Plains Woodland by Watson (2005) indicates that fuel loads peak at around 9 tonnes per hectare approximately 10 years after fire (see **Figure 7**). This low fuel

loading significantly reduces the maximum fire intensity likely within the retained and restored bushland across the site and allows for greater integration of bushfire and ecological objectives in close proximity to development areas.

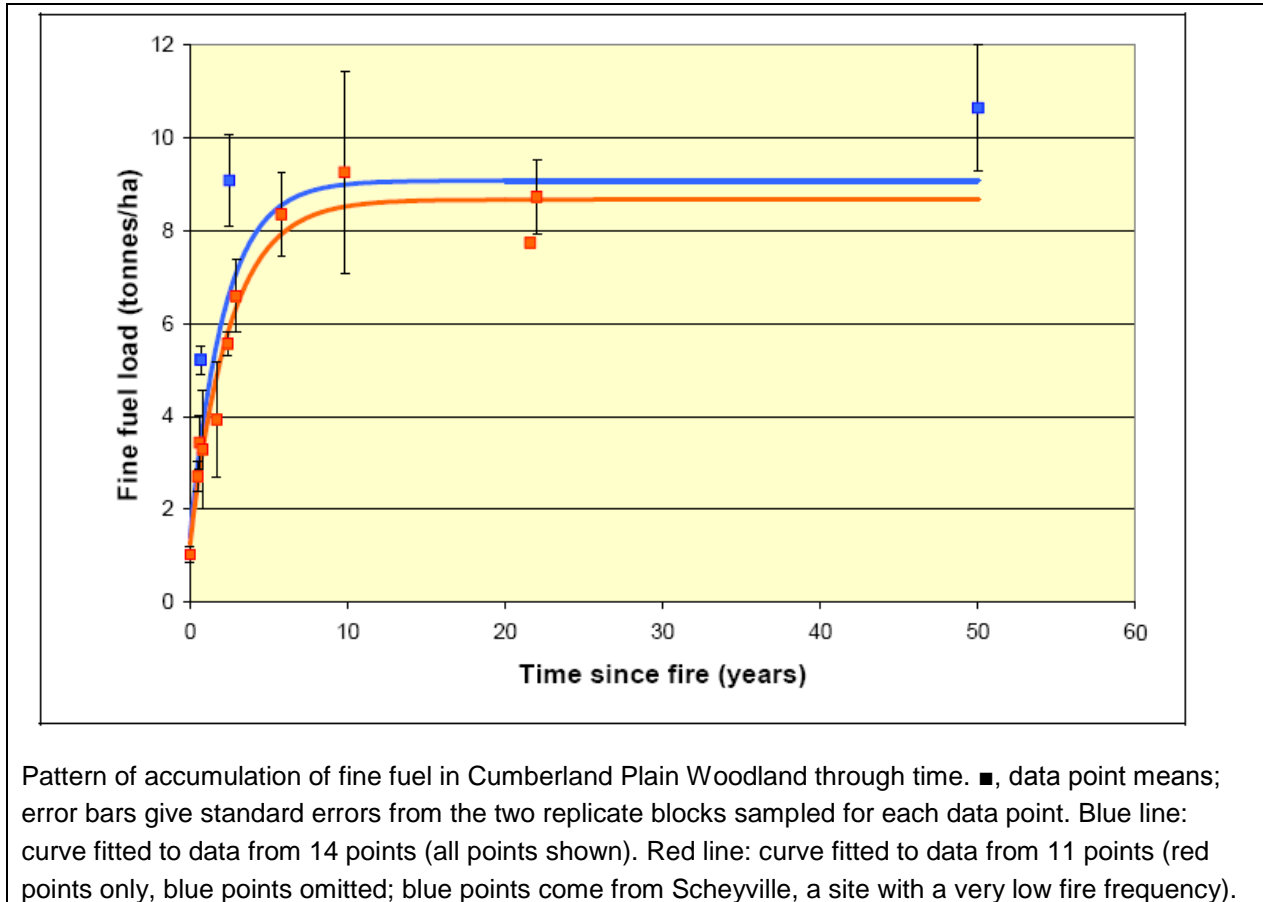


Figure 7: Fuel Accumulation patterns in Cumberland Plain Woodland (Watson 2005)

Aims

- To reduce the residual bushfire risk to life and property within the Carrington Centennial Care estate,
- To reduce the residual bushfire risk to life and property adjacent to the Carrington Centennial Care estate,
- To improve the level of safety for emergency personnel engaged in fire suppression activities on site by providing a buffer between areas where fuel levels are not managed and the assets requiring protection,
- To maintain important ecological features and values within the APZs,
- To provide a natural containment line for use in potential future hazard reduction prescribed burns in the conservation lands,
- To minimise or eliminate any negative environmental impacts from the establishment and ongoing maintenance of APZs (such as soil erosion, weed invasion etc).

Description

- Must be wholly contained within “Development Lands” as must generally be in located in accordance with the location of APZs shown in shown in Figure 6,
- Be managed to the standard of an Inner Protection area (IPA)
- Fuel reduction techniques will include:
 - Mowing, raking and slashing of ground fuels and mid-storey fuels,
 - Tree pruning and removal to ensure adequate canopy separation,
 - Bush regeneration, involving initial weed treatment and removal and long term weed management practices,
 - Prescribed burns (as part of prescribed burns for the Conservation Lands) to ensure that the retained and re-created CPW vegetation remains within its preferred inter-fire period,

APZ Fuel Management Establishment and Maintenance Prescriptions

The entire APZ will be managed to the standard of an Inner Protection Area (IPA). According to the NSW RFS (2006), the performance of the APZ must be such that:

- There is minimal fine fuel at ground level which could be set alight by a bushfire (grasses and groundcovers must be kept below 100mm in height).
- Any vegetation in the APZ does not provide a path for the transfer of fire to the development – that is, the fuels are discontinuous both vertically and horizontally.
- The presence of a few shrubs or trees in the APZ is acceptable provided that they:
 - do not touch or overhang the buildings;
 - are well spread out and do not form a continuous canopy;
 - are not species that retain dead material within the canopy or deposit excessive quantities of ground fuel in a short period or in a danger period; and
 - are located far enough away from the buildings so that they will not ignite the buildings by direct flame contact or radiant heat emission.



TYPICAL 20m APZ LANDSCAPE TREATMENT

Figure 8: Typical APZ Cross Section (Source: Hassell & Associates)

Building and Equipment Maintenance Prescription

- Regular removal of material such as litter from the roof and gutters;
- Ensure painted surfaces are in good condition with decaying timbers being given particular attention to prevent the lodging of embers within gaps;
- Check pumps and water supplies are available and in working order, prior to the beginning of and monthly during the bushfire danger period
- Pavements of driveways and footpaths are in good condition, with a minimum 4m vertical clearance above all internal roadways and driveways so as not to prevent access by fire appliances during emergencies;
- Check roof lines for broken tiles or dislodged roofing materials;
- Screens on windows and doors are in good condition without breaks or holes in screen material and frames are well fitted into sills and window frames;
- Any drenching or spray systems are regularly tested before the commencement of the fire season and if reliant on stored (onsite) water storages, water delivery system is checked and fully operational;
- All onsite water storages dedicated to emergency fire fighting must be full and in complete working order prior to the beginning of the bushfire danger period,
- Hoses and hose reels are in good condition, have all appropriate fittings and in full working order;
- Doors are fitted with draught seals and well maintained; and
- All other provisions of the Emergency Evacuation Plan (developed at DA approval stage) are adhered to.

3.1.3 Riparian Management Unit

Works within the Riparian Zone aim to slow the water speed in the creek line, stabilise the bed and banks of the creek line, control weed species found in the riparian zone, reduce the abundance of weed species and provide for the re-establishment of ecological communities through a combination of bush regeneration and active re-planting of appropriate native, endemic species.

The overall objective management of the riparian zone is to emulate the native vegetation communities of the area and ensure a naturalised stable creek is functioning before the end of the establishment period. The maintenance period will commence once the activities and performance criteria of the establishment period have been met and will continue in perpetuity. During the 5 yearly review of CLUMP additional management prescriptions may be added and other prescriptions may be removed if completed and no longer relevant.

In-stream works are to be implemented by bush regeneration, landscape or civil contractors who have demonstrated experience in construction of engineered structures in sensitive riparian environments. A project specific, comprehensive environmental and WH&S plan is to be prepared by the contractors prior to undertaking works and all staff are to be inducted to the site by the lead supervisor.

A lead supervisor is to be appointed by Carrington Centennial Care to oversee, monitor and report on the site. The lead supervisor must have tertiary qualifications in environmental engineering and/or fluvial geomorphology and expertise in the regeneration/revegetation of native vegetation communities.

Aims

- Improve water quality in the riparian zone onsite and for stretches of the watercourse downstream;
- Improve the ecological health, integrity and functioning of the riparian zone by re-vegetating with native species and provide a variety of aquatic habitat types such as pools, riffle zones etc;
- Maintain and enhance habitat values currently present on site, particularly aquatic habitat;
- Ensure watercourse bed and banks are stabilised and as far as possible functioning as a naturalised watercourse,
- Maximise retention of existing native vegetation to reduce the requirement for direct plantings and to maintain a level of site cover (shade, buffering from wind) which will assist in the establishment of rehabilitated areas and reduce the potential for weed incursion,
- Appropriately stage works completed to mimic the natural ecological processes of colonisation and succession,
- Result in adequate restoration and rehabilitation of the area in a way that does not unduly increase bushfire risks to adjacent infrastructure zones,
- To ensure that flooding risks are not exacerbated by restoration works,
- To increase community appreciation of the natural environment by providing a close and safe exposure to the natural environment.

Description

- The riparian zone exists within the Small Road Campus (Development Lands) and runs for a length of approximately 300 m;
- The watercourse is a 1st Order Stream under the Strahler Stream Ordering system;
- The riparian zone is a total width of 20m, with (on average) 10m of the riparian zone occurring on each bank and measure out from the Top of Bank;

- The geology of the site is characterised by Wianamatta shales and as is typical of that geologic sequence the soils are deep, heavy clays with no rock outcrops;
- The soils can be very dispersive and prone to saline subsurface layers.

Riparian Bank Management Prescription – Preliminary Works Period

- Highly disturbed areas may also require regrading and stream rehabilitation measures as determined by consultation between Carrington Centennial Trust and the bush regeneration contractor appointed,
- If required, soil remediation of highly degraded areas with a history of intense grazing to improve soil structure to facilitate regeneration,
- If required, Rip-rap structure will be installed at the points of highest erosion potential and rocks will be installed in low densities along the bottom of the swales,
- Protection of any areas of existing native vegetation through exclusion fencing,
- Slowing water speed by the use of pool and riffle zones, strategically placed and secured natural debris or naturalised structures,
- Collection and propagation of seeds / propagative material from locally endemic, native species for use in later revegetation (using species specified in Appendix 1),
- Controlling both human and stock access to the area through fencing to minimise soil compaction, erosion and plant losses,
- Timing of planting these areas will need to take into consideration sediment control requirements for the adjacent development.

Riparian Bank Management Prescription – Establishment and Maintenance Periods

- Regular maintenance work to control weeds and maintain revegetation will be required.
- Primary weeding to promote natural regeneration in the absence of competition from weeds through manual clearance methods (cut and paint, drill and inject),
- Secondary and maintenance weeding through selective hand removal, selective herbicide spraying (using RoundUp Biactive) and manual clearance methods (cut and paint, drill and inject),
- Revegetation of creek banks from direct seeding and direct planting and revegetation of creek bed with aquatic / wetlands species,
- Feral cats, foxes and rabbits will be targeted for eradication from the site in consultation with the Livestock Health and Pest Authorities local office.
- Options to control the plague mosquito-fish (*Gambusia holbrooki*) are to be explored if they persist in any remaining water bodies.

Riparian Instream Management Prescription – Preliminary Works

- Given the gentle gradient of the creekline and its position close to the top of the small catchment, meanders should be built into the creekline. These meanders should have rock armouring and a steep grade on the outside of the bend and an earthen slope on a gentle gradient on the inside.
- Rock armouring should be buried deep enough to avoid undercutting as the stream scours and fills overtime.
- Along straight sections with a gentle gradient, deep pools with muddy bottoms should be occasionally dug in. Steeper sections should have a cobble to gravel ripple along the bottom.

- Throughout the length of the creek irregular shaped rocks of various sizes should be placed based on the expected water velocity to provide varied habitat. This can include rocks from gravel sized to boulder sized (larger than a soccer ball) arranged singly or in piles.
- The channel is to be lined with jute mat to assist in soil stabilisation and weed control. It is recommended that this jute matting be installed below the low flow point of the in-stream works to prevent undercutting.

Riparian Instream Management Prescription – Establishment and Maintenance Works

- Plantings in the areas of infrequent or low inundation should be at a density of 4 plants per square metre using **Table 11** and **Table 12**.
- Plantings in areas of total or frequent inundation should be at a density of 6 plants per square metre using species shown in **Table 13**.

3.1.4 Mixed Use Management Unit

The Mixed Use Management Unit has a range of values and is to serve several purposes. It will provide visual value to the Carrington residents living upslope of the zone, softening the outlook to existing large lot residential allotments to the south-east. The area will also provide some level of biodiversity conservation benefits through the maintenance of the established native tree canopy. The understorey vegetation will be managed effectively as a fuel reduced APZ and therefore provide a level of protection for both buildings and their occupants and emergency personnel.

Some landscape plantings may be proposed within the Mixed Use management unit. Where other (non-endemic) native species are used, there must be no adverse effect on the ecology of the surrounding Conservation Lands and all species must be managed to ensure no spread of non-indigenous individuals into the surrounding community. For example, large flowering hybrid Grevilleas are not part of the endemic CPW community but are commonly used in 'native landscaping'. These plants provide an abundant food source for common myna, native miner birds and large native wattlebirds which are aggressive and drive away smaller, less aggressive native birds.

Aims

- To maintain a visual buffer between existing large lot residential properties to the south-east and the new dwellings within the Smalls Road Campus,
- To maintain a level of biodiversity value by retention of the established native tree canopy,
- To form a continually managed, fuel reduced area of open space between the existing (offsite) properties and the new properties within Smalls Road Campus and increase safety for emergency personnel
- To provide an additional area of open space for the enjoyment of residents of the aged care facilities,
- To provide through natural means, a range of positive environmental living benefits such as shading and a wind break.
- To provide opportunities for passive recreation activities such as walking and picnic areas as well as environmental education opportunities through the use of interpretative signage and possible involvement of residents in 'bushcare' type activities.

Description

- The Mixed Use Management Unit exists as a narrow band along the south-east edge of the Smalls Road campus site. The zone measures 1.9a ha in size.
- The unit will form part of the 'communal private open space' area of the Carrington Centennial Care estate.
- The land within this unit is considered part of the Development Lands in the Biodiversity Certification Assessment on the basis that it is not being fully restored as Conservation Lands, however it will retain some level of biodiversity conservation value (the value of which is not recognised by the BCAM assessment).
- The land will consist of an intact canopy of native existing trees and an understorey and ground layer which is continuously managed as a fuel reduced APZ.

Mixed Use Management Unit Prescriptions

- Unless pruning or removal is required for bushfire safety purposes, all native trees are to be retained. If removal of individual specimens is required, preference must be given to:

- retaining trees across a range of ages and maturities,
- retaining trees across a range of species,
- retaining hollow bearing trees,
- retaining trees which form a line-of-sight buffer between existing residential developments off site and the new housing developments within Smalls Road Campus,
- There is minimal fine fuel at ground level which could be set alight by a bushfire (grasses and groundcovers must be kept below 100mm in height);
- Any vegetation in the Mixed Use Management Unit must not provide a path for the transfer of fire to the existing or new development – that is, the fuels are discontinuous both vertically and horizontally.
- Any landscaping or planting works in this unit should be give preference to locally endemic species which are naturally part of the vegetation communities in the Camden area. This planting should attempt to create a variety of habitat types that helps to increase the suitability of the site for a diverse range of native fauna species that would naturally occur in Camden area.
- Any landscaping or planting works should attempt to increase the visual buffer between the Carrington Estate facilities and adjoining existing residential areas.

3.1.5 Picnic Area Management Unit

The Picnic Area Management Unit is located alongside the large lake in the Northern Campus and will provide a visually attractive area of relaxation and an opportunity for Carrington residents to enjoy the natural beauty of the estate and the variety of wildlife that the lake area and adjacent bushland and grasslands provides.

The route to the picnic area will be formalised through the creation of a formalised trail Picnic Area which is to be designed and constructed so as to have minimal impact on the adjacent Conservation Lands and to require minimal maintenance and upkeep.

Aims:

- To create a visually attractive areas for passive recreation uses by Carrington residents,
- To provide an area where Carrington residents can observe and appreciate the ecological values of their estate and increase their awareness and understanding of their local environment,
- To provide an opportunity and designated area for small scale low impact amenities such as picnic tables, formal seating, small areas of soft and / or hard pavement, lake viewing platform etc.

Description:

- The picnic area management unit is an area of approximately 0.6ha
- The picnic area is immediately adjacent to, and on the eastern edge of the existing lake on the Northern Campus,
- The picnic area is located within the vegetation community of Derived Native Grassland, which currently has good quality and diversity of native grass species and very low density of native shrub cover.
- The Derived Native Grassland area would previously have contained species which comprise the Grey Box – Forest Red Gum grassy woodland vegetation community and which will over time regenerate (naturally and with assistance) towards this vegetation community.

Picnic Area Management Unit Prescription

- All facilities or amenities installed or erected in this area are to be for passive creation uses only, such as formal seating, picnic tables, viewing platforms, formalised pathways etc.
- The groundcover vegetation of native grasses is to be maintained and encouraged. Non native grasses are not to be used due to their potential to outcompete native grasses and impact on the adjacent conservation lands.

3.2 CONSERVATION LANDS

Conservation Lands cover lands within the Northern campus of the Carrington Centennial Care estate as well as the Smalls Road campus. Within these areas, three (3) different management units have been identified (Regeneration, Revegetation and Riparian) and are mapped in **Figure 9**

Management units are based on the assessed natural resilience of the existing remnant vegetation and the likely treatments required to restore them to a more resilient, sustainable ecosystem. The Regeneration and Revegetation management units are further divided into their relevant (Biometric) vegetation communities so that identification of appropriate species for replanting is simplified.

Within the Conservation Lands Management Area, most of the land falls into the Regeneration Management Unit. The Regeneration Management Unit is comprised of two biometric vegetation communities:

- Grey Box – Forest Red Gum grassy woodland (also known as Cumberland Plain Woodland),
- Forest Red Gum – Rough Barked Apple grassy woodland (also known as Alluvial Woodland)

The Grey Box – Forest Red Gum grassy woodland exists in 3 different condition classes of High, Medium and Poor. The area mapped as Derived Native Grasslands is the poor condition area of this community as it is a highly modified form with an intact, diverse native groundcover of grasses and herbs from which the canopy and midstorey layers have been removed and may or may not be regenerating.

Lands within the Revegetation Management Unit are substantially cleared of all native vegetation and dominated by exotic species. These areas will require extensive intervention works to restore them to the original vegetation communities that would have been present historically. The patch mapped as Exotics (2b) will be restored to Forest Red Gum – Rough Barked Apple grassy woodland community given its location on the banks of the Nepean River, while the area mapped as Cleared (2a) will be restored as an extension of the Grey Box – Forest Red Gum grassy woodland community, in accordance with the planting lists in Appendix 1.

The 3 management units are further broken down based on their current ecological condition and this is shown in **Figure 10**.

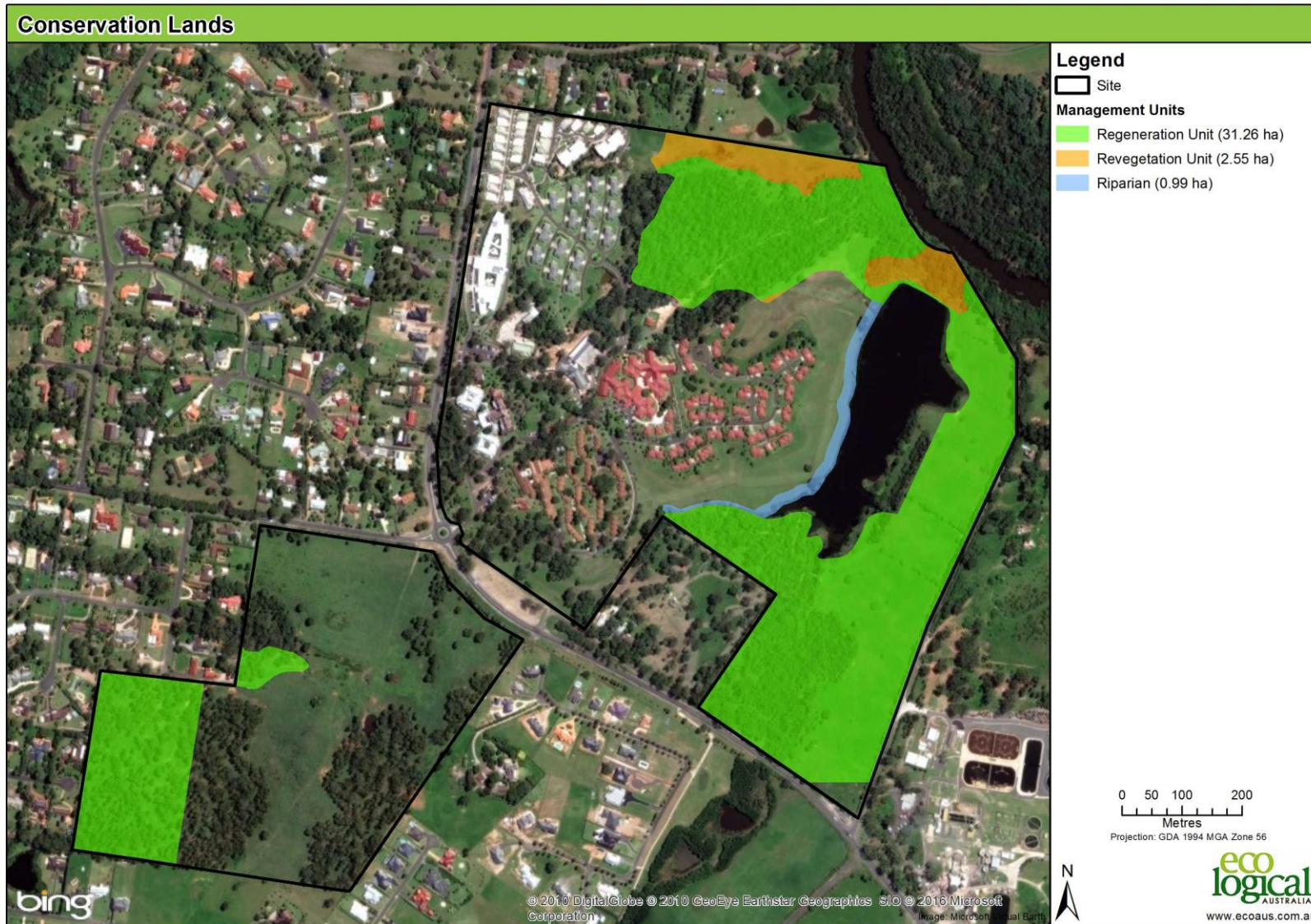


Figure 9: Conservation Lands Management Units

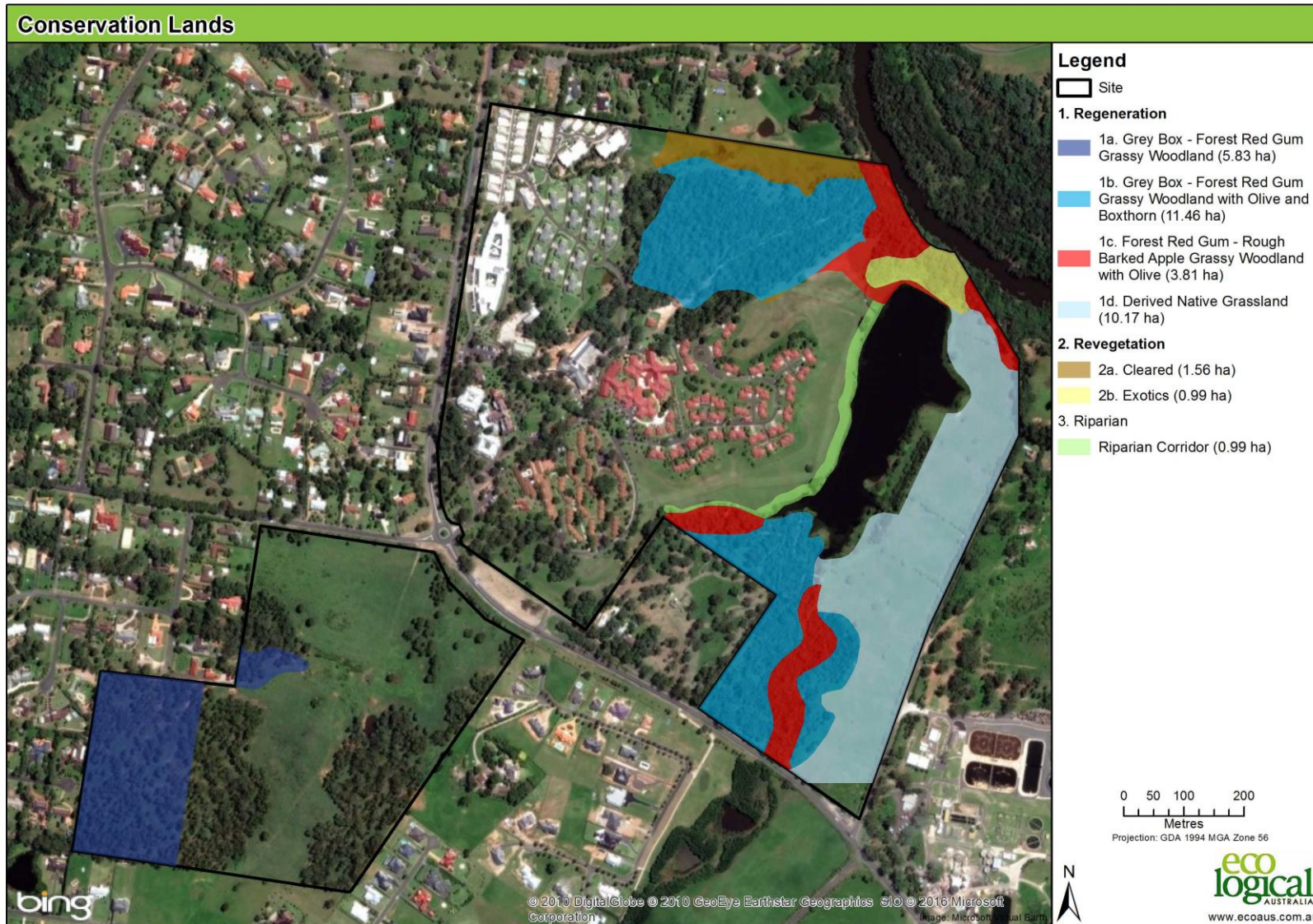


Figure 10: Management Units within Conservation Lands

The field survey completed for the BCAM assessment of the Carrington Centennial Care estate has informed the designation of current condition classes within the regeneration and revegetation areas based on such factors as the vegetation's structural integrity, degree and type of weed invasion, level of natural recruitment etc.

Table 5: Management Unit breakdown

MANAGEMENT UNIT	BCAM ANCILLARY CODE	AREA
Regeneration	1(a) Grey Box – Forest Red Gum grassy woodland (High)	5.83ha
	1(b) Grey Box – Forest Red Gum grassy woodland (Medium)	11.46ha
	1(c) Grey Box – Forest Red Gum grassy woodland (Poor - Olive)	3.81ha
	1(d) Grey Box – Forest Red Gum grassy woodland (Other:- Derived Native Grassland)	10.17ha
Revegetation	2(a) Cleared (Low)	1.56ha
	2(b) Cleared Exotics (Low)	0.99ha
Riparian	Riparian	0.99ha

3.3 OVERARCHING MANAGEMENT PRINCIPLES

The overarching aim for the Conservation Lands is to follow best practice management techniques to restore and maintain the two threatened ecological communities of Cumberland Plain Woodland and Alluvial Woodland. This will be achieved by managing threatened biodiversity in accordance with the Cumberland Plain Recovery Plan (DECCW 2010), following the best practice guidelines for the management and restoration of bushland on the Cumberland Plain (DEC 2005) and applying other best practice restoration methods.

This broad aim will be achieved by meeting the following objectives:

- Facilitate natural regeneration at high resilience sites by retaining vegetation, fencing, stock removal and weed suppression
- Assist regeneration at moderate resilience sites through bush regeneration including weed control and some planting
- Reconstruct Cumberland Plain Woodland at low resilience sites through weed suppression, revegetation and direct seeding.
- Conduct ecological burns every 5 to 10 years to maintain the Cumberland Plain Woodland Threatened Ecological Community. Actual intervals, seasonality and fire intensity experienced at the site should be variable to ensure the greatest species diversity.

As many of the treatments required within each Management Unit are similar in nature and extent and listing them as a management prescription for each unit would involve significant duplication, the various management activities are essentially presented as a master list, **Table 7** should be consulted to determine which activities are appropriate for each management unit and at which time during the life of the CLUMP. Accordingly, each management unit within the Conservation Lands is described with

introductory text and has had objectives set, however the detail of the management treatments and tasks is contained in **Appendix 1**.

3.3.1 Management of native vegetation within preferred fire regimes

The fire regime of an area encompasses several fire variables:

- Fire Frequency or inter-fire period (the time between prescribed burns or wild fires)
- Fire intensity
- Fire seasonality

Fire frequency is usually presented as duration of inter-fire periods. The minimum recommended inter-fire period is the minimum amount of time required for plants that where individuals are most likely killed by fire events and continued existence of that species requires germination of seed from the seed bank. The maximum inter-fire period refers to the maximum amount of time between fires before senescence may begin due to lack of natural replacement initiated by a fire. Short inter-fire periods encourage species that have short lifecycles (such as annuals and grasses) over species that take longer to reach reproductive stages (e.g. trees and many shrubs). Short interfire periods are therefore preferable where a predominantly grassy/herbaceous understorey is desirable.

In Cumberland Plain Woodland the following is generally observed:

- Short interfire periods – results in grassy understorey, often dominated by *Themeda australis*
- Long interfire periods – often results in dominance of the shrub layer by *Bursaria spinosa* and lower diversity / abundance of ground cover species.

The Cumberland Plain Recovery Plan (DECCW 2011) recommends the following fire regime for the threatened ecological communities on the Cumberland Plain, summarised in **Table 6**. As yet, no preferred fire regime has been determined for the Derived Native Grassland (DNG) versions of the woodland communities, and the numbers presented in the table below for DNG are based on ELA’s knowledge of this community and of the intended longterm progression for this community to recover to a level approaching the species diversity and ecosystem structure of Grey Box – Forest Red Gum grassy woodland.

Table 6: Inter-fire Periods

VEGETATION TYPE	MINIMUM PERIODS	INTER-FIRE	MAXIMUM PERIODS	INTER-FIRE
Grey Box – Forest Red Gum grassy woodland	5 years		40 years	
Forest Red Gum – Rough Barked Apple grassy woodland	7		30	
Derived Native Grasslands	10		40	

Cumberland Plain Land Snail (*Meridolum corneovirens*) is the only threatened species known to occur on the site that has a specific bushfire related recovery action: *Implement appropriate fire regimes (ones that allow build up of grass and litter layers)*. Accordingly, managing the remnant bushland onsite so as to maintain significant leaf litter groundcover and native grasses will deliver preferable outcomes for the Cumberland Land Snail.

Fire intensity refers to the level of radiant heat generated by the fire and is determined by variables such as fuel load, flame height and rate of spread. High intensity fires can be a useful tool in heavily weed infested areas since these fires tend to kill individual plants as well as stored seed in the soil. However, high intensity fires can remove desirable plants from the community by impacting younger recruits and should therefore be balanced with low and medium intensity fires.

Fire seasonality needs to integrate with the lifecycles of native species and preferably be counter to the requirements of exotic species. As such ecological burns are recommended between the periods of August and January to coincide with native plant life cycles (DEC 2005). However, due to bushfire danger periods generally occurring between 1st October and 30 March, delivering a safe and manageable burn during this time may not always be possible. Taking this into account, the window of opportunity narrows to August – November, which also co-incides with the months of spring when many species will be reproducing. It is recommended that a combination of Spring and Autumn be implemented with varying inter-fire periods.

3.3.2 Recovery of Known, Likely or Potential Threatened Species and their habitat

The site is known habitat for 1 threatened fauna species, Cumberland Plain Land Snail and is potentially home to other threatened flora and fauna species not recorded during survey. Additionally, the site contains two endangered ecological communities. Whilst the site contains a number of environmental values, the work prescriptions and treatments to be undertaken within both the Development and Conservation Lands management areas are designed primarily to assist in the recovery of the endangered ecological communities on site and improvement in the condition of habitat available on site for potential threatened flora and fauna species.

Table 7: Treatments and tasks required in the Conservation Lands Management Units

Management Unit	Area (ha)	Treatments (refer to Appendix 1)	Preliminary Works	Establishment	Maintenance
6. REGENERATION	31.26ha				
1a. Grey Box – Forest Red Gum Grassy Woodland (High)	5.83 ha	Identification of Clearing Limits	✓		
		Fencing	✓		✓
		Seed Collection	✓		
		Weed Management Primary Weed Control		✓	
		Secondary Weed Control		✓	✓
		Maintenance Weed Control			
		Re-vegetation Brush Matting		✓	✓
1b. Grey Box – Forest Red Gum Grassy Woodland (Medium)	11.46	Pest Animal Management	✓	✓	✓
		Litter Management	✓	✓	✓
		Identification of Clearing Limits	✓		
		Fencing	✓		
		Seed Collection	✓		
		Soil Preparation	✓		

		Soil Rehabilitation	✓		
		Weed Management			
		Primary Weed Control	✓	✓	
		Secondary Weed Control	✓	✓	✓
		Maintenance Weed Control		✓	✓
		Re-vegetation			
	Brush Matting		✓		
	Pest Animal Management	✓	✓	✓	
	Litter Management	✓	✓	✓	
1c. Forest Red Gum – Rough Barked Apple Grassy Woodland (Poor – Olive)	3.81ha	Identification of Clearing Limits	✓		
		Fencing	✓		✓
		Seed Collection	✓		
		Soil Preparation	✓		
		Soil Rehabilitation	✓		
		Weed Management			
		Primary Weed Control	✓		
		Secondary Weed Control	✓	✓	✓
		Maintenance Weed Control	✓	✓	✓
		Re-vegetation			
		Brush Matting	✓	✓	✓
		Direct Seeding		✓	✓
Pest Animal Management	✓	✓	✓		
Litter Management	✓	✓	✓		

1d. Grey Box – Forest Red Gum grassy woodland (Other - Derived Native Grassland)	10.17ha	Seed Collection	✓	✓	
		Soil Preparation	✓	✓	
		Soil Rehabilitation	✓	✓	
		Weed Management			
		Primary Weed Control	✓	✓	
		Secondary Weed Control	✓	✓	✓
		Maintenance Weed Control			✓
		Re-vegetation			
Brush Matting	✓				
Direct Seeding	✓	✓			
Hand Planting	✓	✓			
Tube Stock Planting	✓	✓			
Pest Animal Management	✓	✓	✓		
Litter Management	✓	✓	✓		
REVEGETATION	2.55				
2a. Cleared	1.56ha	Identification of Clearing Limits	✓		
		Fencing	✓		
		Seed Collection	✓	✓	
		Soil Preparation	✓	✓	
		Soil Rehabilitation	✓	✓	

		Weed Management			
		Primary Weed Control	✓		
		Secondary Weed Control	✓	✓	
		Maintenance Weed Control		✓	✓
		Re-vegetation			
Brush Matting	✓	✓			
Direct Seeding	✓	✓			
Hand Planting	✓	✓	✓		
Tube Stock Planting	✓	✓	✓		
Pest Animal Management	✓	✓	✓		
Litter Management	✓	✓	✓		
2b. Exotics	0.99ha	Soil Preparation	✓	✓	
		Soil Rehabilitation	✓	✓	
		Weed Management			
		Primary Weed Control	✓		
		Secondary Weed Control	✓	✓	✓
		Maintenance Weed Control		✓	✓
		Re-vegetation			
Brush Matting	✓				
Direct Seeding	✓	✓			
Hand Planting	✓	✓	✓		
Tube Stock Planting	✓	✓	✓		
Pest Animal Management	✓	✓	✓		
Litter Management	✓	✓	✓		
RIPARIAN	0.99ha				

	Identification of Clearing Limits	✓		
	Fencing	✓		
	Seed Collection	✓		
	Soil Preparation	✓		
	Soil Rehabilitation	✓		
	Weed Management			
	Primary Weed Control	✓		
	Secondary Weed Control	✓	✓	✓
	Maintenance Weed Control		✓	✓
	Re-vegetation			
	Brush Matting	✓	✓	
	Direct Seeding	✓	✓	✓
	Hand Planting	✓	✓	✓
	Tube Stock Planting	✓		
	Pest Animal Management	✓	✓	✓
Litter Management	✓	✓	✓	

3.3.3 Regeneration Management Unit

Regeneration sites will require a combination of natural regeneration and assisted regeneration treatments. The land within regeneration management units have a higher level of natural resilience, which will be significantly enhanced by addressing the current threats or pressures impacting on these areas.

The primary management objectives in this management unit is to maintain and improve structural and species diversity, exclude all stock access, remove current threats to biodiversity and implement ongoing monitoring of ecological condition to detect changes in vegetation condition to inform adaptive management techniques and treatments. The high resilience of the vegetation in this zone should enable natural regeneration in structural and species diversity to improve native fauna habitat over time.

Assisted regeneration is required in units dominated by weeds. The major weeds within the Conservation Area are African Olive (*Olea europaea*), Honey Locust (*Gleditsia triacanthos*), Broad-Leaved Privet (*Ligustrum lucidum*), Small-Leaved Privet (*Ligustrum sinense*), African Boxthorn (*Lycium ferocissimum*), African Love Grass (*Eragrostis curvula*) and Wandering Jew (*Tradescantia albiflora*).

The second priority for weed control will be large seed producing weeds targeted to prevent their further spread. Following from this, areas with a high density of mature seed producing weeds will be given high priority in order to reduce the production of weed seed over the site and prevent their spread. Introduced grasses, including African Lovegrass, Paspalum, Kikuyu and Pigeon Grass will be managed by slashing in large infestations then spot spraying using a non-specific herbicide. Small infestations, especially around natives, will be hand removed. Control for herbaceous weeds that occur throughout this area including *Plantago lanceolata* (Ribwort), *Senecio madagascariensis* (Fireweed), *Cirsium vulgare* (Spear Thistle) and a variety of other weed species should be controlled by hand pulling.

The aim of primary weed control is to reduce the weed biomass by targeting mostly woody weeds such as African olive (*Olea europaea subsp. cuspidata*), African Boxthorn (*Lycium ferocissimum*), and Broad-leaved Privet (*Ligustrum lucidum*). Primary weed control works will minimise disturbance to any native species and the soil. Techniques that minimise secondary weed growth will be used thus reducing time required for follow up treatment. Activities undertaken will follow a staged, logical approach to ensure that adequately resources are available for follow up and so that previously treated areas are not neglected.

The priority for weed removal in the Conservation Lands is dense mid-storey species (notably African Olive) associated with high densities of Bell Miners (*Manorina melanophrys*). Narrow-leaved Ironbark (*Eucalyptus crebra*) dieback is occurring in parts of the Conservation Lands in association with Bell Miners (BMAD). 'Forest eucalypt dieback associated with over-abundant psyllids and Bell Miner' is listed as a Key Threatening Process in Schedule 3 of the NSW *Threatened Species Conservation Act*. BMAD is a process whereby leaf sap sucking psyllid populations defoliate trees. Bell Miners, through their habit of eating lerps (sugary cover of the psyllid), whilst leaving the psyllid intact and aggressively excluding other avifauna which consume the psyllids, ensure the continuation of eucalypt dieback, which can lead to the death of trees. Bell Miners require a dense mid-storey of up to 3-metres for nesting. Removal of African Olive (*Olea europaea*) and other similar weeds will make the woodland less suitable for Bell Miner colonies with likely improvement in the health of the tree canopy.

Aims

- To promote a healthy tree canopy
- To establish native mid- and under-storeys
- To minimise disturbance to native flora

- To minimise disturbance to the soil
- To promote a diversity in age structure of dominant trees

3.3.4 Revegetation Management Unit

The management objectives in this management unit are to maintain and improve current biodiversity values and prevent further degradation by excluding threats and negative ecological pressures and undertaking selected replanting activities in areas. This unit will also support and buffer the existing good condition conservation lands in the regeneration management unit.

The area for revegetation will require primary weed control by the broad scale application of herbicide focussing on introduced pasture grasses. Multiple herbicide applications will be required to exhaust weed seed present in the soil seed bank and any vegetative material that may survive the initial treatments. The site is likely to require a minimum of two treatments, further treatments may be required should weeds continue to germinate after the second treatment. Mulching to a depth of 100mm will be required throughout this zone above the five year flood model. Regular spot spraying of weed growth will be required after revegetation has occurred.

Maintenance weed control works will be required after the revegetation has occurred. This will involve hand weeding herbaceous weeds and pasture grasses found growing under tree guards. Herbaceous weeds and pasture grasses not under the tree guards will be slashed using a brush cutter and the regrowth will be spot sprayed 3-4 weeks later. All slashing will occur prior to flower and seed heads forming to prevent the replenishment of the soil seed bank.

In areas of Grey Box – Forest Red Gum grassy woodland, overstorey species will be planted as required at a density of no more than 1 per 20m² and will be based on the species nominated in **Table 9**. Shrubs and groundcovers will be planted at a density of four plants per square metre utilising the species identified in **Table 10** below. In areas of Forest Red Gum – Rough Barked Apple, overstorey species will be planted as required at a density of no more than 1 per 10m² and will be based on the species nominated in **Table 11**. Shrubs and groundcovers will be planted at a density of four plants per square metre utilising the species identified in **Table 12**.

Areas of dense exotic grasses or disturbed soil profiles (fill, eroded) may require ripping to allow for planting. Mulching to 100mm depth will be required on any areas of high erosion potential or low relief. This mulch should, where possible, be from native trees removed in the remainder of site. Logs and other large woody debris can be placed in this zone after preliminary works have taken place but before planting works to provide habitat.

Aims

- To revegetate with species, and at a density typical of the two endangered ecological communities present on site;
- To eliminate exotic vegetation and the negative impacts created by these species;
- To minimise unnecessary disturbance to the soil unless soil preparation and rehabilitation actions are required to improve replanting and regeneration initiatives;
- To promote a diversity in age structure of dominant canopy trees;
- To improve the habitat link to the Nepean River and to remnant bushland on adjacent lands.

3.3.5 Riparian Management Unit

A narrow strip of land on the western edge of the large dam present in the Northern Campus has been designated into a Riparian Management Unit as a smaller watercourse runs through the southern stretch of this area. Additionally, because the exact extent of the dam will vary based on the prevailing weather conditions (i.e. periods of drought or periods of high rain) the edge of the dam will at times approach the soil moisture levels of a wetland and at other times have little to no influence of high moisture content.

Works within riparian areas aim to slow the water speed in the creek line, stabilise the bed and banks of the creek line, reduce the abundance and diversity of weed species and provide for the re-establishment of ecological communities through a combination of bush regeneration and active re-planting of appropriate native, endemic species.

The overall objective management of the riparian zone is to emulate the native vegetation communities of the area and ensure a naturalised stable creek is functioning before the end of the establishment period. The maintenance period will commence once the activities and performance criteria of the establishment period have been met and will continue in perpetuity. During the 5 yearly review of CLUMP additional management prescriptions may be added and other prescriptions may be removed if completed and no longer relevant.

In-stream works are to be implemented by bush regeneration, landscape or civil contractors who have demonstrated experience in construction of engineered structures in sensitive riparian environments. A project specific, comprehensive environmental and WH&S plan is to be prepared by the contractors prior to undertaking works and all staff are to be inducted to the site by the lead supervisor.

A lead supervisor is to be appointed by Carrington Centennial Trust to oversee, monitor and report on the site. The lead supervisor must have tertiary qualifications in environmental engineering and/or fluvial geomorphology and expertise in the regeneration/revegetation of native vegetation communities.

Aims

- To ensure watercourse bed and banks are stabilised and as far as possible functioning as a naturalised watercourse,
- To improve water quality in the riparian zone onsite and for stretches of the watercourse downstream;
- To improve the ecological health, integrity and functioning of the riparian zone by re-vegetating with native species and provide a variety of aquatic habitat types such as pools, riffle zones etc
- Maintain and enhance habitat values currently present on site, particularly aquatic habitat
- To buffer any upstream impacts from activities undertaken in Development Lands,
- Maximise retention of existing native vegetation to reduce the requirement for direct plantings and to maintain a level of site cover (shade, buffering from wind) which will assist in the establishment of rehabilitated areas and reduce the potential for weed incursion,
- Appropriately stage works completed to mimic the natural ecological processes of colonisation and succession,
- To ensure that flooding risks are not exacerbated by restoration works,
- To increase community appreciation of the natural environment by providing a close and safe exposure to the natural environment.

4 Monitoring and reporting

The objective of the monitoring and reporting program is to record changes to the vegetation as a result of vegetation management works and to ensure that creek bed and creek bank stability is achieved. Monitoring is an essential part of any management plan as it allows for adaptive management techniques to achieve positive outcomes for the environment. Without monitoring, the success (or failure) of management cannot be fully understood. While many of the methods described in this CLUMP are considered standard practice, the science of ecological restoration and rehabilitation is still in its early infancy and cannot be assumed that they will be successful in all circumstances.

When rehabilitation and restoration is undertaken successfully, monitoring is documented evidence which allows for the methods of restoration to become the standard, and for the methods to be applied in other projects with similar site features or restoration objectives.

Monitoring works will require liaison with Camden Council. The bush regeneration contractor will monitor the vegetation for changes over time. The lead supervisor will establish photo monitoring points whilst contractors will prepare regular reports to describe the progress of their work and demonstrate compliance with the CLUMP. Reporting will initially be on an annual basis.

For the Conservation Lands, a Before-After-Control-Intervention (BACI) design is recommended for flora / vegetation monitoring to enable comparison of changes in vegetation condition against baseline data collected on site and between sites that are undergoing a variety of active management tasks. The data collected for the BCAM assessment of the site can be utilised as the baseline vegetation condition. This will measure changes effected by the management treatment / task interventions and the variability due to the prevailing climatic conditions to provide a more useful management measure of the amount, need for and timing of intervention measures.

An area will be deemed to be sustainable if it satisfies the upper level biometric benchmarks (Gibbon *et al* 2005) relevant to the two vegetation types present on site (see **Appendix 3**). The rate at which different areas reach sustainability will vary across the site, depending on initial site conditions, effectiveness of CLUMP works, prevailing climatic conditions and on-going maintenance and management. Once sustainability is reached, maintenance will still be required to prevent degradation from continued external factors and threats (e.g. rubbish, weeds).

4.1 PHOTO MONITORING POINTS

Photo monitoring points will be established across the site to provide a visual reference of changes in the vegetation and performance of stream works. This will be undertaken prior to the commencement of works and at the beginning of each summer season. The lead supervisor will:

- set up two monitoring points within each management unit (i.e. a total of sixteen photo points across the site), including a monitoring point at each location where instream works are being undertaken;
- mark the photo point with two six foot star pickets 10m apart and map the location of one star picket at each photo point;

- take a digital photo at each photo monitoring point from the first start picket, towards the second star picket, with the whole length of the second star picket visible in the photo to act as a reference point,
- organise the digital photos logically with each image labelled with a unique reference number indicating the location of the photo point and the date the photo is taken (i.e. "01_2012_11_23" would represent photo point 1 taken on 23rd November 2012).

It is recommended that the following site based condition attributes be recorded at each monitoring site:

- Large trees (number and general health)
- Tree Canopy Height and cover
- Recruitment of canopy species
- Native shrub layer cover
- Coarse woody debris
- Native plant species richness for three vegetation life forms (tree, shrubs and grasses),
- Non-native plant cover
- Leaf litter cover
- Evidence of pest animals (scats, burrows, fur)

At each photo monitoring report, a full floristic survey plot should be undertaken for each report to enable measurement against the desired biometric benchmarks for the two vegetation communities (see **Appendix 3**).

4.2 BUSH REGENERATION & REVEGETATION REPORTING

A brief report outlining work undertaken by the bush regeneration contractor will be prepared quarterly (i.e. every third month) for the first 2 years, then annually for the next 3 years. After 5 years bi-ennial reports should be prepared. These reports will be submitted to Carrington Centennial Trust or their appointed representative and council. Reports will include:

- a summary of works carried out within the period,
- an approximation of the time spent on each task,
- mapping of areas worked presented in a GIS compatible format,
- a description of any problems encountered in implementing the works recommended in the CLUMP and how they were overcome,
- any observations made including new plant species recorded (native and weed species), comments on rates of regeneration and any problems which impact on the implementation of the CLUMP.

4.3 PERFORMANCE CRITERIA

The progress and compliance with the CLUMP will be monitored and reviewed quarterly for the first two years. This process will involve the contractor(s), the lead supervisor, Carrington Centennial Trust, and Camden Council.. The performance criteria are outlined in Table 8. Some of the management treatments / tasks will be performed within both Developments Lands and Conservation Lands (such as the pre-

clearing survey of Development Lands and the relocation of significant species and individuals into the Conservation Lands).

Table 8: Performance Criteria for Treatments / Tasks carried out in Conservation Lands Management Units

MANAGEMENT TREATMENT / TASK	EXPECTED OUTCOME	MANAGEMENT UNITS	TARGET	TIMING
Identification of Clearing Limits	All Conservation Lands protected from impacts in Development Lands	Regeneration Revegetation Riparian	Clearing limits surveyed and pegged	Prior to any development activity
Control of Human Disturbance and Access	Reduction of soil disturbance	Regeneration Revegetation Riparian	All Conservation Lands fenced off, access for bush regeneration contractors and residents only	Prior to any development activity
Pre-Clearing Survey	Minimise / eliminate loss of significant individual flora / fauna species	Regeneration Revegetation	Individual flora / fauna species relocated from Development Lands	Prior to any development activity
Fencing	All Conservation Lands protected from impacts in Development Lands and unauthorised access	Regeneration Revegetation Riparian	All Conservation Lands fenced off, access for bush regeneration contractors and residents only	Prior to any development activity
Seed Collection	Use of local endemic species enabled through onsite seed collection	Regeneration Revegetation Riparian	90% of plantings on site to be from seed collected on site	Ongoing
Clearing of Vegetation	Increased area and number of habitat features on site and increased fauna habitat complexity	Regeneration Revegetation Riparian	100% of vegetation cleared from Development Lands is re-used on site	Ongoing
Soil Preparation	Currently degraded and disturbed soils improved	Revegetation	All disturbed soils are restored and do not impede revegetation	Prior to revegetation works
Soil Rehabilitation	Currently degraded and disturbed soils improved	Revegetation	All disturbed soils are restored and do not impede revegetation	Prior to revegetation works

Weed Management	Reduction in weed cover (abundance and diversity of species present)	Regeneration Revegetation Riparian	All infestations of WONS and noxious weeds are controlled and eliminated	2 Years and then ongoing
			All infestations of environmental weeds are treated and reduced.	Year 1: < 70% exotic cover Year 2: <60% exotic cover Year 3: <40% exotic cover Year 4: < 20% exotic cover Year 5 +: <10% exotic cover
Revegetation	Increased native plant diversity and reduction in weed cover (abundance and diversity of species present)	Revegetation Riparian	No active erosion and bare ground less than 5% 50% Treatment of woody weeds 100% treatment of woody weeds	2 – 5 years Year 1 Year 2
Pest Animal Management	Reduction in pest animals	Regeneration Revegetation Riparian	Feral animal control undertaken as per site- specific advice of Livestock Health and Pest Authorities	Ongoing
Ecological Prescribed Burns	Improved Biodiversity values	Regeneration Revegetation	Ecological burns undertaken in accordance with fire season, intensity and frequency for each endangered ecological community	Ongoing

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Appendix 1: Treatments and Tasks

Several treatments are proposed to achieve the aims identified in Conservation Lands and these are described in detail below. The works have been broken down into the three phases:

- Preliminary Works,
- Establishment Works,
- Maintenance Works.

All bush regeneration, revegetation and maintenance work will be undertaken by qualified bush regeneration contractors. Bush regeneration and maintenance work will control pasture grasses, herbaceous species and woody weeds. This weeding will include hand weeding, slashing, spot spraying, cut and paint or drill and fill. Where herbicide use is required, a non-selective herbicide and other additives identified for use near water will be used (i.e. RoundUp® Bioactive™). Maintenance will occur on a weekly basis during warmer periods and monthly during cooler periods.

PRELIMINARY WORKS

4.4 IDENTIFICATION OF CLEARING LIMITS

The clearing limits have been pegged by the surveyors Land Partners. The clearing limits are referred to under other actions, with temporary exclusion fencing of particular relevance to delineating clearing limits on the ground.

4.5 CONTROL OF HUMAN DISTURBANCE AND ACCESS

Unauthorised access to the Conservation Lands will be prohibited. This will prevent soil disturbance, weed dispersal, fauna habitat disturbance and illegal rubbish dumping. Avoiding soil disturbance is an effective means to prevent weed establishment (McIntyre et al 2002).

It is recommended that Carrington Centennial Trust appoint a Specialist Contractor / staff member who will be responsible for coordinating the implementation and reporting on all aspects of this CLUMP. The approval of this position must be obtained for any access to or activities on or in the Conservation Lands. Personnel will only be permitted into the Conservation Lands to undertake management and monitoring actions identified through this CLUMP.

Signage identifying the nature of the Conservation Lands is to be installed at the major access points for both Campuses around the perimeter of the site. Signage should include information on prohibited activities (domestic pets, rubbish dumping, unauthorised access etc.), information on weed infestations and hygiene protocols and contacts (including emergency contacts) for the Carrington Centennial Care.

4.5.1 Management of construction vehicles and construction materials transport and storage

All actions for this matter are to occur during pre and construction activities. The parking and traffic routes for construction trucks / vehicles and for all materials storage is to be contained within the Infrastructure Management Unit of the Development Lands and is not to encroach into the APZ or Mixed Use units. Parking for all construction related vehicles will be provided within the development site, in an area outside of the Conservation Lands, APZs and Mixed Use management units.

4.5.2 Management of access and illegal dumping

During the future construction works, the site must be fenced to prevent unauthorised access to any parts of the site. During removal of earth and other materials on site, any piles of rubbish should also be removed from the Conservation Lands where it is possible to complete without causing damage to the site and retained habitat. No machinery is allowed into the Conservation Lands for rubbish removal. External fencing of Conservation Lands should be considered if the potential exists for illegal rubbish dumping to occur / continue.

4.6 PRE-CLEARING SURVEY

Pre-clearance translocation for Cumberland Plain Land Snail is to be undertaken by suitably qualified and experienced personnel. The actions for this translocation will consist of sifting through the leaf litter with a small hand held cultivator or similar tool, by searching under loose and flaking bark, and by lifting or turning logs or other debris in a similar fashion to reptile searches within the Cumberland Plain Woodland vegetation clearance area. There is to be one day spent by two ecologists performing the searches and translocations. The pre-clearance translocation is to be performed 1 – 5 days prior to vegetation clearance commencing on site. Ideally the pre-clearance translocation should be conducted following rain when Cumberland Land Snail is easier to detect.

The reported genetic neighbourhood distance is 350m for this species (Clark and Richardson 2002). Individual snails have been recorded moving over distances of up to 60m over several months in a monitoring program at Mt Druitt (AMBS 2004). Therefore any Cumberland Land Snails found within management units of the Development Lands are to be translocated into the regeneration management units of the Conservation Lands, between 50m to 200m from the vegetation clearance area. Any Cumberland Plain Land Snails shells found are also to be translocated as the old shells can act as a source of calcium for other Cumberland Plain Land Snails. Notes should be kept on the number of Cumberland Land Snails translocated, and locations that the snails were moved to. These details are to form part of the monitoring report (see **Section 4** on monitoring).

4.7 FENCING

Temporary fencing is required to delineate the Development Lands management area from the Conservation Lands management area and prevent all construction impacts within Conservation Lands. Fencing is to be installed prior to any construction commencing and be in accordance with the clearing limits identified in preliminary works.

Fencing must not be placed outside of the clearing limits. Any shrubs that are located within 1m of the fencing line may be pruned, or removed if the base is within 0.5m of the fencing line. Trees may only be removed if their trunk is on the fencing line, or within 0.5m.

The temporary fencing is to comply with section 4 of AS 4970 – 2009 Protection of Trees and be at least 1.8m tall. Temporary fencing to the south of the training field may consist of hi-visibility fluoroc orange plastic 'para-web' fencing mesh or similar strung on star pickets. Signage is to be erected along Werombi Road and Small Road to identify the presence of the Conservation Lands. All temporary fencing is to be maintained for the duration of any construction activities on site.

Specific erosion and sediment controls for the various construction activities will be set out in the CEMP and OEMPs developed with individual DAs for construction work.

4.8 SEED COLLECTION

Seed must be collected from local provenance species. Groundcovers, shrubs and trees should be collected from within 5 kilometres of the site. If seed is not available within 5 kilometres, this radius can be extended to a maximum of 10km, any further extension of the seed collection radius requires written approval from Camden Council.

Native grasses typically have much larger dispersal mechanisms and are to be collected from within a 10km radius of the site. Should seed not be available within this radius, Camden Council may provide written approval for seed supply from other areas of the Cumberland Plain.

Wetland species are typically widely dispersed and can be collected from the Cumberland Plain component of the Hawkesbury Nepean Catchment. However, seed must be sourced from within a 10km radius of the site where available.

Where the species identified in this CLUMP cannot be sourced, they may be substituted for other Cumberland Plains Woodland species as identified by Tozer (2003). Trees must be substituted with trees, shrubs with shrubs etc. Only wild native species are to be used. Plants are not to be substituted with horticultural varieties under any circumstances.

Record keeping of seed collection and planting locations is to follow the Flora Bank guidelines (Mortlock, 2000). This is important for this site as future revegetation works across the site are likely to draw on seed sources created through these revegetation works. The bush regeneration contractor is responsible for recording this information and providing it to Council and the NSW OEH.

Timing

Seed harvesting for native grasses should generally be undertaken during the summer period following rainfall. Monitoring of donor sites within the area mapped as Derived Native Grasslands will be required following the first summer rains to determine the most appropriate time for seed collection.

When collecting seed from protected species or TECs, the collector must ensure they have the appropriate permits under the TSC Act and EPBC Act prior to collecting seed.

Seed viability

Seed viability testing should be undertaken for all batches of native seed collected using the methodology outlined by Ralph (2003):

- Seed viability is usually difficult to detect from external visual examination. Viable seed tend to be firm or plump, while non-viable seed will be soft and hollow, although this is difficult to determine with fine or very small seeds. With larger seeds, small holes in the seed coat may be an indication that the seed is not viable.
- To gain a more accurate indication of seed viability a number of tests may be carried out. The 'cut test' is most suitable for larger seeds. A minimum of 25 seeds are randomly selected from the seedlot (although for greater reliability four samples of 25 seeds should be used). These are cut in half along the length of the seed using a scalpel, sharp knife or razor. The internal appearance of each seed is visually inspected, using a hand lens if necessary. Viable seed will be firm and white, whole non-viable seed will be off-white or brownish. The number of viable seeds is counted and recorded as a percentage.

More formal seed viability tests can be undertaken in a growth chamber if required. The seed viability, purity (% seed content) and weight are to be provided for each batch. Seed is to be sorted, dried and

stored in a vermin proof, ventilated container located out of direct sunlight. Collection details (collector, collection locality, date, rainfall, species etc.) are to be recorded for each seed collection batch.

4.9 CLEARING OF VEGETATION

Clearing limits as per **Sections 5.4.1 and 5.4.2** are to be followed.

If any previously unknown threatened flora or fauna species are encountered during clearing work on site, clearing work is to cease immediately, and advice obtained from an ecologist or Council officers.

Any injured birds, reptiles, frogs or mammals found during any stage of construction should be reported to WIRES on 1300 094 737. Any fauna found during or post felling should have their species, threatened status, found status (e.g. under bark, in hollow, etc.), and fate (e.g. injured, death, escaped, or GPS location of where relocated to) recorded. These records are to be attached to (or recorded on) weekly construction monitoring checklists. Any recovered fauna should be relocated to the CMP lands.

Any weed material and weed waste removed during clearing is to be treated as described in **Section 4.12**.

Felled trees are to be kept as whole as possible and relocated to portions of the Conservation Lands as directed by an ecologist. The felled trees may be stored in the interim on site. Felled trees (i.e. logs) may be placed within the Conservation Lands bushland if this can be achieved with minimal impact to bushland from machinery. Alternatively felled trees may be placed at, or near, the boundaries of the Conservation Lands, including across informal access trails to prevent unauthorised access and reduce dumping issues. These logs may, if large enough, function as a fence for a portion of the CMP lands.

Tree branches and other native vegetation material are to be chipped, and used as mulch along the fenceline or in other areas as designated in the rehabilitation plan (see **Section 5.14.1**). This native mulch is to be stored in a designated area, and be kept separate to the weed waste, and is to have a sign to indicate that it is "Native Mulch".

Dead standing and fallen timber is to be retained in all Management Units. This will provide micro habitats for roosting, breeding and shelter. In addition to fauna habitat for insects, reptiles, birds, and mammals, fallen timber is also recognised as an important successional habitat for specialised colonising plants.

ESTABLISHMENT WORKS

4.10 SOIL PREPARATION

Site preparation is required to improve the success of direct seeding works. Site preparation will be dependent on the species and the site conditions. Preparation may include slashing and spraying of the ground layer vegetation to remove biomass and reduce initial competition with germinating seeds. Minor soil disturbance may also be beneficial to create a suitable seedbed for germination. Site preparation may also include the retention of ground layer vegetation as this may provide protection to young seedlings.

Soil studies in Western Sydney have identified considerable chemical change in soils between the A and B horizons. The B horizons in particular are highly sodic and are prone to deflocculation, erosion and water logging. B horizon soils also significantly reduce the success of revegetation works.

Hence, areas where excavation works will be undertaken to a level at or below the B horizon, they will be required to be treated in the following way:

1. Stockpile top soil and A horizon;
2. Excavate to a level 300mm below finished surface level;
3. Place stockpiled A horizon and topsoil on top of B horizon soils, minimum depth of 200mm;
4. Water, allow weed seed to germinate and spray with herbicide;
5. Place a minimum of 100mm of topsoil (from stockpile or imported) on top of replaced A horizon and topsoil; and
6. Jute or mulch as required.

Sites suitable to receive salvaged topsoil will be open degraded areas with a low proportion (<10%) of native species. The sites will be flat and preferably adjacent to an existing water source such as a dam or stormwater wetland to allow the site to be irrigated.

In areas where native groundcover species are prevalent, site preparation will be limited to slashing. Areas dominated by groundcover weeds may be sprayed with herbicide prior to direct seeding. Minor soil disturbance to the topsoil through raking will create more favourable conditions for seed germination but will be restricted to smaller areas where follow up weed control of these disturbed areas will be undertaken.

Soil seed bank testing – topsoil translocation

Where topsoil translocation is to be undertaken, it is recommended that soil seed bank testing is undertaken to determine the proportion of native and exotic species and therefore the suitability of the topsoil for translocation.

Soil seed bank testing can be undertaken by taking a range of samples from the donor (impacted site). The number of samples required will depend on the area of the donor site. Samples should be taken from representative areas by extracting soil from a 200 mm square to approximately 50 mm in depth. The precise depth of topsoil is to be determined on site. Above ground vegetation should be removed and the soil homogenised.

A sample of approximately 1,000 ml should be extracted from each sample, with half heated in an 80°C fan forced oven for 20 min to simulate germination (Cole *et al.* 2010). Both halves of each sample should then be placed over clean (autoclaved) sand and allowed to germinate in a shade house.

Following germination and establishment, all species should be identified to species level and the proportion of native and exotic species determined. The presence of a large proportion of exotic species and/or environmental weeds species will identify that the topsoil is unsuitable for translocation.

4.11 SOIL REHABILITATION

Ripping of specified areas (including all areas where soil has been severely compacted) to a depth of up to 200mm. Given the possibility of sodic soils and the risk of dispersal of fine clays brought to the surface, Gypsum should be added to the ripped soil at the recommended rate (e.g. 0.25kg per m²). During excavation and ripping works it is important that the clay layer not be disturbed. In addition, excavation and ripping may not be required in all parts of this zone. As such, an ecologist or qualified bush regenerator should be on hand to direct the removal. Maximum soil depth has been assumed to 200-300cm.

Where topsoil removed from other areas is to be re-used in the Conservation Lands where the soils are currently degraded, this must be in accordance with their natural occurrence in the soil profile (i.e. soil from the B horizon is placed first, followed by soil from the A horizon which is followed by the collected groundcover and leaf litter layer) .

Where trees have been cleared from the development site, this material will be used to provide micro-habitats for wildlife in the Conservation Lands. Native vegetation removed from the remainder of the site should be stockpiled for use either as whole logs or as mulch for erosion control. Branches with a diameter of 10-20 cm and 1-4 metres in length will be spread randomly throughout the remainder of the Conservation Lands at low density and placed horizontally across the slope.

4.12 WEED MANAGEMENT

Initial weed removal from the infrastructure management units of the estate should be done before large scale construction machinery enters the site for native vegetation clearing and woody debris relocation. The weeds for removal should be based on instruction from a suitably qualified and experienced ecologist. Initial weed removal should target the most invasive and impacting weeds on site African Olive (*Olea europaea*) and African Boxthorn (*Lycium ferocissimum*). Given the highly invasive nature of African Lovegrass, it will be more efficient to remove it as part of a wider treatment program.

During construction any soil or plant material with noxious and environmental weeds should be removed stored in a designated area (kept separate to the native mulch), and disposed of as soon as possible / practicable to a site licenced to receive green waste. This designated storage area is to have a sign to indicate that it is "Weed Waste".

Construction machinery should be washed prior to entering and leaving the site to ensure weed propagules are not transported. This is to occur in a designated washdown area.

All bush regeneration works will be undertaken by a qualified bush regenerator. Bush regeneration and maintenance work will control pasture grasses, herbaceous species and woody weeds. Weeding will include hand weeding, slashing, spot spraying, cut and paint or drill and fill. Where herbicide use is required, a non-selective herbicide and other additives identified for use near water will be required (e.g. RoundUp® Biactive™). Maintenance will occur on a weekly basis during warmer periods and monthly during cooler periods.

Weed management activities during the establishment phase consists of 2 types:

- **Primary weed clearance:** Clearing of weeds from areas that have not received treatment before or who have established populations of weeds.
- **Secondary treatment or follow-up:** Intensive weeding in areas which have already received primary work.

4.12.1 Primary Weed Control

Primary weed control refers to the first time an area is weeded; it can be labour intensive and time consuming and depending on the target species and site conditions, it may take over several months to complete for one species (Buchanan 2009). In areas of high weed infestation and with no native resilience and/or native plants present, primary weeding may be accelerated as preparatory works for revegetation. However, in areas where native plants may occur, primary weeding should be undertaken at a pace that assists with the natural regeneration of the site.

Primary weed control which will be achieved through slashing and herbicide application. Pasture weed species will be slashed at the beginning of works and regrowth sprayed. Before works begin this zone should be examined by the bush regeneration contractor to identify any areas of dense native vegetation (such as Kangaroo Grass) that can remain. These areas will require hand weeding or targeted spot-spraying. Timing will vary depending on season and weather condition, but the intention is to spray exotic species before they have the chance to set seed but after they are large enough to be distinguished from native species. Sufficient treatments will be required to exhaust weed seed present in the soil seedbank. This is likely to require a minimum of 2 treatments, further treatments may be required should weeds continue to germinate.

Mechanical primary weed control

Mechanical primary weed control will be undertaken mostly on large stands of dense Privet and African Olive. Large thickets of African boxthorn will also be mulched to prevent any piles of treated debris becoming habitat for feral hares. The method of mechanical primary weed control for African Olive and privet involves:

- Mechanical mulching using an excavator with a mulching head attached, with mulch left in situ
- Remaining stumps will be recut with a chainsaw as low as possible and treated with herbicide using the cut stump method
- Where the mulching machine cannot access due to slope or other obstacles, olives will be felled using chainsaws and treated with herbicide using the cut and paint method. Large logs will be left in situ and smaller branches trimmed and dragged to a point where they can be mulched
- After treatment of large olives any seedlings remaining will be sprayed with herbicide within two weeks
- Areas will be closely monitored after treatment and any re-shooting stumps or seedlings will be retreated
- Where olives are among *Bursaria* thickets or if *Bursaria* is limiting access, both species will be mulched but only the olive will be treated with herbicide (the *Bursaria* will readily re-shoot)
- Follow up treatment will control regrowth of olive and any subsequent weed regrowth

Note: the choice of herbicide will have to be considered carefully. 600g/L Triclopyr (eg Garlon™) is registered for use on olive with a diesel solvent; however this is a soil active herbicide and will not be used in the vicinity of native vegetation including trees. This is particularly relevant if the basal bark treatment is being used. 360g/L Glyphosate (e.g. Roundup™) will be used to treat olives when they are actively growing/flowering in autumn.

4.12.2 Secondary Weed Control

Secondary weed control follows primary measures and controls weeds that grow from the increase in available resources (e.g. light, moisture and nutrients) following the removal of large woody weeds. Secondary weed control involves treatment of weeds whilst ensuring the regeneration of native species is not inhibited or negatively affected. Techniques include:

- Selective hand removal
- Selective herbicide spraying
- Cutting and painting with herbicide woody weeds and other persistent weeds with hand tools and chainsaws
- Slashing herbaceous weeds using brush cutters or lawn mowers to prevent seed set
- Collection of all weed material which has set seed or is able to propagate vegetatively and removal to central areas where it is contained and composted on site

Secondary weed control needs to be carefully timed to:

- Prevent weeds from setting seed
- Suppress vegetative regrowth while plants are still small
- Allow native plants to recruit without being smothered or out-competed by weeds

However, secondary weed control should allow enough time for the soil profile to recover following primary weed control and the establishment of weed growth from the soil seed bank. The focus of these works will be the removal of exotic species at a pace that allows native species to re-establish in their wake. Works should not progress at such a rate that weeds are able to re-establish were they were just removed.

4.12.3 Grassland weed control

Slashing, burning or grazing to prevent seed set will control weedy annual grasses. This will be undertaken in early spring to allow the growth and seed set of summer dominant perennial native grasses. Trials with the addition of carbon in the form of sugar or sawdust to reduce available nitrates will also suppress weedy annual grasses and reduce competition on native perennial grass species which are tolerant of lower nitrate levels (Prober and Thiele 2005).

Perennial weed grasses particularly couch (*Cynodon dactylon*) are more persistent. Control of couch will focus on over planting with vigorous native tussock grasses such as *Themeda australis* and *Poa labillardiera* to out compete and replace it. Slashing, burning or grazing to prevent seed set and herbicide spraying to kill large tussocks will also be used to control perennial weed grasses.

4.13 REVEGETATION

Encouraging the site's natural resilience through bush regeneration techniques and direct seeding will be used in preference to planting. Planting will be restricted to areas where natural regeneration is unlikely or will be slow due to past disturbances. These areas include areas currently dominated by introduced pasture grasses, areas that are too far removed from remnant vegetation to receive input of propagules or areas that have been heavily degraded by past land use and will immediately benefit from increased vegetation cover.

Revegetation should be undertaken with appropriate species and at an appropriate density to match the natural structural and species diversity of the two endangered ecological communities being restored on site.

Tree plantings should be no closer than 5m to existing trees to ensure no root damage. Shrub and groundcover plantings should be placed no closer than 2m to existing shrubs or trees and should be planted in diverse clumps of different species. Where groundcovers are planted, they will be in groups rather than individuals spread evenly around the site. Three or four plants of the same species will be planted in close proximity to each other (i.e. approximately 30 x 30cm square).

In deciding what species will be planted, consideration will also be given to the adjacent vegetation community, species present on site in the same mapped vegetation community and species known to occur in that community as described by NSW NPWS (2002). Some areas will be planted as thickets to mimic the natural distribution of certain species.

Planting will start as soon as the works outlined above have occurred. In areas of Grey Box – Forest Red Gum grassy woodland, overstorey species will be planted as required at a density of no more than 1 per 20m² and will be based on the species nominated in **Table 9**. Shrubs and groundcovers will be planted at a density of four plants per square metre utilising the species identified in **Table 10** below. In areas of

Forest Red Gum – Rough Barked Apple, overstorey species will be planted as required at a density of no more than 1 per 10m² and will be based on the species nominated in **Table 11**. Shrubs and groundcovers will be planted at a density of four plants per square metre utilising the species identified in **Table 12**.

Areas of dense exotic grasses or disturbed soil profiles (fill, eroded) may require ripping to allow for planting. Mulching to 100mm depth will be required on any areas of high erosion potential or low relief. This mulch should, where possible, be from native trees removed in the remainder of site. Logs and other large woody debris can be placed in this zone after preliminary works have taken place but before planting works to provide habitat.

Table 9: Indicative tree species for revegetation of Grey Box-Forest Red Gum grassy woodland

SCIENTIFIC NAME	COMMON NAME	% OF MIX
<i>Eucalyptus amplifolia</i>	Cabbage Gum	25
<i>Eucalyptus crebra</i>	Narrow Leaved Ironbark	10
<i>Eucalyptus eugenioides</i>	Thin-leaved Stringybark	10
<i>Eucalyptus moluccana</i>	Grey Box	25
<i>Eucalyptus tereticornis</i>	Forest Red Gum	10
<i>Melaleuca styphelioides</i>	Prickly-leaved Tea Tree	20

Table 10: Indicative Shrub and Groundcover species for revegetation of Grey Box- Forest Red Gum Grassy Woodland

SCIENTIFIC NAME	COMMON NAME	% OF MIX
<i>Aristida ramosa</i>	Purple Wiregrass	5
<i>Aristida vagans</i>	Threeawn Speargrass	5
<i>Bursaria spinosa</i>	Blackthorn	5
<i>Dianella longifolia</i>	Blue Flax-lily	5
<i>Dichelachne micrantha</i>	Shorthair Plumegrass	10
<i>Dodonaea viscosa</i> subsp. <i>cuneata</i>	Wedge-leaf Hopbush	5
<i>Echinopogon caespitosus</i>	Tufted Hedgehog Grass	5
<i>Hardenbergia violacea</i>	Purple Coral Pea	5
<i>Imperata cylindrica</i> var. <i>major</i>	Blady Grass	10
<i>Indigofera australis</i>	Native Indigo	5
<i>Lomandra longifolia</i>	Spiny-headed Mat-rush	10
<i>Melaleuca decora</i>	White-feather Honey Myrtle	5
<i>Microlaena stipoides</i>	Weeping Grass	10
<i>Ozothamnus diosmifolius</i>	White Dogwood	5
<i>Themeda australis</i>	Kangaroo Grass	10

Table 11: Indicative Tree Species list for Forest Red Gum - Rough Barked Apple grassy woodland

SCIENTIFIC NAME	COMMON NAME	% OF MIX
<i>Angophora floribunda</i>	Rough Barked Apple	10
<i>Angophora subvelutina</i>	Broad Leaved Apple	10
<i>Casuarina cunninghamiana</i>	River Oak	15
<i>Casuarina glauca</i>	Swamp Oak	15
<i>Eucalyptus amplifolia</i>	Cabbage Gum	10
<i>Eucalyptus benthamii</i>	Camden White Gum	10
<i>Eucalyptus moluccana</i>	Grey Box	10
<i>Eucalyptus tereticornis</i>	Forest Red Gum	10
<i>Melaleuca styphelioides</i>	Prickly-leaved Tea Tree	10

Table 12: Indicative shrub and groundcover species list for Forest Red Gum - Rough Barked Apple grassy woodland

SCIENTIFIC NAME	COMMON NAME	% OF MIX
Shrubs		
<i>Bursaria spinosa</i>	Christmas Bush	
<i>Dillwynia juniperina</i>	Prickly Parrot-pea	
<i>Dodonaea viscosa</i>	Hopbush	
<i>Indigofera australis</i>	Australian Indigo	
Grasses		
<i>Aristida ramosa</i>	Purple Wiregrass	10
<i>Aristida vagans</i>	Threeawn Speargrass	10
<i>Chloris truncata</i>	Windmill Grass	15
<i>Chloris ventricosa</i>	Plump Windmill Grass	10
<i>Echinopogon ovatus</i>	Tufted Hedgehog Grass	5
<i>Lachnagrostis filiformis</i>	Common Blown Grass	15
<i>Microlaena stipoides</i> var <i>sitpoides</i>	Weeping Grass	10
<i>Themeda australis</i>	Kangaroo Grass	10
Groundcovers		
<i>Atriplex semibaccata</i>	Creeping Saltbush	5
<i>Brunoniella australis</i>	Blue Trumpet	5
<i>Dichondra repens</i>	Kidney Weed	10
<i>Dianella longifolia</i>	Blue Flax-Lily	5
<i>Einadia hastata</i>	Berry Saltbush	5
<i>Einadia nutans</i>	Climbing Saltbush	5
<i>Einadia trigonos</i>	Fishweed	5
<i>Glycine clandestina</i>	Twining Glycine	10
<i>Glycine tabacina</i>	Pea Glycine	10
<i>Goodenia hederacea</i>	Forest Goodenia	10
<i>Hardenbergia violacea</i>	Native Sarsaparilla	10
<i>Persicaria decipiens</i>	Slender Knotweed	10
<i>Commelina cyanea</i>	Native Wandering Jew	10

Table 13: Species to be used in revegetation of the channel base

SPECIES	COMMON NAME	% OF MIX
Sedges		
<i>Carex appressa</i>	Tall Sedge	20
<i>Cyperus exaltatus</i>	Flat-sedge	20
<i>Eleocharis sphacelata</i>	Tall Spike-rush	20
<i>Juncus planifolius</i>	Board-leaf Rush	20
<i>Juncus usitatus</i>	Billabong Rush	20

4.13.1 Brush matting

Brush matting will be used to introduce seed of woody vegetation to areas of degraded woodland and grassy open woodland. Site preparation required is similar to that described for direct seeding. Brush matting is particularly useful in areas subject to erosion, as the added rough mulch will help protect the soil and provide protection to any seeds that germinate. Areas prone to erosion include slopes and ephemeral creek lines. Brush matting will be collected from areas within the Development Area, which are to be cleared and will consist of seed bearing tree branches and the tops of shrubs with ripe fruit. This material will be spread on the prepared site on the same day as it is harvested and not stockpiled.

4.13.2 Direct seeding

Direct seeding is a technique of re-establishing native vegetation by sowing seed directly into the field without the need to plant tube stock. Mechanical direct seeding will be undertaken over large areas using equipment such as the Rodden tree and shrub seeder while direct seeding by hand will be used for smaller areas.

Direct seeding will be undertaken in moderately disturbed areas that already contain components of the native vegetation particularly in areas adjacent high quality remnant vegetation.

Mechanical direct seeding

Mechanical direct seeding will be undertaken with the Rodden tree and shrub seeder. Mechanical direct seeding is more cost effective than planting however the results are less certain. Mechanical direct seeding is suited to a limited range of commonly occurring species as it requires a large quantity of seed. Mechanical direct seeding will be coordinated with large-scale revegetation to achieve desired species diversity.

Mechanical direct seeding will also be used in areas where there is potential for natural regeneration but the quick establishment of perennial native species such as *Acacia sp.* is beneficial. This includes erosion prone areas with a high proportion of existing native groundcovers.

Pre-treatment of seed prior to sowing will increase chances of success. Pre-treatment will include heat treatment for species with hard seed coats such as *Acacia*, Fabaceae species and *Dodonaea sp.* and cold stratification for *Bursaria*. Site preparation is usually limited to slashing of groundcover vegetation when using mechanical direct seeders.

Hand direct seeding

Hand direct seeding will be undertaken on a smaller scale with smaller quantities of seed than mechanical direct seeding. This technique will be used in small disturbed areas surrounded by higher quality vegetation. It will facilitate the natural spread of seed and increase the rate of colonisation of native plants into these disturbed areas. Hand direct seeding will utilise seed collected from the immediate vicinity of the site to be seeded and spread soon after collection. Site preparation will include slashing of weedy vegetation and raking of the soil surface to create conditions suitable for germination. In exposed areas seed will be sown within plant protectors (otherwise known as grow bags which consist of a small plastic sleeve held in place with 3 stakes). These will provide a suitable microclimate and protect germinating seeds.

The seed of less common grassland herbs which are to be grown intensively and will be used in hand direct seeding works. As with all other works, records will be kept to monitor the success of all hand direct seeding works.

4.13.3 Hand planting

Hand planting will be used in smaller areas with fewer plants. Hand planting may also be required on slopes too steep for mechanical planting. During hand planting all holes will be dug with an auger to increase efficiency.

4.13.4 Using tube stock

Growing or striking of plant stock can take up to 9 months before planting occurs and needs to be factored in to project timeframes. Confirmation from suppliers will be required regarding seed origin.

All tube stock will be irrigated when planted to assist with survival and encourage rapid establishment of plants. Watering will occur on the day of planting and once during the following week. Further planting will be determined by the bush regeneration contractor and will be dependent on significant rainfall during the season of planting.

Tree guards will be used to protect seedlings from extreme weather (frosts and heat), herbivore grazing and herbicide spray drift during maintenance. These will be erected at the time of planting where required. Water retaining crystals will also be used.

Timing and irrigation

Direct seeding works will be timed to mimic natural seed fall patterns and to take advantage of seasonal rain to increase the chances of survival of sown seed. Where a water source such as an existing dam or stormwater detention wetland is readily available, irrigation of direct seeded areas will improve the chances of germination and survival of seedlings.

4.14 PEST ANIMAL MANAGEMENT

A rabbit control program for the site should be implemented based on identification and fumigation of rabbit warrens. Reducing Rabbit populations has historically been achieved through an integrated approach utilising myxomatosis, rabbit haemorrhagic disease virus, the European Rabbit flea and 1080 poison. The site is to be constantly monitored for evidence of rabbit activity. Any damage by rabbits, primarily due to grazing young plants, will require rectification. Destruction of rabbit warrens should be undertaken as part of the holistic management of both the Development and Conservation Lands within Carrington Centennial Care estate.

Feral cats and foxes predate native fauna and these species will be targeted for control on the site. Ongoing feral cat control, including baiting and trapping, is highly recommended. Maintaining and restoring large areas of native vegetation with a dense understorey is likely to be an important habitat management approach to reducing the impact of cats on terrestrial fauna assemblages (Dickman 1996). Due to surrounding mix of open space / semi-agricultural land uses, mice may provide favourable prey for feral and house cats in the area cats which may prey on native fauna within retained bushland onsite. Control programs for mice and rats should be implemented including education, rodent baiting and trapping of cats. Fox control is primarily achieved using a baiting program. In addition, searches for, and destruction of, fox dens throughout the estate lands should be undertaken regularly. Coordinating the baiting program with neighbouring landholders (particularly Sydney Water Corporation and Camden Council) will prove the most effective means of reducing European Red Fox.

MAINTENANCE WORKS

Maintenance will be undertaken on a regular basis of at least weekly in the peak growing seasons (spring and summer) and monthly in cooler periods (autumn and winter). Maintenance will be undertaken for 5

years after practical completion of establishment works. Practical completion refers to the completion of all civil works, soil preparation, initial weed control and planting.

Maintenance of stream bed and stream bank work within the Riparian Management Units is to occur during and after the establishment period. High rainfall events during implementation works are likely to damage uncompleted works – these will need to be rectified in order for practical completion of establishment works to be achieved. It needs to be recognised that the channel will continue to move over time; all existing active areas need to be stabilised initially however as time progresses and the watercourse migrates, such stabilisation works may be required in different locations.

4.15 FENCING

Maintenance and replacement of fences will be required on an annual rotational basis whereby the entire fence is replaced once in every 20 years along most of the area (areas with low-moderate risk of vandalism) and once in every 10 years for sites where the risk of vandalism was perceived as high (e.g. adjacent to the school in the south).

Mulch or other erosion control material (e.g. Jute Matting) should be used as part of revegetation. The use of erosion control material is important because it provides organic matter to the top soil, improves soil structure and aeration, water infiltration, nutrient availability, and is also useful in the suppression of weed growth (Buchanan 2009). If mulch is used it should be sourced from within the local area and be free of weed propagules and invasive woody material. Specific erosion and sediment controls for the various construction activities will be set out in the CEMP and OEMPs developed with individual DAs for construction work.

4.16 WEED MANAGEMENT

Weed management activities on site during the maintenance period will consist primarily of maintenance weeding of weeds that have already undergone primary and secondary weed management activities.

The goal of follow-up control is to remove weedy recruits so that native species can re-colonise the area; frequent visits are likely to be needed at first, although the amount of time and resources used should gradually decrease through time. This will be particularly important after any disturbances including programmed ecological burns.

Maintenance weeding will be required on an on-going basis to prevent reinfestation of previously treated areas. It is expected that the amount of maintenance weeding required will decrease once the native plants become established.

The most cost effective method of minimising the amount of maintenance weed control required is by maintaining healthy native vegetation communities and preventing the introduction of new weed sources. This is achieved by avoiding:

- Unplanned soil disturbance
- Importing contaminated soil to the site
- Sudden physical changes to native vegetation (e.g. clearing)
- Growing plants with weed potential in neighbourhood gardens that can be dispersed by garden refuse dumping, animals (especially birds), wind and water
- Stormwater impacts (stormwater can change soil moisture and nutrients, and can carry weed propagules and seeds).

Weed control on site boundaries

Allowance has to be made for weed control in the adjacent road corridors surrounding the site. Neglecting to control these weeds will result in reinfestation of treated areas within the site. Control in these areas will be coordinated with the appropriate authorities.

Management of weed waste

All weed debris from grassy and herbaceous weeds is to be left in situ as mulch where possible. If this mulch is excessive in some areas, the treated weed biomass will be relocated and spread in areas where the mulch is thin.

Where woody weed material is dense, it will be removed from the site and disposed off site and taken to an appropriately licensed facility which is able to receive green waste.

4.17 REVEGETATION

Maintenance of direct seeded areas is vital to ensure success and will include weed control, irrigation and pest and feral animal control.

Tree guards will be used to protect seedlings from extreme weather (frosts and heat), herbivore grazing and herbicide spray drift during maintenance. These will be erected at the time of planting where required. Water retaining crystals will also be used.

4.18 ECOLOGICAL PRESCRIBED BURNS

Management of fire within the Conservation Lands is essential for conserving biodiversity. High fire frequencies have the potential to alter the structural diversity of habitats through a reduction in canopy cover, removal of understorey and development of a dense grassy understorey. Appropriate fire regimes will help maintain a healthy native vegetation community and has been shown to control certain weed species. It is anticipated that in larger areas of woodland, the programmed ecological burns will assist in the control of African Olive with a stem diameter less than 20 mm (von Richter et al. 2005). Large olives will be treated manually (cut and paint method). The control of African olive will be a long-term maintenance requirement, as recruitment of young olives will continue as seed is brought onto the site from surrounding infestations by birds and other animals. Using fire will reduce the amount of labour required to maintain these areas.

Careful follow up of burnt areas will be required to ensure that the growth of any opportunistic weeds is controlled. It is vital that all forms of disturbance to burnt areas is avoided and access is strictly controlled following all programmed ecological burns to avoid unnecessary soil disturbance which will encourage weed growth. Fire will be avoided on steep slopes due to the potential to increase erosion hazards. Fires are not to be lit in any of the Management Units for purposes other than ecological burning for conservation.

4.19 PEST ANIMAL MANAGEMENT

A rabbit control program for the site should be implemented based on identification and fumigation of rabbit warrens. This is to be undertaken in consultation with the Rural Lands Protection Board. The site is to be constantly monitored for evidence of rabbit activity. Any damage by rabbits, primarily due to grazing young plants, will require rectification.

4.20 LITTER MANAGEMENT

Litter includes paper and plastic rubbish, and dumped garden waste and soil. It is aesthetically unpleasing and can negatively impact the ecosystems by:

- Smothering vegetation
- Increasing nutrient levels in bushland and waterways
- Spreading weed propagules
- Killing fauna

Litter will be managed by regular inspections, especially after storms, and regular cleaning of litter traps.

Future littering and dumping will be reduced through the provision of adequate fencing and supply of bins in passive recreation areas.

INDICATIVE COSTINGS

Indicative costings have been prepared for the implementation of the CLUMP. The total cost of implementation over a 5 year period is \$1.85M. The cost to implement each treatment, based on the Regeneration and Revegetation zones described in **Table 7**, is presented in **Table 14**. Given the indicative nature of the costings, preparation and establishment costs have been grouped for the Regeneration zone and calculated on a unit rate per hectare of \$8,000, \$15,000, \$25,000 and \$5,000 for the 1a, 1b, 1c and 1d zones respectively. Similarly, for the Revegetation zones unit costs of \$95,000 and \$120,000 for the 2a and 2b zones have been applied. These higher rates tend to reflect the additional costs associated with revegetation and mechanical weed control techniques (e.g. trittering) associated with these zones.

Maintenance costs are based on a unit rate per hectare that has been determined based on the condition of each zone and discounted each year as the environmental condition of the respective zone improves.

Table 14: Preparation, establishment and maintenance costs for each zone

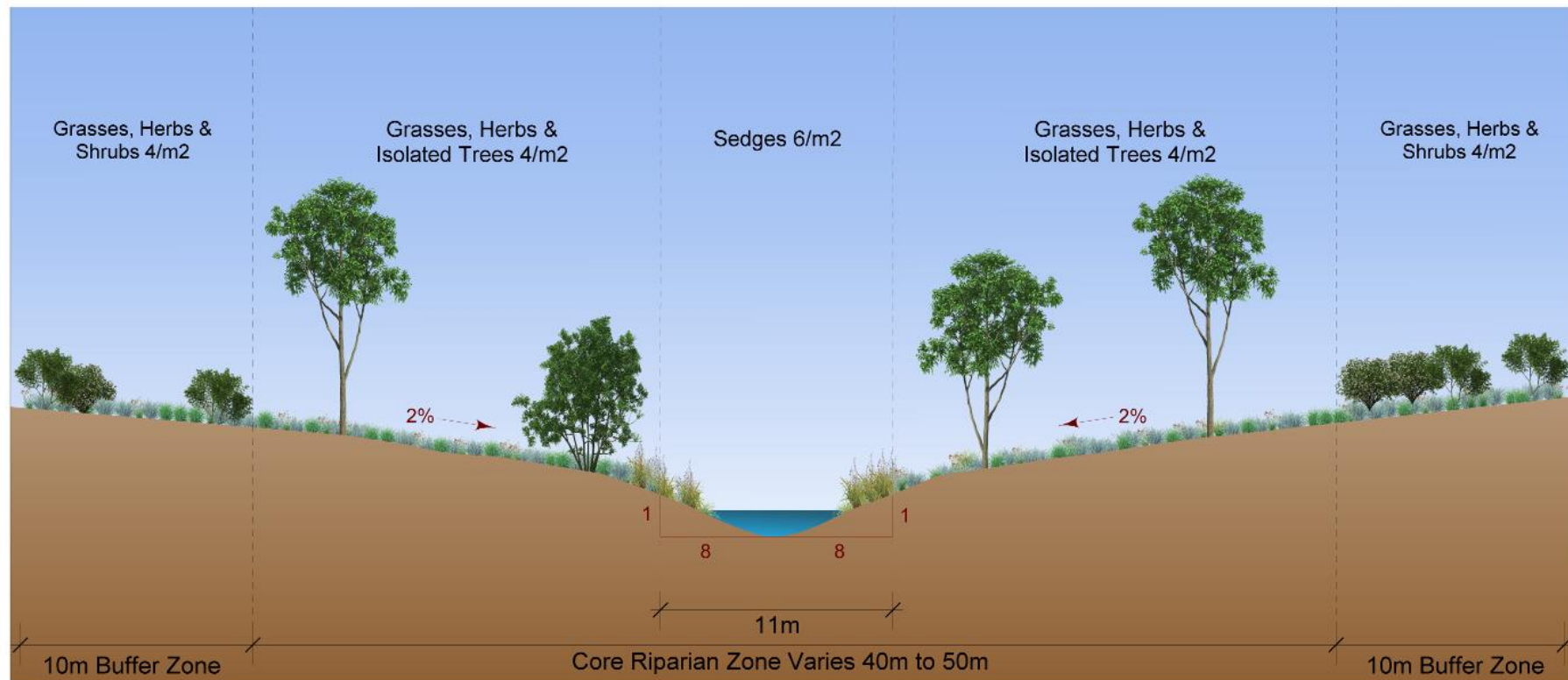
MANAGEMENT UNIT/ZONE	CONDITION	AREA (HA)	TREATMENT	YR 1	YR 2	YR 3	YR 4	YR 5	TOTAL
<i>Regeneration</i>									
1a	High	5.25	Preparation						
			Establishment	94,500					94,500
			Maintenance		42,000	31,500	21,000	10,500	105,000
1b	Medium	11.46	Preparation						
			Establishment	286,500					286,500
			Maintenance		91,680	68,760	45,840	22,920	229,200
1c	Poor (Heavy olive infestation)	3.81	Preparation						
			Establishment	133,350					133,350
			Maintenance		38,100	22,860	15,240	7,620	83,820

MANAGEMENT UNIT/ZONE	CONDITION	AREA (HA)	TREATMENT	YR 1	YR 2	YR 3	YR 4	YR 5	TOTAL
1d	Derived Native Grassland (DNG)	10.17	Preparation						
			Establishment	151,700					151,700
			Maintenance		101,700	61,020	40,680	20,340	233,740
<i>Revegetation</i>									
2a	Cleared	1.56	Preparation	18,281					18,281
			Establishment	165,000					165,600
			Maintenance		15,600	9,360	6,240	3,120	34,320
2b	Exotics	0.99	Preparation	18,178					18,178
			Establishment	129,900					129,900
			Maintenance		9,900	5,940	3,960	1,980	21,780

MANAGEMENT UNIT/ZONE	CONDITION	AREA (HA)	TREATMENT	YR 1	YR 2	YR 3	YR 4	YR 5	TOTAL
<i>Riparian</i>	-	0.99	Preparation	24,178					24,178
			Establishment	110,000					110,000
			Maintenance		9,900	5,940	3,960	1,980	21,780
TOTAL				1,132,187	308,880	205,380	136,920	68,460	1,851,827

Appendix 2

INDICATIVE CROSS SECTION OF RIPARIAN CORRIDOR



Appendix 3

Biometric vegetation type benchmarks for *Grey Box – Forest Red Gum grassy woodland on shales of the Cumberland Plain, Sydney Basin (GB-FRG)* and *Forest Red Gum – Rough Barked Apple grassy woodland on alluvial flats of the Cumberland Plain, Sydney Basin (FRG-RBA)*.

Table 15: Biometric vegetation condition classes

Veg Type Name	Veg Type ID	Native Plant Species Richness	Native over-storey Cover		Native mid-storey cover		Native groundcover (grasses)		Native groundcover (shrubs)		Native groundcover (other)		No. trees with hollows	Total length of fallen logs
			Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper		
GB-FRG	HN 529	24	27.5	32.5	21	31	24.45	30.45	0	10	24.45	30.45	1	50m
FRG-RBA	HN 526	29 P	18.5	23.5	20	30	23	31	0	5	11.75	19.75	0	0m

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ABORIGINAL HERITAGE PRELIMINARY ASSESSMENT 5 SMALLS ROAD, GRASMERE, CAMDEN LGA



CONSULTATION DRAFT REPORT
JANUARY 2013

REPORT PREPARED BY AHMS (AUTHORED BY OLIVER BROWN)
FOR CARRINGTON CARE

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CONTENTS

1	Introduction.....	10
1.1	Proponent Details.....	10
1.2	Purpose of the Assessment	10
1.3	Subject Area.....	11
1.4	Report Outline	12
1.5	Limitations.....	13
1.6	Investigator and Contributors.....	13
2	Aboriginal Community Consultation.....	14
3	Ethnographic Information.....	15
3.1	Traditional Owners & Contemporary Stakeholders	15
3.2	Local Aboriginal History	16
4	Landscape Context.....	17
4.1	Landscape Characteristics.....	17
4.2	Geology and Soils	17
4.3	Vegetation	17
4.4	Waterways	18
4.5	Previous Land Use and Disturbance	21
5	archaeological Context.....	25
5.1	Regional Context - Site Types and Locations	25
5.2	Activity Zones	27
5.3	Regional Context - Artefact Types	29
5.4	AHIMS Search Results.....	30
5.5	Local Studies	32
5.6	Summary	33
6	Site Inspection.....	34
6.1	Aims and Framework.....	34
6.2	Methods	35
6.2.1	Rationale for Exposure Survey Methods.....	35
6.3	Results.....	36
6.4	Discussion.....	37

7	Conclusions and Recommendations	41
7.1	The archaeological Resource and Significance	41
7.2	Subject Site Management Recommendations.....	42
8	References	44
	Appendix 1: Photographs	47
	Appendix 2: Exposure Survey Data	50
	Appendix 3: Aboriginal Community Consultation	52
	Appendix 4: Legislation.....	53
	National Parks and Wildlife Act 1974	53
	Environmental Planning and Assessment Act 1979	53
	Heritage Act 1977.....	53
	Aboriginal Land Rights Act 1983	54
	Native title legislation	54
	Other Acts	55
	Appendix 5 Artefact Recording.....	56
A5.1	Artefact Images	56
A5.2	Artefact Recording	57

LIST OF FIGURES

Figure 1:	Aerial Image of the Study Area	11
Figure 2:	Slope analysis.....	18
Figure 3:	Geology.....	19
Figure 4:	Soil Landscape mapping.....	19
Figure 5:	Study Area drainage - west into Sickles Creek then north to the Nepean River ..	20
Figure 6:	Section of creekline likely to have held reliable water	20
Figure 7:	1956 aerial imagery	21
Figure 8:	1984 aerial imagery	22
Figure 9:	Disturbance as assessed in 2005 based on vegetation clearance	23
Figure 10:	Disturbance assessed in 2005 against earlier aerial imagery.....	23
Figure 11:	Reassessment of land disturbance	24

Figure 12: Site proximity to water in the comparable landform of the Hills Shire (Brown 2010b).....	26
Figure 13: Distribution of AHIMS registered sites	31
Figure 14: Distribution of known sites within Carrington Care land	32
Figure 15: Separation of Subject Area into 6 Landform Zones.....	34
Figure 16: Survey routes, exposure locations and results	36
Figure 17: Artefact distribution modelling results (this study only)	38
Figure 18: Artefact distribution modelling results (2005 and this study)	38
Figure 19: Artefact distribution modelling <80m of potential standing water area	39
Figure 20: Location of photos with Plate label	47

LIST OF TABLES

Table 1: Proponent details.....	10
Table 2: Site Classification System used in this assessment	29
Table 3: Summary of AHIMS registered sites	31
Table 4: Exposure survey statistics by landform zone	37
Table 5: Three zone artefact distribution statistics.....	39
Table 6: Artefact distribution statistics - 80m to standing water	40
Table 7: Summary of potential archaeological significance.....	42
Table 8: Exposure Survey results.....	50

GLOSSARY

Aboriginal Cultural Heritage Assessment	A document developed to assess the archaeological and cultural values of an area, generally required as part of an Environmental Assessment (EA).
Aboriginal Heritage Impact Permit (AHIP)	The statutory instrument that the Director General of the Office of Environment and Heritage (OEH) (formerly the Department of Environment, Climate Change and Water (DECCW)) issues under Section 90 of the <i>National Parks and Wildlife Act 1974</i> to allow the investigation (when not in accordance with certain guidelines), impact and/or destruction of Aboriginal objects. AHIPs are not required for a project subject to Part 3A of the <i>Environmental Planning and Assessment Act 1979</i> or State Significant Major Developments subject to Part 4 of the Act.
Aboriginal object	A statutory term defined under the <i>National Parks and Wildlife Act 1974</i> as, ‘any deposit, object or material evidence (not being a handicraft made for sale) relating to the Aboriginal habitation of the area that comprises NSW, being habitation before or concurrent with (or both) the occupation of that area by persons of non-Aboriginal extraction, and includes Aboriginal remains’.
Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales	A series of guidelines developed by DECCW (now OEH) that prescribe the structure and content of certain Aboriginal Cultural Heritage Assessments and associated archaeological investigations/excavations. The Code of Practice applies to non-State Significant projects subject to Parts 4 and 5 of the <i>Environmental Planning and Assessment Act, 1979</i> .
Department of Environment, Climate Change and Water (DECCW)	Now known as the Office of Environment and Heritage (OEH).
Department of Planning and Industry	A NSW government department that, among other things, is the assessing authority for State Significant developments subject to Part 3A and 4 of the <i>Environmental Planning and Assessment Act 1979</i> . In such developments..
Director General’s Requirements (DGRs)	Project specific requirements of the Director General, Department of Planning (now the Department of Planning and Infrastructure (DPI) for State Significant development under Part 3A or 4 of the <i>EP& A Act</i> .
Due Diligence Code of	A series of guidelines developed by DECCW (now OEH). These

Practice for the Protection of Aboriginal Objects in New South Wales	guidelines prescribe the structure and content of a two stage process to determine whether Aboriginal objects and/or areas of archaeological interest are present within a subject area. The results of a due diligence assessment can find that an Aboriginal Cultural Heritage Assessment may be subsequently required.
Guidelines For Aboriginal Cultural Heritage Impact Assessment and Community Consultation , July 2005	Requirements for Aboriginal heritage assessments for projects subject to Part 3A of the <i>Environmental Planning and Assessment Act, 1979</i> . The Guidelines include site assessment and Aboriginal community consultation process and are now also used for Part 4 State Significant developmnts.
<i>National Parks and Wildlife Act 1974</i>	Legislation that protects Aboriginal cultural heritage in NSW. Part 6 of the Act outlines the protection afforded to and offences relating to disturbance of Aboriginal objects. The Act is administered by the OEH.
Office of Environment and Heritage (OEH)	Formerly the Department of Environment, Climate Change and Water (DECCW). A State government agency that manages and regulates Aboriginal cultural heritage under the <i>National Parks and Wildlife Act, 1974</i> .
Proponent	A corporate entity, Government agency or an individual in the private sector that proposes to undertake a development project.

ABBREVIATIONS

ACHA	Aboriginal Cultural Heritage Assessment
AHD	Australian Height Datum
AHIMS	Aboriginal Heritage Information Management System
AHMS	Archaeological and Heritage Management Solutions Pty Ltd
BP	Before present (AD 1950)
CHL	Commonwealth Heritage List
DCP	Development Control Plan
DECCW	Department of Environment, Climate Change and Water (now OEH)
DGRs	Director General's Requirements.
DP	Deposited Plan

DPI	Department of Planning and Industry
EP&A Act	Environmental Planning and Assessment Act 1979
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999
LALC	Local Aboriginal Land Council
LEP	Local Environmental Plan
LGA	Local Government Area
LTO	Land Titles Office
NHL	National Heritage List
NPW Act	National Parks and Wildlife Act 1974
OEH	Office of Environment and Heritage (formerly DECCW)
PAD	Potential Archaeological Deposit
PEA	Preliminary Environmental Assessment
SSD	State Significant Development

ACKNOWLEDGEMENTS

Glenda Chalker (Cubbitch Barta Native Title Claimants Aboriginal Corporation), Elwyn Brown and James Knight (Tharawal Local Aboriginal Land Council), Alan Williams, Fenella Atkinson and Michelle Lau (AHMS) and Julie Leslie (Business Latitude Australia).

EXECUTIVE SUMMARY

Carrington Care intends to rezone a 27 hectare parcel of land at 5 Smalls Road, Grasmere. Gateway Determination has been issued by the Department of Planning and Infrastructure which included the following conditions relating to Aboriginal heritage:

Council is to ensure that the Aboriginal Archaeological Survey and Assessment is updated and an assessment into potential additional heritage value of the land is undertaken prior to community consultation.

This assessment reports on:

- An account of the consultation undertaken with the Aboriginal community in assessing the nature, extent and significance of Aboriginal heritage within the subject area;
- Research on the Aboriginal cultural background, ethnography and history for the subject area;
- The landscape context inclusive of geology, soils, topography, vegetation, waterways and historical disturbance (analysed through historical aerial imagery) - all of which affect the likelihood of Aboriginal objects occurring in the subject area and whether or not they may be in disturbed contexts;
- The archaeological context, including the types of sites and artefacts that may be found in the subject area based on local and regional patterns;
- Summary of relevant previous studies undertaken in the area, particular a 2005 archaeological survey and assessment by AHMS which included the subject area;
- A generalised predictive statement about the likelihood of Aboriginal objects occurring within certain landscape contexts within the subject area;
- Additional survey focused on topsoil exposure areas which were searched for artefacts, measured and entered into a GIS-based system of artefact distribution modelling;
- Locations and technical descriptions of five artefacts located during survey, which in addition to the five found in 2005 allow a revision of the listed sites (one artefact concentration site CR4 and three isolated finds IF4, IF5 and the newly listed IF6);
- Consideration of the results of survey and artefact distribution modelling leading to the assessment that:
 - The area (around CR4) in close proximity to a section of drainage line likely to have held standing water for some time after rainfall contains most artefacts, has the highest archaeological significance as a site (within the subject area) in terms of research potential, is likely to be considered to have the greatest significance to the Aboriginal community, and should be prioritised in the consideration of potential avoidance of impact;
 - All other areas are likely to contain nil, dispersed or sparse occurrences of artefacts, and have relatively low archaeological significance
- Management recommendations that include that:

- The nature and extent of Aboriginal cultural heritage in the subject area should not be considered as a constraint to rezoning of the land;
- Concept planning and urban design should consider opportunities for the avoidance of harm in the area of the site CR4S;
- Subsequent development of other areas is likely to lead to some harm to Aboriginal objects and this will necessitate the proponent seeking one or more Aboriginal Heritage Impact Permits (AHIPs);
- A formal Aboriginal Cultural Heritage Assessment (ACHA) is required to accompany any application for an AHIP;
- Given remaining uncertainties about the subsurface distribution of artefacts, particular within the site CR4, test excavation will be required to advise the ACHA.

1 INTRODUCTION

1.1 PROPONENT DETAILS

This report has been prepared by Archaeological & Heritage Management Solutions (AHMS) for Carrington Care. The proponent intend to re-zone land at 5 Smalls Road, Grasmere, NSW (hereafter the 'subject area'; **Figure 1**) to permit seniors' housing, health services facilities and retail premises.

Table 1: Proponent details

Proponent	Archaeological Advisor
Carrington Care PO Box 269 Camden NSW 2570	Archaeological & Heritage Management Solutions Pty Ltd 349 Annandale Street, Annandale NSW 2038
Contact Person: Raad Richards T. 02 4659 0306 E: r-richards@carringtoncare.com.au	Contact Person: Oliver Brown T. 02 9555 4000 E: obrown@ahms.com.au

1.2 PURPOSE OF THE ASSESSMENT

This Preliminary Aboriginal Heritage Assessment serves two main purposes:

- To update the previous Aboriginal cultural heritage assessment covering the area that was prepared in 2005 by AHMS, as required by Gateway Determination (29 June 2012):
 - *'Council is to ensure that the Aboriginal Archaeological Survey and Assessment is updated and an assessment into potential additional heritage value of the land is undertaken prior to community consultation'*.
- To report on additional archaeological investigation developing an artefact distribution model that provides for potential future development to address possible needs for conservation, avoidance, minimisation or mitigation of harm to Aboriginal objects; and
- To develop the assessment framework into a format that can transition into a formal Aboriginal Cultural Heritage Assessment (ACHA) in the event of later requirements for an Aboriginal Heritage Impact Permit (AHIP);

- To provide information on the archaeological resource to the Aboriginal community as a part of a process to determine cultural values associated with either the heritage material or the locality.

The assessment and consequent advice is intended to ensure statutory compliance at both State and Commonwealth levels, in particular with the NSW *National Parks and Wildlife Act 1974* (NPW Act) and the following OEH guidelines, being:

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

1.3 SUBJECT AREA

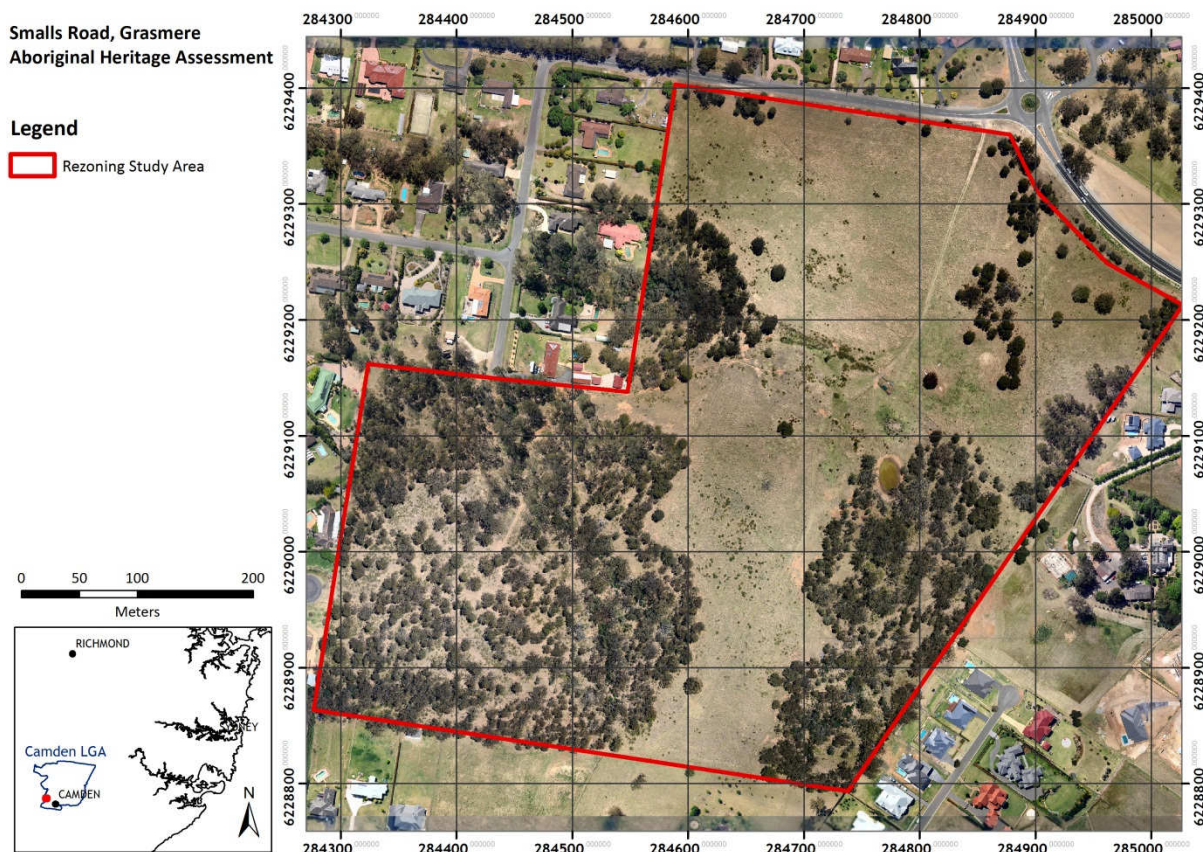


Figure 1: Aerial Image of the Study Area

The study area comprises a 27ha parcel of land in one lot (Lot 201 DP734620) bounded by Smalls Road on the northernmost boundary and Werombi on the northeast boundary (Figure 1).

1.4 REPORT OUTLINE

The principle aims of the preliminary assessment are to:

- Carry out background research to identify known Aboriginal objects, sites and places, and to identify the potential for any unknown objects and places of significance;
- Undertake informal Aboriginal Community Consultation in accordance with industry best practice (noting that this does not meet the full requirements of the OEH's Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010 for the purposes of AHIP application);
- Carry out an additional survey of the subject area to rediscover and assess known items, identify previously unrecorded items, and assess the Aboriginal archaeological potential of the subject area;
- Develop preliminary mapping of the known and potential Aboriginal cultural heritage sites in the subject area;
- Assess the archaeological (scientific) significance of any Aboriginal sites or objects that may be impacted by future proposed development;
- Present information to representatives of the Aboriginal community so that cultural values can be incorporated into the assessment and planning processes.
- Provide recommendations about further Aboriginal cultural heritage assessment requirements.

A summary of relevant legislation applying to the management of Aboriginal cultural heritage in NSW is provided in

Appendix 4: Legislation.

1.5 LIMITATIONS

This report is based on existing and publically available environmental and archaeological information, and basic archaeological survey of the subject area. It did not include any independent verification of the results or interpretations of externally sourced reports. This report includes some predictions about the probability of subsurface archaeological materials occurring in certain landforms/landscapes of the subject area. It is acknowledged, however, that sub-surface materials may survive in landform/landscape contexts despite indicators that may suggest that they do not. The converse also applies.

The Aboriginal Heritage Information Management System (AHIMS) information was provided to AHMS by OEH. Information in the archaeological assessment report reflects the scope and the accuracy of the AHIMS site data, which in some instances is limited.

1.6 INVESTIGATOR AND CONTRIBUTORS

This report was written by Oliver Brown (BA (Hons), MAACAI, Senior Archaeologist, AHMS). Further input has been provided by Fenella Atkinson and Michelle Lau (Archaeological Consultants, AHMS) and report review by Alan Williams (Senior Archaeologist, AHMS). Fieldwork was undertaken by Oliver Brown (AHMS), James Knight (TLALC), Glenda Chalker (CBNTCAC), and Fenella Atkinson (AHMS). Assistance with GIS mapping (slope analysis) was provided by Julie Leslie (Business Latitude Australia).

2 ABORIGINAL COMMUNITY CONSULTATION

Aboriginal community consultation is a fundamental aspect of Aboriginal cultural heritage management in NSW. OEH recognises that Aboriginal people are the principal determinants of the significance of their heritage. The minimum requirements for consultation with the Aboriginal community are set out in the OEH *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010*. These requirements are enforced through being subject to review in the event of an application for an Aboriginal Heritage Impact Permit (AHIP) and as a requirement for test excavation under the *Code of Practice for Archaeological Investigation of Aboriginal Objects in NSW*.

Due to the preliminary nature of the assessment process, and because no impacts are proposed through rezoning that may be subject to an AHIP, Aboriginal community consultation has been conducted on a preliminary basis for the current assessment. In advance of future likely development impacts, the proscribed consultation process has however been commenced as a parallel process. It is currently at the stage of registering interested parties and has led to the following groups being informed of the rezoning proposal and assessment process:

- Tharawal Local Aboriginal Land Council
- Cubbitch Barta Native Title Claimants Aboriginal Corporation
- Tocomwall
- Darug Land Observations
- Peter Falk
- Darug Tribal Aboriginal Corporation
- Gunjeewong Cultural Heritage Aboriginal Corporation
- Mygunyah Camden Aboriginal Residents Group
- Darug Aboriginal Cultural Heritage Assessments

For the purposes of additional survey, representatives of Tharawal Local Aboriginal Land Council (TLALC) and Cubbitch Barta Native Title Claimants Aboriginal Corporation (CBNTCAC) were engaged to take part. These groups were involved in the earlier 2005 assessment and are the two most widely consulted Aboriginal parties in the Camden local government area. Wider consultation will take part in the subsequent (and necessary) stage of developing a formal Aboriginal Cultural Heritage Assessment (ACHA) prior to any development being undertaken.

During the site visit with Glenda Chalker (CBNTCAC) and James Knight (TLALC) on 5th December 2012 (in addition to surveying) a discussion was held regarding the rezoning and the likely future needs of assessment and ongoing Aboriginal community consultation. No objections or issues were raised in relation to the rezoning of the subject site. It was generally accepted that the likely presence of Aboriginal objects within the subject area did not in itself preclude rezoning, but that ongoing involvement of the Aboriginal community will be essential in relation to any future development impact.

3 ETHNOGRAPHIC INFORMATION

3.1 TRADITIONAL OWNERS & CONTEMPORARY STAKEHOLDERS

The pre-1788 inhabitants of the study area are considered by some to be the Tharawal people - specifically the 'Cowpastures Tribe' also known as the Cubbitch Barta clan (Tindale 1974; Dallas & Watts 1997; Dallas *et al.* 2003). Other sources map the area as within Darug-speaking country (Mathews 1901; Capell 1970; Kohen 1993; Attenbrow 2002; Brown 2010). A further variant is provided by Ross (1988), who used historical accounts in mapping the area as Gundungurra. These uncertainties, as problematic as they are for the purposes of contemporary Aboriginal community engagement, will remain difficult to resolve, either by documentary research or by agreement between contemporary members and descendants of the different cultural groups.

Within the regulatory context of Aboriginal cultural heritage management and community consultation, the Office of Environment and Heritage allows that multiple and overlapping claims of traditional connection to the study area are valid - that is, from people of Tharawal, Darug and other descent - or at least are provisionally valid in the absence of an Aboriginal community-mediated resolution. This is based on the reasonable premise that it is for the Aboriginal community to determine who has the right to 'speak for country'; and the equally reasonable position that the absence of such a determination does not imply the absence of relevant stakeholders with whom to consult.

In addition to traditional owner groups, Local Aboriginal Land Councils also have statutory obligations under S52 (4) of the *Aboriginal Land Rights Act 1983*: "a) to take action to protect the culture and heritage of Aboriginal persons in the Council's area, subject to any other law, and; b) to promote awareness in the community of the culture and heritage of Aboriginal persons in the Council's area". Certain roles for Land Councils in the community consultation process are also specified in the OEH *Aboriginal Cultural Heritage Consultation Requirements for Proponents 2010*.

Land Council membership includes all Aboriginal people within the Land Council area whether or not they are traditional owners. Many people with traditional links elsewhere have developed strong historical associations with the area and consider traditional ownership only a part of a wider custodial responsibility in relation to shared Aboriginal cultural heritage. A Local Aboriginal Land Council, as representative of its members, also has an accountability to those who consider that contemporary ties to country should not be restricted by pre-invasion cultural geography (i.e. who feel they have an entitlement and/or obligation as an Aboriginal stakeholder in the area).

3.2 LOCAL ABORIGINAL HISTORY

The first European documentation of Aboriginal life in the southwest of Sydney in the areas of Camden and Campbelltown are taken to be two separate 1802 expeditions of Barralier (who passed through the area en route to the Southern Highlands) and Caley (who journeyed up the Georges River). These encountered an Aboriginal population which was already familiar with the European arrivals, their interactions with other Aboriginal people and their material goods (metal hatchets were already being heavily traded in the Aboriginal community). These were followed closely by determined pastoral settlement of the area coincident with a time of rising tensions between settlers and displaced Aboriginal people. Locally this is particularly marked by the 1826 Appin Massacre of fourteen Aboriginal men, women and children (Navin Officer 2002; Liston 1988).

At the same time, some settlers are recorded as having strongly opposed the violence towards Aboriginal people. Charles Throsby is reported to have sheltered wanted Aboriginal men and the Macarthurs set out land in 1818 on their 5,000 acre Camden Park estate for Aboriginal people with the intention that they could live there under their protection (Liston 1988). The subject area became incorporated into Camden Park through a second grant to Macarthur of 5,400 acres in 1825 (Wrigley 2001).

By 1827, Cunningham describes Aboriginal people 'toward the Hawkesbury and Cowpasture' as being significantly more integrated into the European-dominated pastoral economy than those around Sydney; although undoubtedly in reduced numbers (cited in Navin Officer 2002). In the winter of 1820, an influenza epidemic led to further population decline. Nonetheless, a range of sources refer to corroborees occurring at Camden Park in 1839, 1846 and 1850 and Denbigh in the 1850s (Liston 1988, Navin Officer 2002, GML 2012). During this period, with the subject area being within the Camden Park estate (expanded to 28,000 acres by the late 1830s), access to the subject area for Aboriginal people is likely to have continued, with the potential for some traditional land use.

Through the late 19th Century until today, the Aboriginal community have persisted through a mix of assimilation and migration (forced and voluntary), with limited ability for continued traditional connections to specific places. However, this needs to be seen in the context of a general shift in most parts of NSW whereby the nature of contemporary Aboriginal connection to country is less fixed to an immutable traditional law. Significance may be specially attached to more general concepts of the natural landscape, to places of significance in recent history (e.g. the Appin Massacre site) and/or to places with strong opportunities for reconnection to country, cultural continuity and renewal, or that may demonstrate (to the both the Aboriginal and non-Aboriginal community) issues of contemporary importance to Aboriginal people.

4 LANDSCAPE CONTEXT

4.1 LANDSCAPE CHARACTERISTICS

At a bioregional level, the study area is in the Cumberland subregion of the Sydney Bioregion (**Figure 2**). The Cumberland subregion, as distinct from surrounding sandstone landscapes in all directions, provides a landscape context within which the types and distribution of Aboriginal archaeological evidence follow generally consistent patterns (Brown 2010a). This is further discussed in **Section 5**.

The Cumberland subregion is characterised by the gently undulating Wianamatta shale-based landscape of western Sydney (NPWS 2003). The high erosional susceptibility of the shale typically leads to landscapes of generally low relief. The subject area, however, includes some relatively steep slopes indicating at least some underlying erosion resistant rock. This probably fine-grained sandstone that occurs within parts of the Wianamatta shale lithology.

The slope analysis prepared for the assessment shows relatively level to undulating land in the north and northeast of the subject area with significantly steeper land alongside drainage catchments in the southern and central parts (**Figure 2**). Additional factors contributing to the overall landscape assessment are also included in the following subsections.

4.2 GEOLOGY AND SOILS

The extent of the underlying Wianamatta Shale geology is mapped as the darker green area coded 'Rw' in **Figure 3**. This geology largely determines the extent of the Cumberland sub-bioregion due to the particular soils that derive from it and then the consequent suite of vegetation and fauna that those soils support.

The 1:100,000 Penrith and Wollongong Soil Landscape Series maps indicate that the study area lies entirely on the Blacktown Soil Landscape (Bannerman and Hazelton, 1990) (**Figure 4**). This is a duplex soil typically 10-40cm deep overlying heavy clay above shale. In most areas, soil deflation and erosion tends to expose rather than bury former land surfaces on which stone artefacts may occur (this is a contributing factor to the large number of artefacts recorded as surface finds on this soil type across western Sydney).

4.3 VEGETATION

The Cumberland subregion of the Sydney bioregion naturally supports grey box, forest red gum, narrow-leaved ironbark woodland with some spotted gum on the shale hills (NPWS 2003). Almost all of the subject area has been subject to land clearance at some stage. While there is currently significant regrowth in the southern half of the property, most of

these areas can be seen as cleared in either the 1956 or 1984 imagery (**Figure 7** and **Figure 8**) and are likely to have been completely cleared at some stage(s) in the preceding 180 years of agricultural use.

4.4 WATERWAYS

The subject area largely drains in a westerly direction via minor tributaries to Sickles Creek; which flows northwards to the Nepean (**Figure 5**). These drainage lines have small catchments, are steep and are generally unlikely to have held standing water for very long after rainfall, with the possible exception of one relatively short level section on the more northerly of the two drainage lines near to the western boundary (as marked in **Figure 6**). This of considerable significance in predicting the likelihood of past activities occurring that would have led to the accumulation of Aboriginal artefacts.

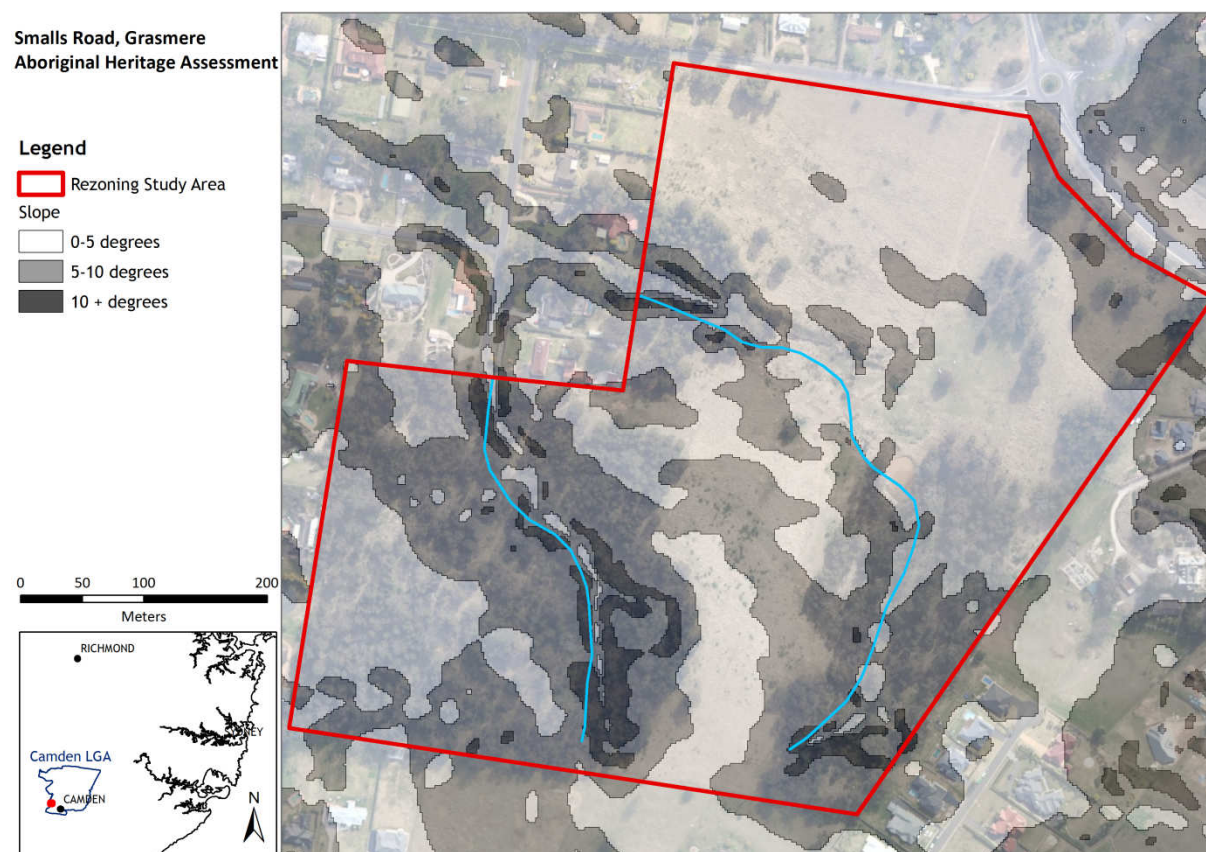


Figure 2: Slope analysis

Smalls Road, Grasmere
Aboriginal Heritage
Assessment

Legend

- ▲ Study Location
- Cumberland sub-Bioregion

0 5 10 20
Kilometers

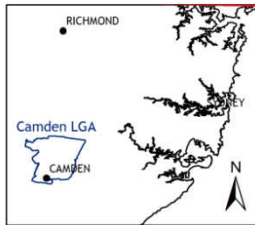


Figure 3: Geology

Smalls Road, Grasmere
Aboriginal Heritage
Assessment

Legend

- Rezoning Study Area

0 200 400 800 1,200
Meters

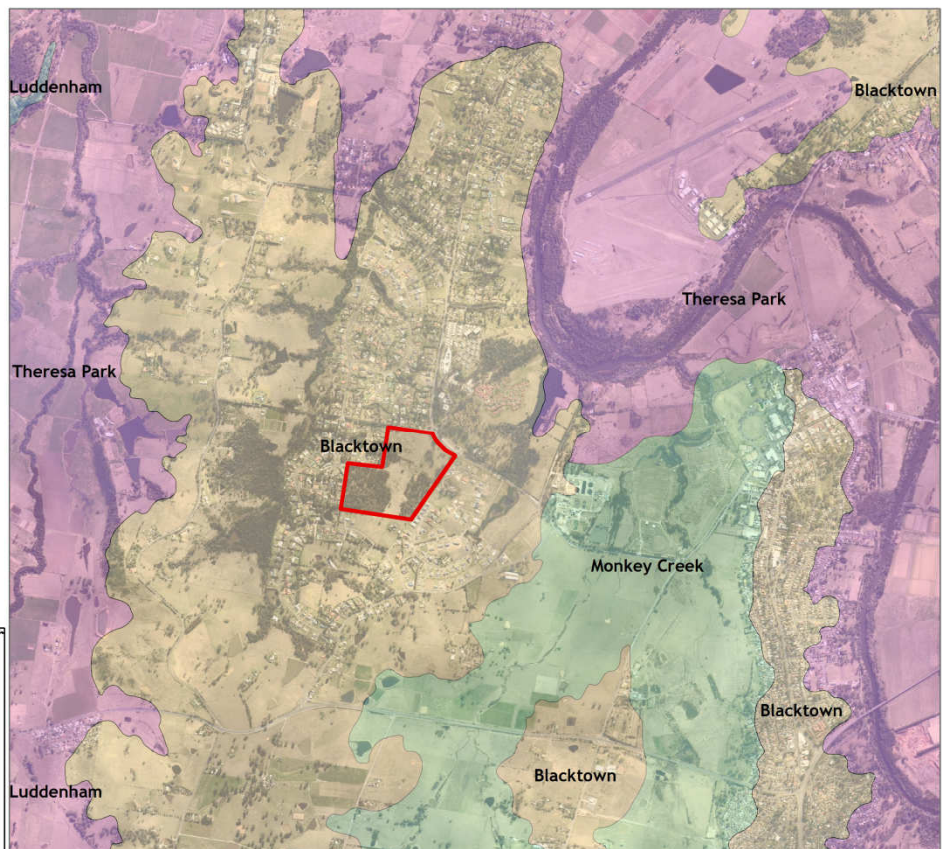
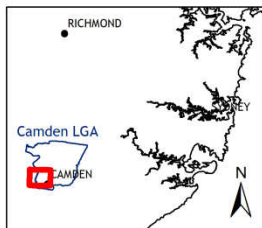


Figure 4: Soil Landscape mapping



Figure 5: Study Area drainage - west into Sickles Creek then north to the Nepean River

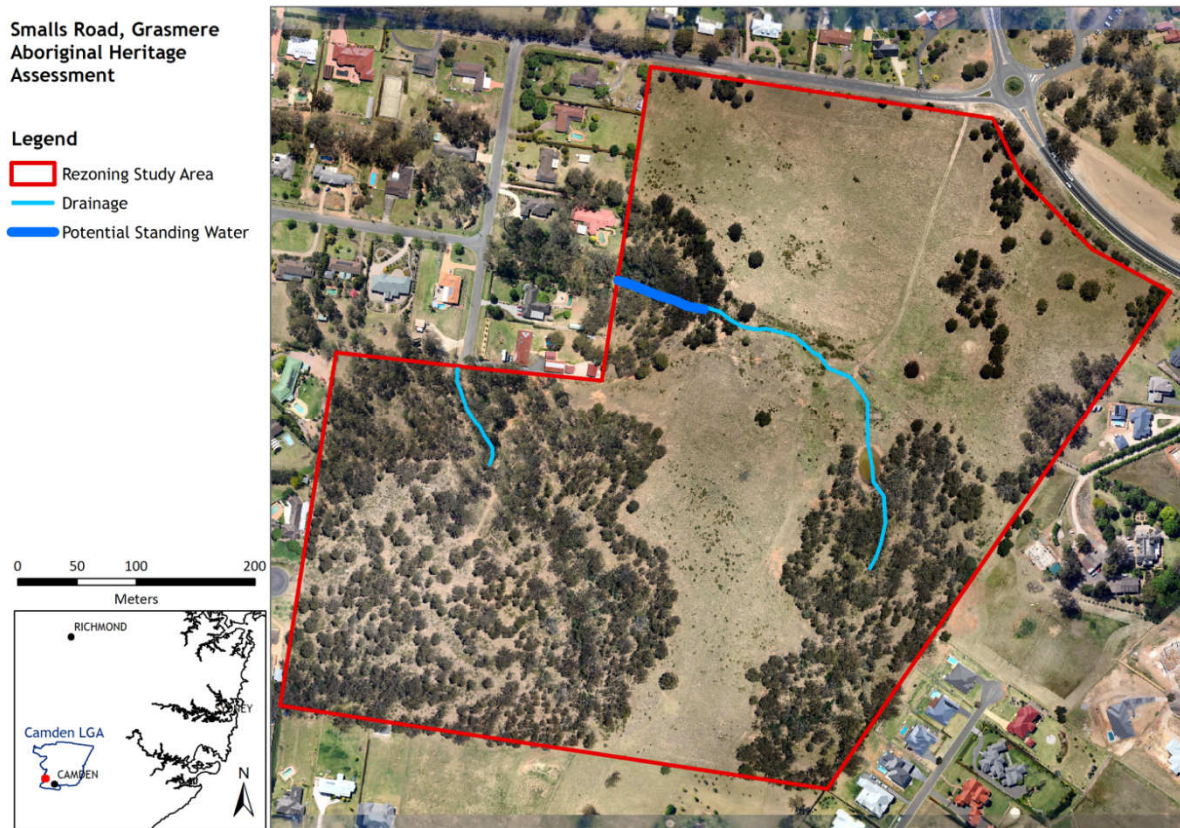


Figure 6: Section of creekline likely to have held reliable water

4.5 PREVIOUS LAND USE AND DISTURBANCE

Historic aerial imagery obtained for 1956 and 1984 (Figure 7 and Figure 8) show that the areas currently covered by native vegetation (trees) are almost entirely regrowth on land that has been previously cleared for grazing. In the course of nearly 200 years of pastoral use, including periods of drought and possible overgrazing, it is likely that topsoil has been exposed to erosion to some extent of across almost the entire subject area. As a whole, the landscape is probably technically erosional, in that topsoil loss is likely to have exceeded soil formation over the last 180 years. In general:

- Most parts of drainage lines (as mapped in Figure 6) have suffered some degree of gully erosion, some of it extensive; parts of which have subsequently been partly refilled with redeposited alluvium and colluvium.
- Areas of greater than 5 degrees slope will almost certainly have experienced some topsoil loss through either sheetwash or gradual soil deflation - this may have led to some downslope movement of artefacts (where they are present);
- Level and undulating areas will have experienced at least some soil deflation - this may have led to some exposure of artefacts and concentration in upper profile topsoil deposits ('lagging'; as opposed to downslope movement).

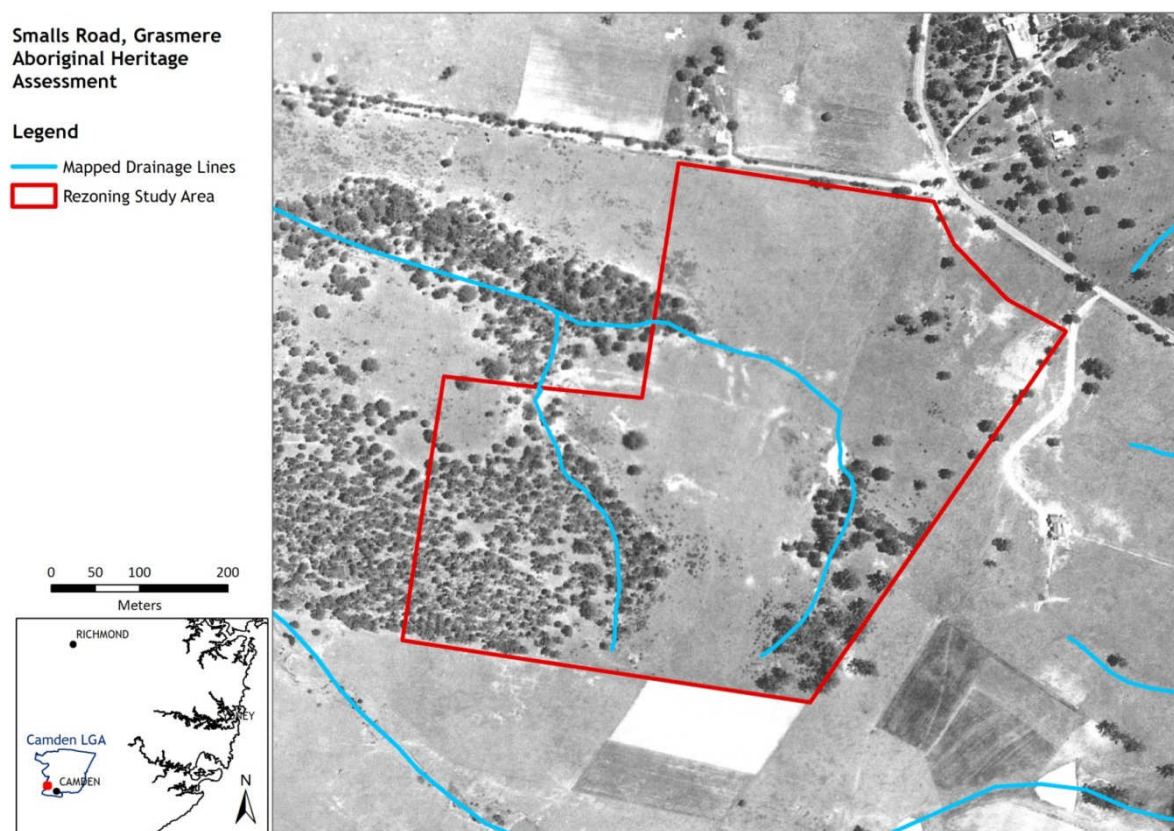


Figure 7: 1956 aerial imagery

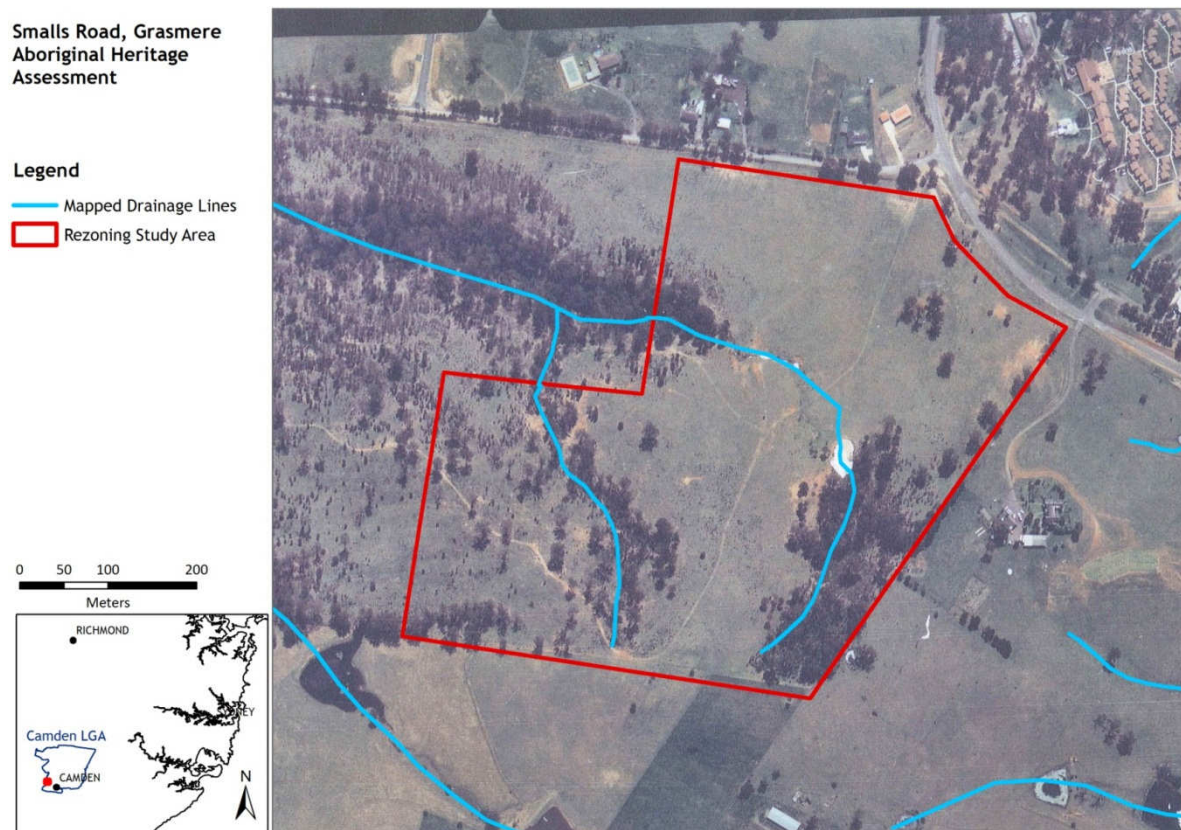


Figure 8: 1984 aerial imagery

The previous assessment by AHMS in 2005 provided an analysis of land disturbance using current vegetation as the main indicator (**Figure 9**). However, while land clearance is generally a valuable proxy for disturbance affecting the intactness of potential Aboriginal archaeological deposits (and is indeed a legislated definition for ‘disturbed land’ for the purposes of Aboriginal cultural heritage assessment through the *National Parks and Wildlife Regulation 2009*), it is not definitive in this case. Reference to earlier historical aerial imagery, shows the convergence of the 2005 mapping of low and moderate disturbance with land clearance to be considerably less precise (**Figure 10**) and little is known about the methods of land clearing employed through time on the subject land and therefore the degree of subsurface disturbance that the reduction in vegetation cover really indicates.

Because of this and on the basis of a review the historical imagery analysis and the 2005 disturbance mapping, a re-assessment of disturbance has been done (**Figure 11**). This separates the subject area into:

- High Disturbance: Areas of dam construction, serious gully erosion associated with land clearance and grazing, and parts of major scalds or tracks clearly visible as eroded in imagery separated by more than 20 years.
- Low-Moderate Disturbance: All other areas.

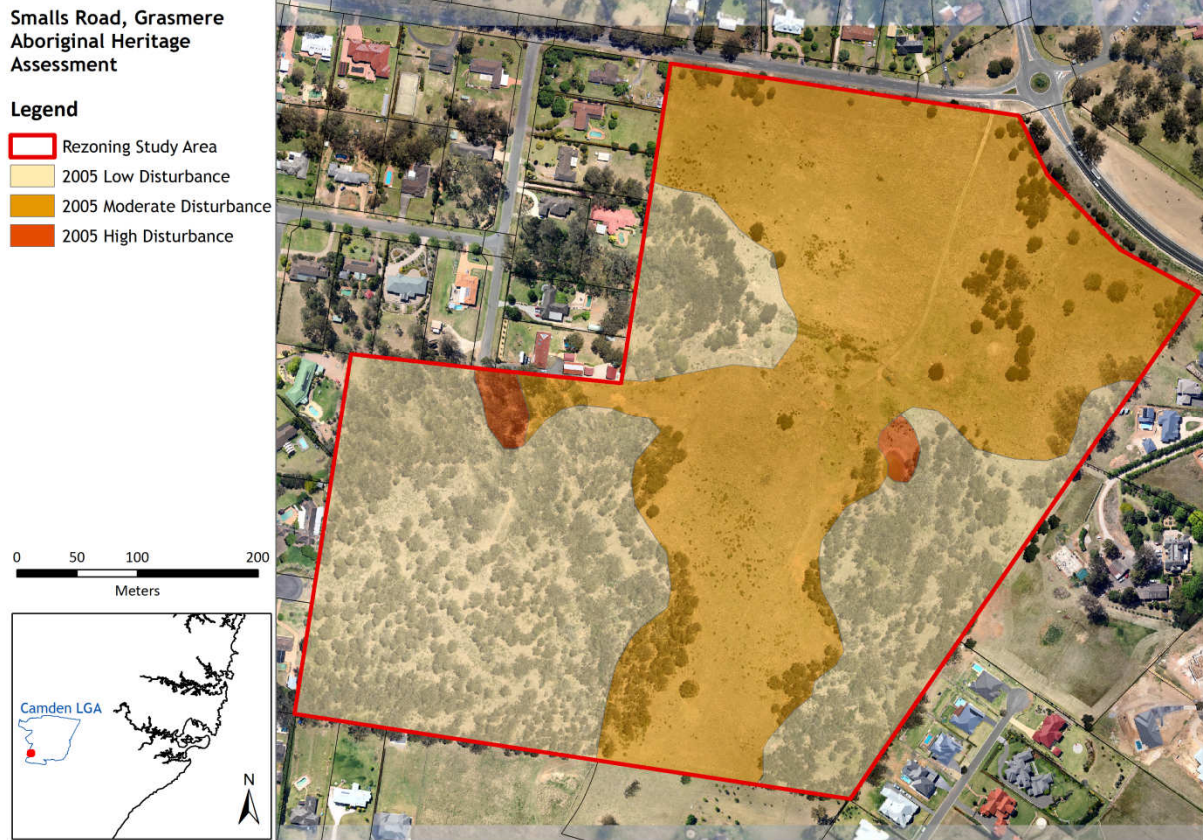


Figure 9: Disturbance as assessed in 2005 based on vegetation clearance

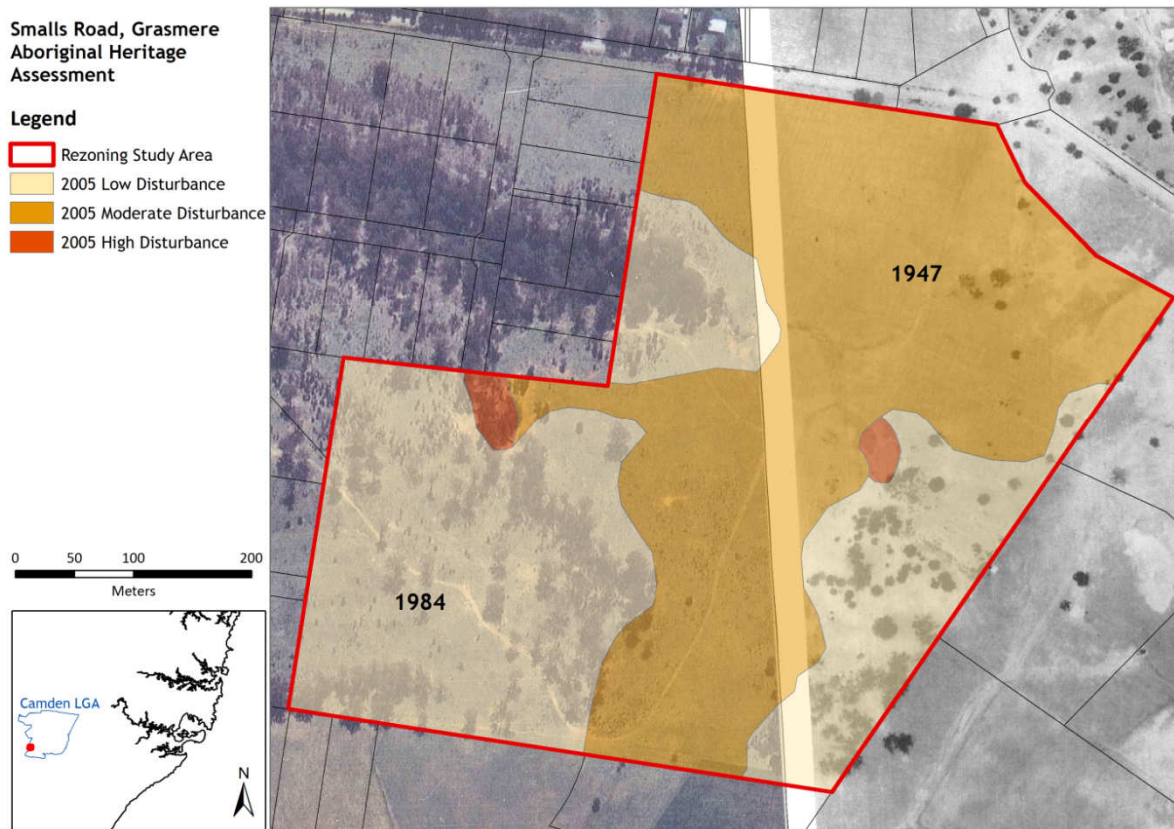


Figure 10: Disturbance assessed in 2005 against earlier aerial imagery

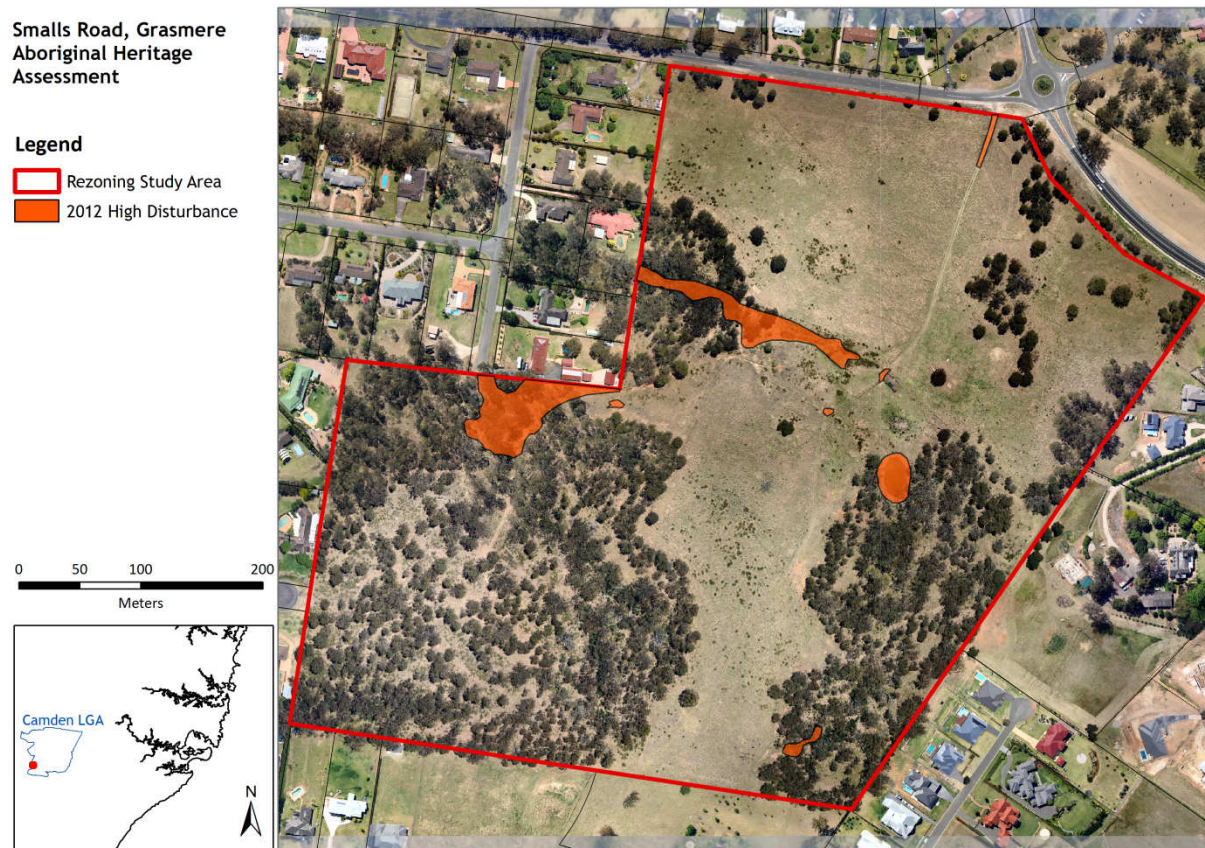


Figure 11: Reassessment of land disturbance

This assessment does not preclude other areas also being significantly disturbed, however surface evidence and aerial imagery is not enough to refine it much more at this stage. As a consequence, in the event of any future archaeological test or salvage excavation, methodology development should allow for generalised testing areas to be determined remotely, but then rely on some preliminary geomorphological analysis in the field to determine precise trench locations. Particularly in the area of Site CR4 (see **Figure 14**), this should include an assessment of both topsoil loss on adjacent land and alluvial aggradation in the drainage channel itself.

5 ARCHAEOLOGICAL CONTEXT

5.1 REGIONAL CONTEXT - SITE TYPES AND LOCATIONS

In terms of assessing and predicting the distribution and potential for harm to any Aboriginal Objects or Places (as defined in the NPW Act) within the subject area, Aboriginal cultural heritage investigation can be limited to an artefact distribution model because:

- Where drainage lines have incised down through shale to underlying sandstone geology, associated site types such as rockshelters, grinding grooves and rock art may occur in the Cumberland sub-bioregion; however this only occurs near to the margins with surrounding sandstone country areas and is not applicable for the current study area;
- Where remnant old growth vegetation remains, culturally modified trees may also occur; however the historical aerial imagery and field inspection indicate that no trees are present that would have been mature in the mid-1800s (when traditional bark use would have ceased (Long 2005, Attenbrow 2002));
- Burial sites typically do not occur in the region outside of sandy or rockshelter contexts; midden (or other faunal) deposits do not occur on Blacktown Soils on minor creeks; stone arrangements have not been recorded in Sydney shale country.
- There are no Aboriginal Places (locations nominated and listed as having special significance to the Aboriginal community) in or adjacent to the subject area.

Predictive modelling of the likelihood of Aboriginal archaeological sites occurring has been well developed for the Cumberland sub-bioregion due to the large number of studies associated with development in western Sydney over recent decades. In relation to stone artefact sites, these may be found as isolated occurrences ('isolated finds'), in concentrations marking the locality of heavily used 'activity areas' (previously referred to as 'open camp sites'), or may be predicted to occur as undetected subsurface deposits ('potential archaeological deposits' (PADs)).

Starting in the 1980s, Haglund (1980), Kohen (1986, 1993) and Smith (1989) analysed strong correlations between the location of artefact sites and proximity to water in western Sydney - i.e. the Cumberland sub-bioregion. These patterns have been further investigated and formalised into predictive 'models' such as McDonald's 'stream order model' (e.g. JMcDCHM 2005, White & McDonald 2011) and Baker's 'activity zones model' (Baker 1998, AMBS 2000). While more recent GIS-based models do provide for some statistical determination of site likelihood (e.g. Ridges 2010), predictive modelling more frequently involves a largely discursive consideration of a number of principles - the most significant being proximity to water.

The location of most archaeological sites is usually given as 200 metres or less within the Cumberland sub-bioregion - and this has become statutorily embodied through Office of

Environment and Heritage (OEH) guidelines. In a recent large scale study of the Hills Shire (northern Cumberland Plain) of a total of 219 sites with verifiable locations, 94% were within 200m of water and those that weren't were mostly isolated finds (Brown 2010b). Only one site was located more than 500m from mapped water (see Figure 12).

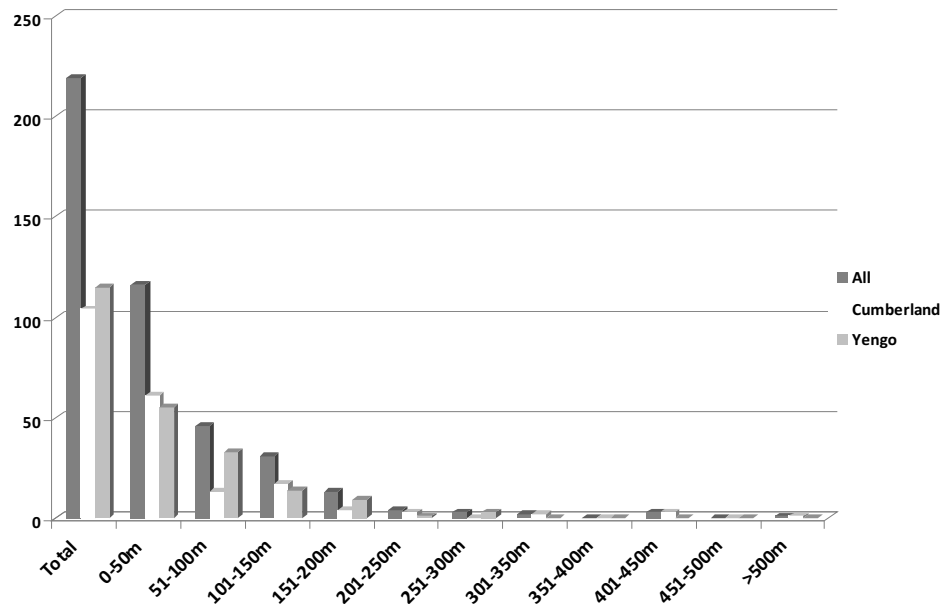


Figure 12: Site proximity to water in the comparable landform of the Hills Shire (Brown 2010b)

Other recent work by White and McDonald (2010) reviewing the large body of data from archaeological investigation of the Rouse Hill Development Area further refined the understanding of artefact location and proximity to water in relation to drainage of different stream order. For 1st order streams, they found that the correlation with proximity to water was relatively weak and essentially representative of a general low density background scatter. For 2nd order streams, the pattern of high density within 50m previously observed by some authors since the 1980s (see above) was confirmed; however for the larger 4th order streams density was found to be highest between 50m and 100m of water.

While it is obviously not improbable for an archaeological site to be located away from water, the predictive models developed for the Cumberland sub-bioregion clearly demonstrate that major activity areas, where stone tools were either manufactured or maintained, did essentially have nearby freshwater as a precondition for use. While Aboriginal people certainly used the entirety of the landscape, and in doing so would inevitably have left some artefactual evidence across it, this is considered to be a part of the ‘background scatter’ of artefacts that is theoretically present across most landscapes in Australia.

Predictive modelling as outlined above is done based on an initial assumption of a landscape undisturbed by development. Where development has essentially destroyed pre-European soil profiles, the statutory framework for heritage management tends to maintain that the Aboriginal objects in it are also destroyed. This applies to some parts of the subject area.

The sum of the information above provides a prediction for the subject area to most likely have a variable density artefact distribution; being sparse across much of the subject area but with higher densities likely near drainage lines. This provides the founding hypothesis used in the artefact distribution modelling process that is developed below in **Section 6** and is used as the basis for using landform zones based on proximity to drainage line in that modelling.

5.2 ACTIVITY ZONES

Archaeologists have established numerous ways of characterising those places where there is enough Aboriginal cultural material evidence for a place to be called a 'site'. Lewis Binford (1980:9-10) characterised the major types of hunter-gatherer sites as:

- 'Residential (home) bases' defined as "the hub of subsistence activities, the locus out of which foraging parties originate and where most processing, manufacturing, and maintenance activities take place"; and
- 'locations' defined as "a place where extractive tasks are exclusively carried out ... only limited quantities [of food and raw materials] are procured there during any one episode and therefore the site is occupied for only a very short period of time ... abandonment of tools is at a very low rate. In fact few if any tools may be expected to remain at such a site"

Among these 'locations' Binford also described sites relating to foraging activities such as hunting hides, overnight camps, butchery locations, raw material sources, etc., to cover the full range of landscape use of the foraging people he observed. An immediate flaw in Binford's basic classification above as applied to Australian contexts is the apparent confinement of lithic evidence to 'residential bases' - in most Australian landscapes, we consider that the majority of lithic concentrations are not best described as 'residential'.

Observing the Anbarra people in Arnhem Land, Meehan used the term 'dinnertime camp' for a site of day time use where gathered resources were promptly consumed near to where they were obtained and occasionally processed for removal (Meehan 1982). The use of 'dinnertime camp' as a term owes as much to Aboriginal use of English as it does to specific Aboriginal land use, and while attractive can nonetheless be misleading for a similar kind of daytime use where food was not consumed. Meehan herself has gone on to suggest that the term has been used beyond the concept that she intended (1988). Nonetheless, it remains useful for considering dispersed sites away from water where

people are most likely to have stopped in the course of their day's work with an inference that site accumulation resulted from multiple brief visits.

In analysing stone tool assemblages in western Sydney that were excavated on hill and ridge tops, Brown and others have noted some lithic sites as having some parallels to 'dinnertime camps' even though nothing about food use could ever be inferred with such sites (Brown et al. 2007a, 2007b). At the time these were likened to an archaeological signature of Aboriginal people out and about in their landscape 'at work' rather than the creekside sites with far higher densities of lithics that are the archaeological signature of people 'at home' (e.g. JMcDCHM 2005). In relation to the continuum of lithic site types in western Sydney from tool manufacture sites with up to a thousand flaked pieces per square metre down to the single artefact isolated find, Sydney lithic analyst Beth White has questioned the use of terms like 'domestic' at all (pers. comm.). At the simplest level, tool manufacture producing thousands of sharp stone shards and 'domestic' use inclusive of activities like children's play would not seem mutually conducive, and yet archaeologists remain tempted to classify any areas of high lithic density as domestic camps. Indeed the Aboriginal Heritage Information Management System (AHIMS) database, on which the recording of an archaeological site is a legal obligation in NSW, previously required that we describe any site with more than one stone artefact outside of a rockshelter be described as an 'open camp site'.

On the basis of work at Mungerie Park in western Sydney, Baker has proposed a system for characterising sites according to an 'activity zone model' in relation to proximity to a freshwater creek in the western Cumberland Plain (AMBS 2000; Baker 1998). Although this was largely intended for use in relation to predicting the likelihood of sites occurring, there are inferences that follow from the varying density of lithic material that provides for assumptions to also be made about site use. Baker's zones were:

- "Complex zone" within a couple of hundred metres of the creek contains overlapping knapping floors and high densities of lithics. Representing sites with repeated use, these may also be stratified.
- "Dispersed zone" with discrete artefact concentrations typically further from streams representing occasional use away from the major foci of occupation or resource use areas.
- "Sparse zone" with consistently low density artefact distribution.

The classification system used here is based largely on Baker's model in terms of lithic characteristics (Table 2). However, it also adopts the likely site use terms discussed above by Binford (1980) and Meehan (1982, 1988) as well as considerations provided by Attenbrow (2002, 2003). A deliberate aspect of this combination is that it uses terms that are specifically not suggestive of any human behaviour other than that which is certain to have occurred. Therefore, words like 'domestic', 'camp' and 'residential' are largely rejected so that inferences about sites are not made before they have been properly understood.

Table 2: Site Classification System used in this assessment

Complex Lithic Site	A site in which dedicated stone tool manufacture and maintenance was among the range of activities undertaken. The stone tool working will have led to areas with high densities of lithics and some representation of the earlier stages of lithic reduction. With likely repeated use over long periods, such sites may also be stratified. Accepting that such debitage densities may not be compatible with some residential activities such as sleeping and children's play, an apparent centre to a complex lithic site may actually mark an area marginal to most of the activity that may have occurred more generally (which can sometimes be used to explain why peak artefact densities may not occur in the areas of greatest amenity)
Dispersed Lithic Site	A concentration of lithic material away from a site likely to have been a residential base and representing a range of lithic reduction evidence generally focused away from initial manufacture, other than small tool manufacture from small portable cores, and more on later stages such as tool maintenance/curation, discard of unwanted material and occasional loss of functioning tools.
Sparse Lithic Site	Anything from a single isolated find to a low density occurrence of lithics (often recorded as 'isolated finds') considered to be part of the 'background scatter' of lithics generally accepted to be across most landscapes. The circumstances of deposition - in the sense of a site use - will almost invariably remain unknown.

5.3 REGIONAL CONTEXT - ARTEFACT TYPES

Aboriginal stone artefacts are an important source of archaeological information because stone is effectively preserved indefinitely whereas organic materials such as bone, shell, wood and plant fibres decay. Stone artefacts provide valuable information about technology, economy, cultural change through time and settlement patterning. Stone has also been used for 'relative' dating of sites where direct methods such as radiocarbon dating cannot be applied. A technological sequence for stone artefacts for the region was first described in the late 1940s by Fred McCarthy and has since been refined by various authors. Currently, the most widely accepted typological sequence is known as the 'Eastern Regional Sequence' (Hiscock & Attenbrow, 1998; 2002). The ERS phases are as follows:

- The **Capertian** phase generally dates to before 5,000 years BP and is distinguished by large uniface pebble tools, core tools, horsehoof cores, scrapers and hammerstones. Backed artefacts are occasionally present.
- In the **Early Bondaian** phase, generally dated from 5000 BP to 2800 years BP, aspects of the Capertian assemblage continue, but backed artefacts and ground-edged artefacts increase. Artefacts during this period were predominantly made from fine-grained siliceous stone such as silcrete and tuff.
- The **Middle Bondaian** phase is generally dated from 2800 - 1600 BP and is characterised by backed artefacts and ground-edged artefacts. Artefact raw

material continues to be dominated by fine grained siliceous rocks, however quartz becomes more frequent.

- The **Late Bondaian**, generally dated from 1600 BP to European arrival is characterised by an increase in bipolar technology, eloueras, ground-edged artefacts, and bone and shell artefacts. The relative amount of quartz artefacts generally increases.

5.4 AHIMS SEARCH RESULTS

A search of the Aboriginal Heritage Information Management System (AHIMS) database, maintained by OEH, was carried out on 7th January 2013 (AHIMS Search #83515). In a 10km x 10km search area, this identified 53 sites, being: 40 artefact sites (75%), 9 potential archaeological deposits (PADs) (17%) where artefacts have predicted to occur, and 4 potential scarred trees (8%) (

and **Figure 13**). These include 8 artefact sites (3 artefact concentrations and 5 isolated finds) recorded on Carrington Care land in 2005 by AHMS; of which 1 artefact concentration and 2 isolated finds are within the current subject area (**Figure 14**).

Smalls Road, Grasmere
Aboriginal Heritage
Assessment

Legend

- Rezoning Study Area
- CamdenAHIMSArea
- ▲ AHIMS Listed Sites
- ▲ AHMS 2005 Recorded Sites

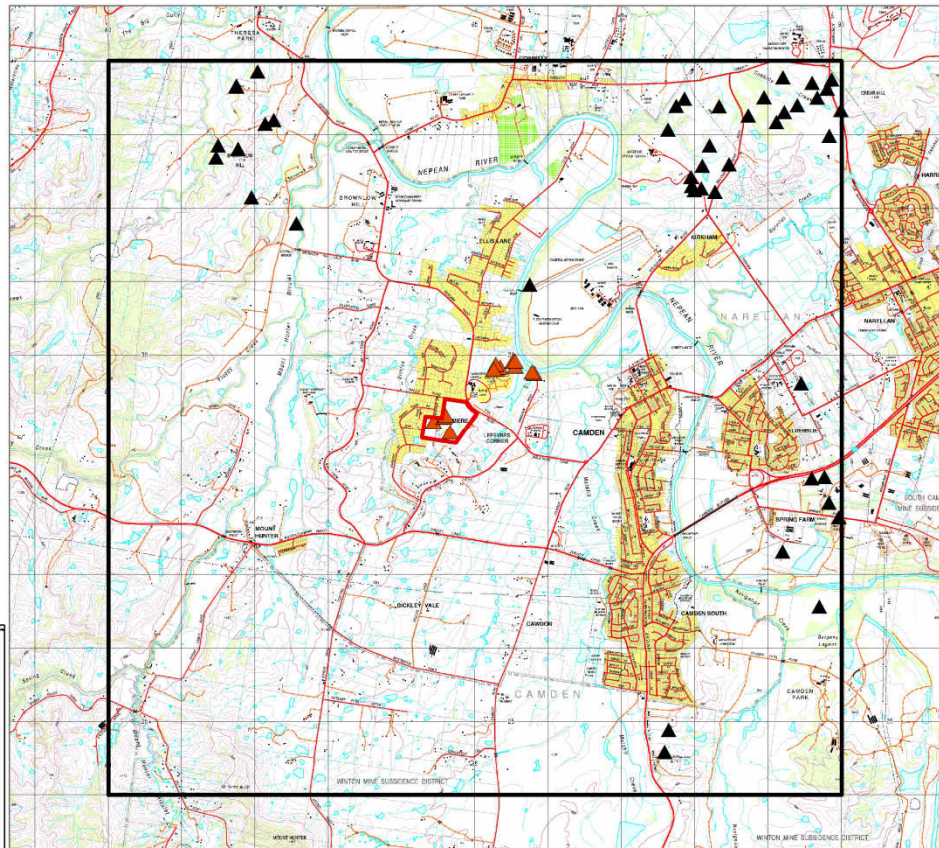
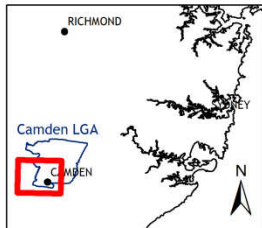
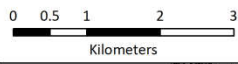


Figure 13: Distribution of AHIMS registered sites

Table 3: Summary of AHIMS registered sites

Artefact - AFT	Potential Archaeological Deposit - PAD	Modified Tree (Carved or Scarred) - TRE
40	9	4

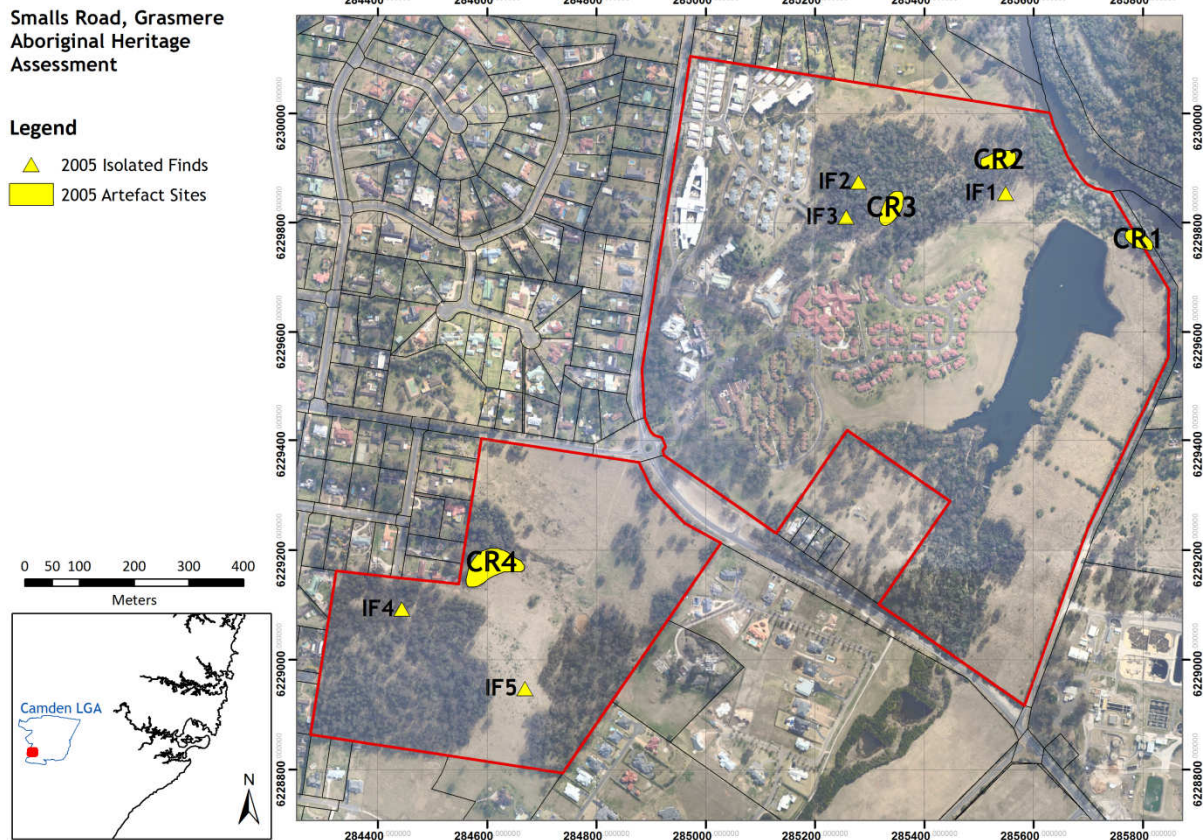


Figure 14: Distribution of known sites within Carrington Care land

5.5 LOCAL STUDIES

AHMS 2005

The key preceding local study was the 2005 assessment of land owned by Carrington Care undertaken by AHMS, the extent of which is shown in Figure 14. Of the four identified artefact ‘sites’ and 5 additional isolated finds, the most significant concentration was associated with a ridgeway spur extending to the bank of the Nepean River (CR2, CR3, IF1, IF2, IF3). An additional artefact concentration was located in the vicinity of a minor drainage line (creek) confluence with the river (CR1), however the area has been disturbed by the damming of that creek to form a small artificial lake.

Within the current subject area, the site CR4 was identified on the basis of 3 flaked stone artefacts in a relatively level area adjacent to a minor creekline. Two additional isolated finds were located in relatively disturbed / eroded areas.

AMBS 2009

In 2009 AMBS undertook artefact recording that included the ‘SW01 Artefact Scatter’ and at Sharpes Weir, just under 1km NNW from the subject area on the banks of the Nepean River (see Figure 13). Three previously recorded artefacts were relocated and recorded

along with six additional artefacts; all of which were then relocated away from proposed access track upgrading.

Kayandel 2009

In 2009 Kayandel Archaeological Services undertook an Aboriginal Cultural Heritage and Archaeological Assessment of Lots 1 and 3 DP863591, indicated by the cluster of registered sites to the northwest of the subject area in **Figure 13**. Their survey identified three artefact scatters and five isolated finds but considered the archaeological potential of the study area to be low to moderate.

5.6 SUMMARY

The review of regional and local archaeology context suggests that the subject area is likely to have an Aboriginal cultural heritage record:

- That is dominated by surface and subsurface occurrences of flaked stone artefacts;
- With a distribution that is likely to conform to regional distribution patterns, in which occurrences are most likely to occur:
 - As complex concentrations in proximity to drainage lines, especially on level land adjacent to the Nepean River and streams that may have held semi-regular standing water (in pre-1788 hydrology);
 - As dispersed concentrations on smaller 1st order streams and on prominent hilltops and ridgelines; and
 - Sparsely across almost any part of the landscape, typically as isolated finds or very low density occurrences.

6 SITE INSPECTION

6.1 AIMS AND FRAMEWORK

The aims of the field survey were: To re-examine the previously located sites (AHMS 2005) (accepting that the surface visibility was likely to be different seven years later); search for any additional artefact material; and conduct exposure-based survey according to a methodology (outlined below) designed to enable artefact distribution modelling for the subject area.

For the purposes of the exposure-based artefact distribution modelling, the subject area has been divided into 5 landform zones (Figure 15). These are intended to be applicable as land units for the purposes of archaeological assessment in which artefact distribution characteristics are predicted to be generally consistent. The zones are also intended to provide a framework for subsequent management of heritage - although it should be accepted that further artefact distribution modelling may change the boundaries of these where test excavation may prove a different delineation to have a geostatistically more significant fit.

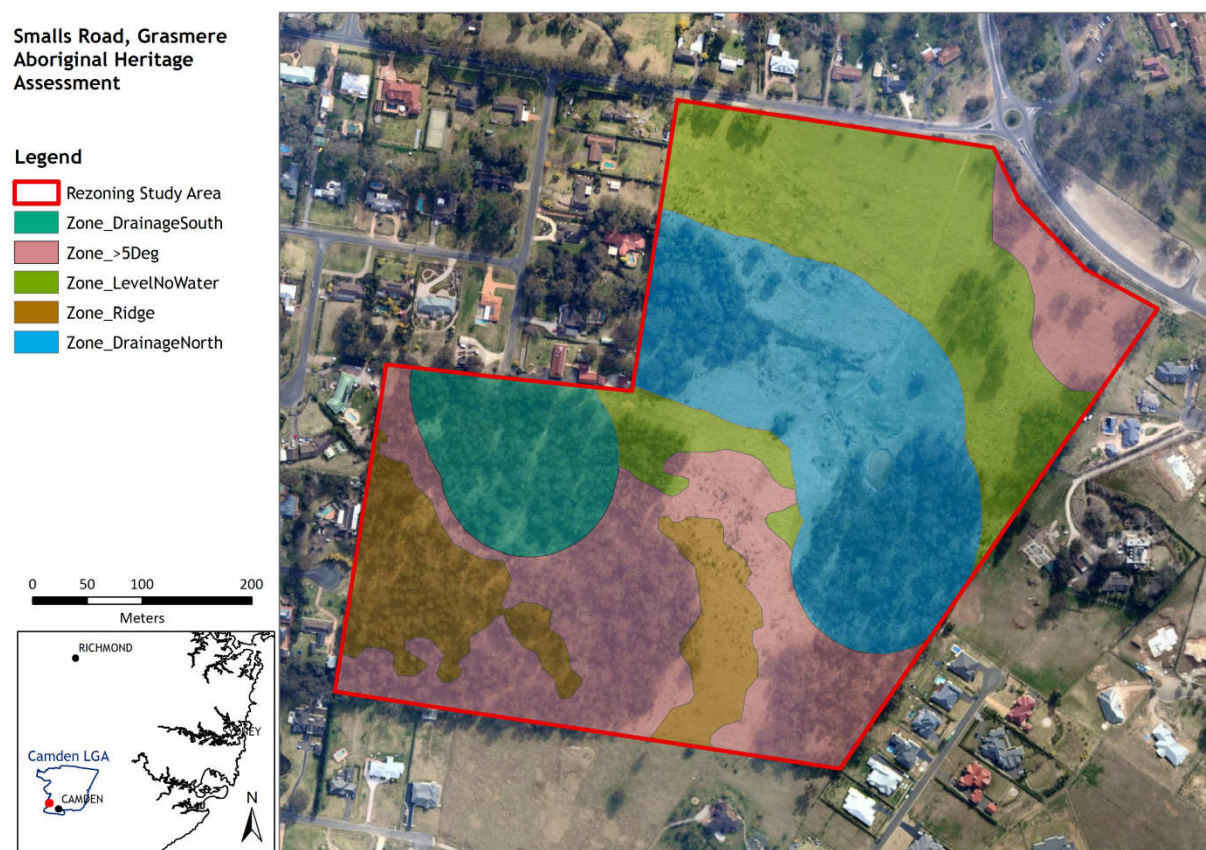


Figure 15: Separation of Subject Area into 6 Landform Zones

6.2 METHODS

Fieldwork was undertaken by Oliver Brown (AHMS), James Knight (TLALC), Glenda Chalker (CBNTCAC), and Fenella Atkinson (AHMS) on 5th December 2012. Due to the almost complete vegetation ground cover across the subject area, pedestrian survey sampling focused on detailed survey of areas of topsoil and subsoil exposure and a general attempt to locate exposure areas across a range of landform units for the purposes of addressing the landform zone-based artefact distribution modelling.

Figure 16 maps the survey route (recorded by GPS) undertaken by Oliver Brown (AHMS) of approximately 7km. Similar distances were also covered by Glenda Chalker (CBNTCAC) and James Knight (TLALC). Additional survey by Fenella Atkinson (AHMS) comprised approximately 3km.

6.2.1 RATIONALE FOR EXPOSURE SURVEY METHODS

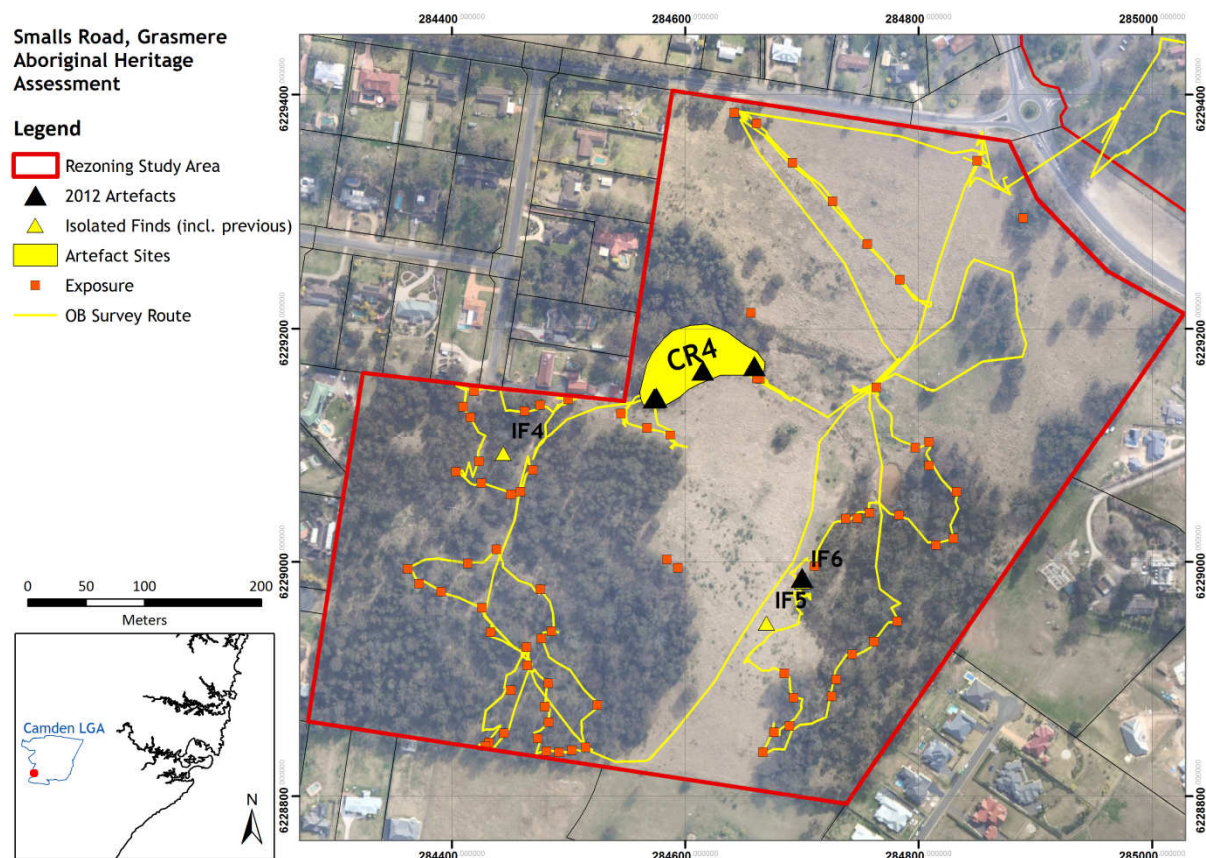
Archaeological surveys of grazing land are frequently heavily constrained by the almost complete coverage of soil deposits by groundcover. In response to this AHMS has been developing exposure-based survey methods that record exposure areas in detail and apply the resulting data in GIS-based artefact distribution modelling (e.g. AHMS 2012). Results elsewhere have so far suggested this model is useful in conditions of low ground surface visibility. For example at a field survey undertaken near Albury in 2012 the method provided an equal or greater efficacy in detecting artefacts with 15-20% of the survey effort when compared to regularly spaced linear survey transects. As such, it is a methodology ideally suited to the surveying constraints of preliminary archaeological assessment.

By treating each exposure as a discrete sampling unit within a larger defined landform zone, compiled data can be used to refine initial desktop-based predictive modelling into a more detailed landform zone-based artefact distribution model. Because the contributing data are quantified in detail, a degree of demonstrable confidence can be applied to how accurately it can be considered to reflect actual distribution and therefore how reliably it can be used to advise heritage management planning in a development context of potential impact. For the purposes of methodological peer and consent authority review, the exposure survey method employed also provides the precise survey coverage data required for archaeological investigation based on OEH Codes.

The data applied to the artefact distribution model is preliminary at this stage, but is structured so that it can be added to and further refined. In particular, the results of test excavation (that may be required prior to potential future development) can be integrated into the same modelling framework and refine it rather than replace it.

6.3 RESULTS

Five flaked stone artefacts were located during the survey, all within surveyed exposures. Four of these artefacts were within the area of the previously described site CR4. The location of these artefacts leads to an extension of the described extent of CR4 and increase in the number of recorded artefacts in the site from three to seven. One additional isolated find was located on an area of significant erosion between a ridge and the eastern drainage line - this artefact may not be *in situ*, but rather may have been subject to downslope movement. It has been listed as an additional isolated find record with the Aboriginal Heritage Information Management Service (AHIMS) as 'IF6'. The previously located isolated finds, IF4 and IF5, were not relocated despite intensive survey effort in these areas.



78 exposures were recorded with an effective area of full surface visibility of 1191m². When these results are compiled by landform zone, artefact distribution can be seen to be clearly focused on the area around the previously described 'CR4'. As detailed further in the discussion below, these results:

- Allow a confirmation that artefact distribution is expected to be consistent with regional patterns; and

- Provide demonstration, through detailed quantification of survey effort by square metre of exposure, that the concentration of artefacts in the site CR4 is a genuine artefact distribution character and not compromised by survey effort bias in that area;

Table 4: Exposure survey statistics by landform zone

	Zone	Area (m2)	Artefacts	Aft/m2	Aft/ha
This Study (excluding 2005 data)	>5deg	160	0	0	0
	LNW	225	0	0	0
	Ridge	103	0	0	0
	DrainNth	477	5	0.01048	104.82
	DrainSth	226	0	0	0

	Zone	Area (m2)	Artefacts	Aft/m2	Aft/ha
All Data (including 2005 data)	>5deg	160	1	0.00625	62.5
	LNW	225	0	0	0.0
	Ridge	103	0	0	0.0
	DrainNth	477	8	0.01677	167.7
	DrainSth	226	1	0.00442	44.2

6.4 DISCUSSION

The combined results of the 2005 and current assessments allow a strong baseline artefact distribution model to be outlined. Using the Landform Zones developed for the study (Figure 15) and the results of the current assessment either alone or combined with the 2005 results, a clear focus on the northern drainage line is indicated (Figure 17 and Figure 18 - colour shading indicative only, refer to Table 4 for detail). It is important to stress that rather than simply being an apparent concentration when ‘eyeballed’ on a map and not qualified by effective survey coverage, the artefact distribution modelling above demonstrates the concentration of artefacts is a genuine representation of artefacts per area of surveyed exposure.

The single artefact located in 2005 in the ‘>5°Slope’ zone (IF5), which generates a significant result in terms of artefacts per m² of exposure, deserves some special explanation. This artefact may have been subject to downslope movement from the ridgeline. Similarly however, this may also be true of the nearby artefact from the current assessment (IF6). Within the context of both of these artefacts also representing a low sample size, a less specific generalisation for all areas >80m from water may be more accurate - as presented in Table 5.

Smalls Road, Grasmere
Aboriginal Heritage
Assessment

Legend

- Rezoning Study Area
- Potential Standing Water
- Drainage
- Zone_DrainageNorth
- Exposure
- ▲ Artefact

0 50 100 200
Meters

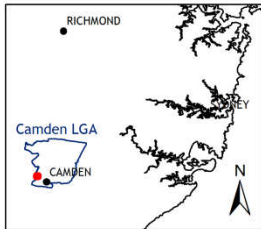


Figure 17: Artefact distribution modelling results (this study only)

Smalls Road, Grasmere
Aboriginal Heritage
Assessment

Legend

- Rezoning Study Area
- ▲ 2012 Artefacts
- ▲ 2005 Artefacts
- CR4 Extent
- Potential Standing Water
- Drainage
- Zone_DrainageNorth

0 50 100 200
Meters

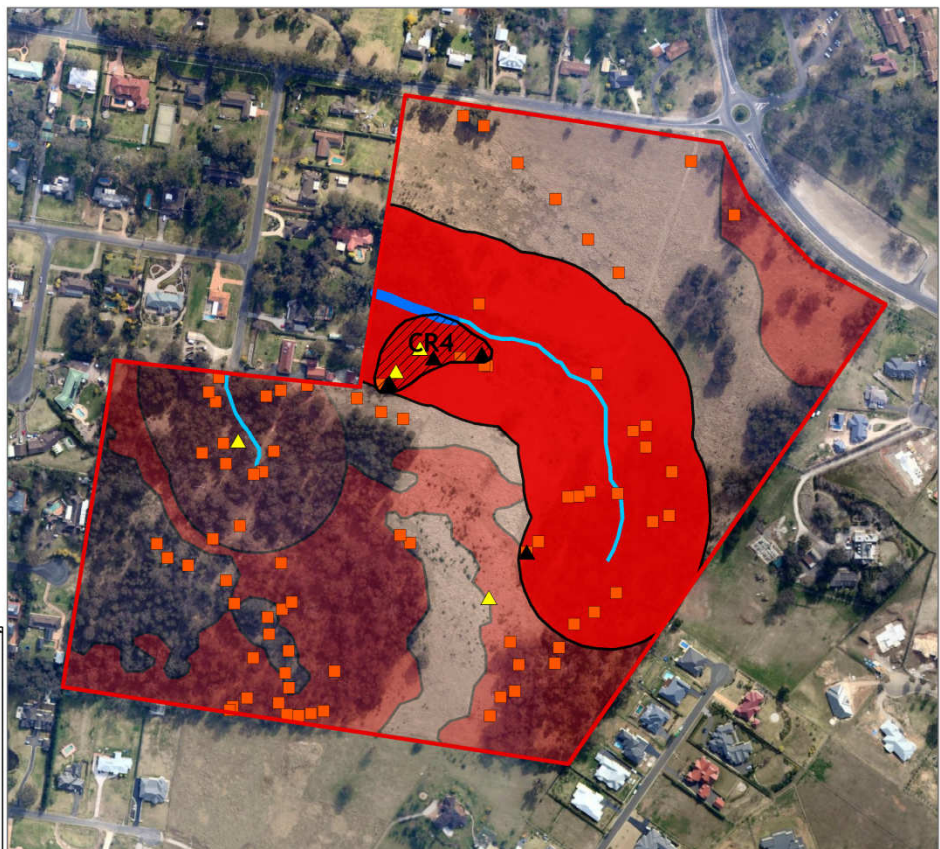
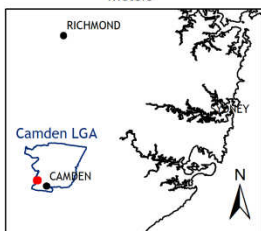


Figure 18: Artefact distribution modelling results (2005 and this study)

Table 5: Three zone artefact distribution statistics

Zone	Area (m ²)	Artefacts	Aft/m2	Aft/ha
<80m WaterNorth	477	8	0.01677	167.7
<80m WaterSouth	226	1	0.00442	44.2
>80mWater	488	1	0.00205	20.5

The concentration of artefacts in the vicinity of the previously described site CR4 has been strongly confirmed by the further investigation. It is also notable that this is within the level area in proximity to that part of the drainage line considered likely to have held standing water for some period after rainfall. Creating a zone that buffers a distance of 80m from the part of the creekline likely to have held standing water at some time, and comparing it against data for all other areas combined: 151 m² of exposure were surveyed in this area and 1040m² in all other areas; and the density of artefacts in this area was recorded as 27.5 times greater than all other parts of the subject area combined (Table 6). This is based only on the recently recorded artefacts (because the 2005 records do not have suitable exposure data for inclusion), but would be a comparable 24x density including the 2005 artefact records without any additional exposure information.

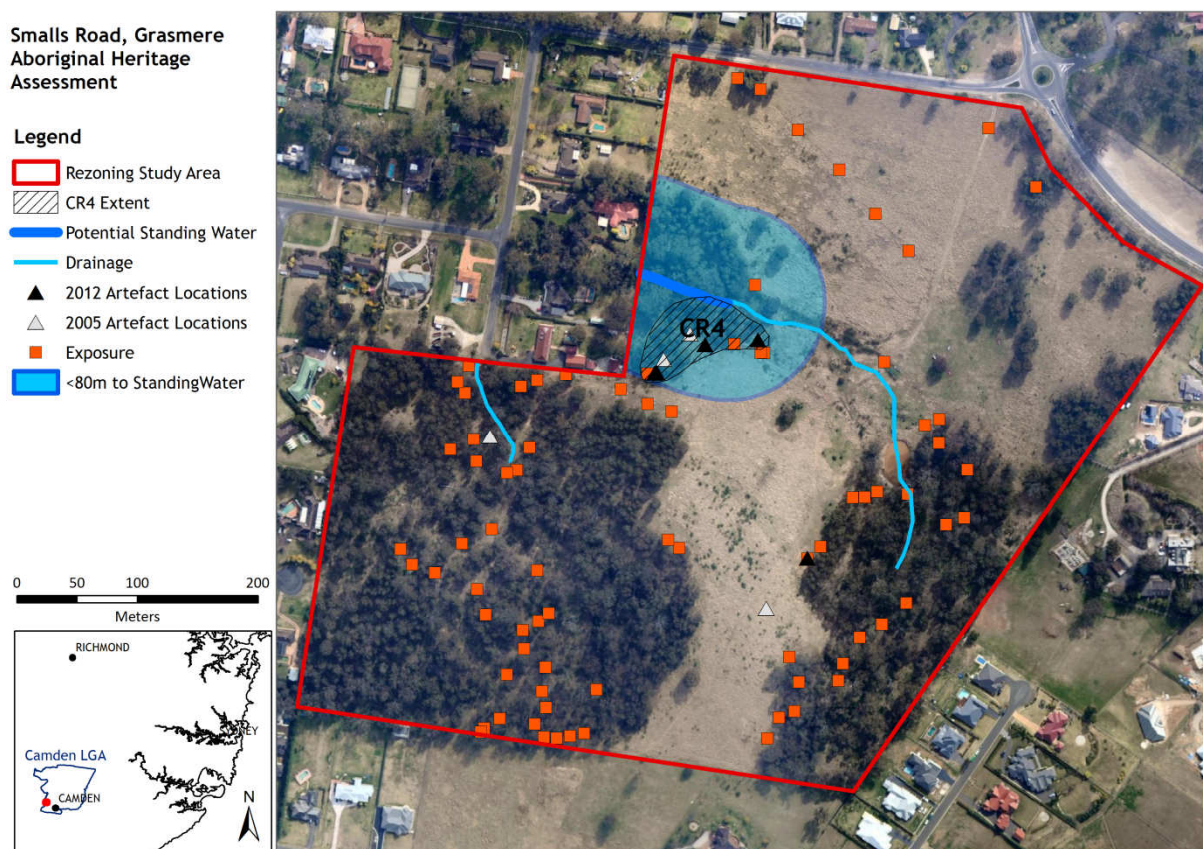


Figure 19: Artefact distribution modelling <80m of potential standing water area

Table 6: Artefact distribution statistics - 80m to standing water

Zone	Area	Artefacts	Aft/m2	Aft/ha
80m within potential standing water	151	4	0.0265	265
All other areas	1040	1	0.0010	10

A generalised prediction using regional distribution patterns (as presented in Section 5) would suggest expected artefact densities in decreasing order as:

- A significant site known to be present and highly likely to be ‘complex’ (as defined in Section 5.2) within zone ‘Drainage North’, particularly that part of it within 80m of the section assessed as being likely to have held standing water after rainfall;
- Moderately likely to unlikely and ‘dispersed’ or ‘sparse’ (as defined in Section 5.2) in all other Landform Zones.

7 CONCLUSIONS AND RECOMMENDATIONS

7.1 THE ARCHAEOLOGICAL RESOURCE AND SIGNIFICANCE

The Aboriginal cultural heritage resource of the subject area is confined to flaked stone artefacts in terms of material heritage. It remains that intangible values may also be identified by Aboriginal parties. The former sets the context for determining potential archaeological (scientific) significance; while both tangible and intangible values may factor into the significance determined by the Aboriginal community.

The density of artefacts has been discussed in preceding sections. The sheer number of artefacts is however not the sole contributor to their archaeological significance. This is instead considered in terms of rareness, representativeness and the ability to address timely and significant research questions (*sensu* Bowdler 1981). Significance considerations for each landform zone are presented below and summarised in **Table 7**.

Within 80m of the northern drainage line: This area has the highest predicted and recorded density of artefacts, particular surrounding CR4 and other areas within 80m of the part of the drainage line assessed as likely to have held standing water for some time following rainfall. While some parts of this area are considered to be heavily disturbed by gully erosion and reposition of eroded material (alluvium and colluvium) from above, intact assemblages are likely to occur in some areas. Complex (as defined in **Section 5.2**) sites may occur showing intra-site patterning and have the potential to yield information on local pre-1788 Aboriginal land use. Complex open artefact sites are not rare in the region and it may be argued that more representative sites may be located in areas with less agricultural disturbance and on higher order stream confluences. Conservation is unlikely to be identified as an absolute requirement, however opportunities for the avoidance of development impact should certainly be explored in future planning. It is often the case that such impact avoidance with sites near drainage lines can be effectively coupled with riparian protection. In the event that impact in this area is planned, a recommendation for need for further investigation is likely to be identified by Aboriginal stakeholders and OEH.

Within 80m of the southern drainage line: This area is generally quite steep (**Figure 2**) and has significant areas of land disturbance (**Figure 11**). One artefact in a disturbed context was recorded in 2005, however this was not relocated, and no further artefacts were found in the recent survey, despite extensive areas of exposure being available to survey. Sparse or dispersed sites (as defined in **Section 5.2**) may occur; however they are likely to be limited in extent and depositional integrity and therefore (even were they to be located) of little archaeological significance (based on any potential deposits being unlikely to be rare, importantly representative of having potential for addressing timely or significant research questions).

Areas of >5° Slope: While 1 artefact was located in this zone in the 2005 survey, it is likely to represent sparse artefact distribution (as defined in **Section 5.2**). Archaeological significance is considered to be low.

Relatively level (<5° slope) areas >80m from water: No artefacts were located in this zone, however it is likely that some sparse (as defined in Section 5.2) artefact occurrences (most likely as ‘isolated finds’) would occur. Being generally characteristic of the ‘background scatter’ that is essentially ubiquitous across the Cumberland sub-Bioregion, such occurrences would not be rare, notably representative or capable of addressing timely or significant research questions. Archaeological significance of any artefacts is therefore considered to be low.

Ridge: Artefact density is considered likely to be low, although sparse (as defined in Section 5.2) ‘background scatter’ occurrences may occur. Archaeological significance of any artefacts is considered to be low.

Table 7: Summary of potential archaeological significance

Zone	Aft	Aft/ha	Known or likely artefact density	Likely research potential
DrainNth	8	168	Relatively high	medium-high
>5deg	1	63	Whilst appearing moderate, likely to be relatively low	Low
DrainSth	1	44	Whilst appearing moderate, likely to be relatively low	Low
LNW	0	0	Low	Low
Ridge	0	0	Low	Low

While all areas with dispersed or sparse likely artefact distribution are considered to have low archaeological significance in themselves, some further investigation in these areas would nonetheless be required (based on the OEH Code of Practice) in the event of investigation in the likely ‘complex’ area of CR4 in order to provide a comparative ‘control’ sample.

7.2 SUBJECT SITE MANAGEMENT RECOMMENDATIONS

The findings of this assessment indicate that while Aboriginal objects are known to be present, their distribution is consistent with regional patterns. No sites are considered to be present which should prevent rezoning, or which could not be managed (through the controls of the *National Parks and Wildlife Act*), following rezoning.

Following rezoning but prior to any further land disturbance, the following actions are recommended :

- Use the results of this assessment, particularly the demonstration of relatively higher density and significance of Aboriginal cultural heritage material in the area of Site CR4, in any early stage concept planning so that impact avoidance can be appropriately considered.
- Continue formal Aboriginal community consultation process according to the OEH *Aboriginal cultural heritage consultation requirements for proponents 2010*

(already commenced). A list of Registered Aboriginal Parties (RAPs) is complete and the next stage of consultation would be updating RAPs on progress to date and commencing consultation on the ACHA methodology.

- Undertake additional archaeological investigation in the form of a test excavation. The extent of excavation would depend on development plans and the extent of potential impact. Excavation would be undertaken under the *Code of Practice for the Archaeological Investigation of Aboriginal Objects in NSW*.
- Following test excavation, prepare a formal Aboriginal Cultural Heritage Assessment (ACHA) and Archaeological Report. This documentation should apply to the entire subject site and be suitable for use in whatever consent framework eventuates. The current report has been structured so as to readily convert and develop into the required ACHA format and should be used as such.

Final considerations:

- A copy of this final report should be provided to the Tharawal LALC and Cubbitch Barta Aboriginal Corporation.
- Additional recommendations may follow review of draft reporting by Aboriginal community groups
- Revisions and additions to the AHIMS database have been submitted and require no further action.

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APPENDIX 1: PHOTOGRAPHS



Figure 20: Location of photos with Plate label





Plate 3: Looking north over southern drainage line



Plate 4: Looking west over ground in the vicinity of Exposure 38



Plate 5: Area of heavy disturbance at top of northern drainage line



Plate 6: View northwards over exposure 38 and towards 39; CR in the distance in centre of photo



Plate 7: Looking east over land sloping down to southern drainage line at boundary of subject area.



Plate 8: View NNW in northern drainage line above dam (not visible, but in middle distance in photo)

APPENDIX 2: EXPOSURE SURVEY DATA

Table 8: Exposure Survey results

Exp #	Wpt	Area	Artefacts	Aft/m2	Aft/ha	Zone
7	7	5	0	0.000	0.0	>5deg
8	8	14	0	0.000	0.0	>5deg
9	9	4	0	0.000	0.0	>5deg
10	10	5	0	0.000	0.0	>5deg
11	11	30	0	0.000	0.0	>5deg
12	12	4	0	0.000	0.0	>5deg
13	13	2	0	0.000	0.0	>5deg
14	14	2	0	0.000	0.0	>5deg
15	15	3	0	0.000	0.0	>5deg
23	23	3	0	0.000	0.0	>5deg
24	n/a	2	0	0.000	0.0	>5deg
25	24	5	0	0.000	0.0	>5deg
26	25	2	0	0.000	0.0	>5deg
59	64	3	0	0.000	0.0	>5deg
60	65	5	0	0.000	0.0	>5deg
61	66	10	0	0.000	0.0	>5deg
62	67	12	0	0.000	0.0	>5deg
63	68	33	0	0.000	0.0	>5deg
64	70	9	0	0.000	0.0	>5deg
65	71	4	0	0.000	0.0	>5deg
78	F34	3	0	0.000	0.0	>5deg
1	1	70	0	0.000	0.0	LNW
39	41	51	0	0.000	0.0	LNW
41	44	12	0	0.000	0.0	LNW
42	45	2	0	0.000	0.0	LNW
69	76	6	0	0.000	0.0	LNW
70	n/a	6	0	0.000	0.0	LNW
71	78	6	0	0.000	0.0	LNW
72	n/a	6	0	0.000	0.0	LNW
73	n/a	6	0	0.000	0.0	LNW
77	F33	60	0	0.000	0.0	LNW
2	2	15	0	0.000	0.0	Rid
3	3	9	0	0.000	0.0	Rid
4	4	3	0	0.000	0.0	Rid
5	5	2	0	0.000	0.0	Rid
6	6	2	0	0.000	0.0	Rid
18	18	2	0	0.000	0.0	Rid
19	19	2	0	0.000	0.0	Rid
20	20	3	0	0.000	0.0	Rid
21	21	4	0	0.000	0.0	Rid
22	22	4	0	0.000	0.0	Rid
74	F30	3	0	0.000	0.0	Rid
75	F31	54	0	0.000	0.0	Rid
40	42	63	2	0.032	317.5	WatNth

Exp #	Wpt	Area	Artefacts	Aft/m2	Aft/ha	Zone
43	47	21	0	0.000	0.0	WatNth
44	n/a	23	2	0.087	869.6	WatNth
45	n/a	19	0	0.000	0.0	WatNth
46	50	57	0	0.000	0.0	WatNth
47	51	13	0	0.000	0.0	WatNth
48	52	9	0	0.000	0.0	WatNth
49	53	5	0	0.000	0.0	WatNth
50	54	8	0	0.000	0.0	WatNth
51	55	5	0	0.000	0.0	WatNth
52	56	8	0	0.000	0.0	WatNth
53	57	4	0	0.000	0.0	WatNth
54	58	12	0	0.000	0.0	WatNth
55	59	13	0	0.000	0.0	WatNth
56	60	32	0	0.000	0.0	WatNth
57	61	6	0	0.000	0.0	WatNth
58	62	130	1	0.008	76.9	WatNth
66	72	12	0	0.000	0.0	WatNth
67	73	3	0	0.000	0.0	WatNth
68	74	9	0	0.000	0.0	WatNth
76	F32	25	0	0.000	0.0	WatNth
16	16	15	0	0.000	0.0	WatSth
17	17	3	0	0.000	0.0	WatSth
27	27	4	0	0.000	0.0	WatSth
28	28	5	0	0.000	0.0	WatSth
29	29	2	0	0.000	0.0	WatSth
30	30	10	0	0.000	0.0	WatSth
31	31	15	0	0.000	0.0	WatSth
32	32	10	0	0.000	0.0	WatSth
33	34	7	0	0.000	0.0	WatSth
34	35	5	0	0.000	0.0	WatSth
35	36	22	0	0.000	0.0	WatSth
36	37	4	0	0.000	0.0	WatSth
37	38	4	0	0.000	0.0	WatSth
38	39	120	0	0.000	0.0	WatSth
Total		1191	5			

APPENDIX 3: ABORIGINAL COMMUNITY CONSULTATION

Space is provided here for further information that may be inserted following further consultation with the Aboriginal community

APPENDIX 4: LEGISLATION

The following information is taken from the Office of Environment and Heritage (April 2011) *Guide to investigating, assessing and reporting on Aboriginal cultural heritage in NSW*. This is available through:

<http://www.environment.nsw.gov.au/licences/investassessreport.htm>

NATIONAL PARKS AND WILDLIFE ACT 1974

The NPW Act is administered by OEH and is the primary legislation for the protection of some aspects of Aboriginal cultural heritage in NSW. One of the objectives of the NPW Act is:

‘... the conservation of objects, places or features (including biological diversity) of cultural value within the landscape, including but not limited to: (i) places, objects and features of significance to Aboriginal people ...’ (s.2A(1)(b))

Part 6 of the NPW Act provides specific protection for Aboriginal objects and places by making it an offence to harm them. If harm to Aboriginal objects and places is anticipated, apply for an AHIP.

A list of declared Aboriginal places can be found at:

www.environment.nsw.gov.au/conservation/AboriginalPlacesNSW.htm

Further information on the NPW Act can be found at:

www.legislation.nsw.gov.au/viewtop/inforce/act+80+1974+first+0+N

ENVIRONMENTAL PLANNING AND ASSESSMENT ACT 1979

The EP&A Act, administered by the NSW Department of Planning and Infrastructure, provides planning controls and requirements for environmental assessment in the development approval process. It also establishes the framework for Aboriginal heritage values to be formally assessed in the land-use planning and development consent processes.

Further information on the EP&A Act can be found at: www.legislation.nsw.gov.au

HERITAGE ACT 1977

The Heritage Act, administered by NSW Office of Environment and Heritage, protects the states’ natural and cultural heritage. Aboriginal heritage is primarily protected under the

NPW Act but may be subject to the provisions of the Heritage Act if the item is listed on the State Heritage Register or subject to an interim heritage order (IHO).

The *Heritage Act* established the NSW Heritage Council, which provides advice and recommendations to the Minister for Heritage. The Minister approves the listing of items and places on the State Heritage Register and can also prevent the destruction, demolition or alteration of items of potential heritage value through an IHO until the significance of the item has been assessed.

Further information on the Heritage Act can be found at www.legislation.nsw.gov.au

ABORIGINAL LAND RIGHTS ACT 1983

The *NSW Aboriginal Land Rights Act 1983* (ALR Act), administered by NSW Department of Education and Communities, establishes the NSW Aboriginal Land Council (NSWALC) and Local Aboriginal Land Councils (LALCs). The Act requires these bodies to:

- take action to protect the culture and heritage of Aboriginal persons in the council's area, subject to any other law
- promote awareness in the community of the culture and heritage of Aboriginal persons in the council's area.

These requirements recognise and acknowledge the statutory role and responsibilities of NSWALC and LALCs.

The ALR Act also establishes the registrar whose functions include, but are not limited to, maintaining the Register of Aboriginal Land Claims and the Register of Aboriginal Owners.

Under the *NSW Aboriginal Lands Right Act 1983*, the registrar is to give priority to the entry in the register of the names of Aboriginal persons who have a cultural association with:

- lands listed in Schedule 14 to the NPW Act
- lands to which section 36A of the ALR Act applies.

NATIVE TITLE LEGISLATION

The Native Title Act 1993 (Cth) (NTA) provides the legislative framework to:

- recognise and protect native title
- establish ways in which future dealings affecting native title may proceed and to set standards for those dealings, including providing certain procedural rights for

registered native title claimants and native title holders in relation to acts which affect native title

- establish a mechanism for determining claims to native title
- provide for, or permit, the validation of past acts invalidated because of the existence of native title.

The *NSW Native Title Act 1994* was introduced to make sure the laws of NSW are consistent with the Commonwealth's NTA on future dealings. It validates past and intermediate acts that may have been invalidated because of the existence of native title.




The National Native Title Tribunal has a number of functions under the NTA, including maintaining the Register of Native Title Claims, the National Native Title Register and the Register of Indigenous Land Use Agreements and mediating native title claims.

OTHER ACTS

The *Australian Government Aboriginal and Torres Strait Islander Heritage Protection Act 1984* (Cth) may be relevant if any item of Aboriginal heritage significance to an Aboriginal community is under threat of injury or desecration and state-based processes are unable to protect it. The *Environment Protection and Biodiversity Conservation Act 1999* (Cth) may also be relevant to some proposals, particularly where there are heritage values of national significance present.

APPENDIX 5 ARTEFACT RECORDING

A5.1 ARTEFACT IMAGES

	
<p>Artefact CR4001</p>	<p>Artefact CR4002</p>
	<p>IMAGE FAIL</p>
<p>Artefact CR4003</p>	<p>Artefact CR4004</p>
<p>IMAGE FAIL</p>	
<p>Artefact IF6001</p>	

A5.2 ARTEFACT RECORDING

Art No	Material	Colour	Type	Platform	Max Dimension/ Axial Length*	Width	Thick	%Cortex	Scars	Heat	Termination	Longest Scar	Plat No.
CR4001	Silcrete	Red	Retouched Flake	Flat	13*	23	4	0	2	N	Feather		
CR4002	Quartz	White	Angular Fragment	n/a	14	8	6	0	0	N	n/a		
CR4003	Silcrete	Pink	Core Fragment	n/a	22	9	3	0	2	Y	Plunge		
CR4004	Quartz	White	Core Fragment	Cortical	11	7	5	1-25	0	N	Plunge		
IF6001	Silicified Wood	Brown Black	Core	Multi	37	23	22	0	6	N	Feather	21	3

**HISTORICAL ARCHAEOLOGICAL
ASSESSMENT:
5 SMALLS ROAD, GRASMERE**

**FOR
CARRINGTON CENTENNIAL CARE**



**Final Report
April 2016**

AHMS

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CONTENTS

1. Introduction.....	7
1.1 Study Area	7
1.2 Background	8
1.3 Authorship	9
1.4 Acknowledgements	9
1.5 Limitations.....	9
1.6 Guidelines.....	10
2. Statutory Considerations and Heritage Listings	11
2.1 Environment Protection and Biodiversity Conservation Act 1999 (Cwlth) .	11
2.1 Environmental Planning and Assessment Act 1979 (NSW)	11
2.2 Heritage Act 1977 (NSW)	12
2.1 Non-Statutory Listings and Heritage Studies	13
3. History	14
3.1 Grasmere.....	14
3.2 Study Area	15
4. Historical Archaeological Potential	22
4.1 Historical Development.....	22
4.2 Site Inspection	23
4.3 Comparative Local Sites	27
4.4 Summary	28
5. Assessment of Heritage Significance.....	29
5.1 Evaluation.....	29
5.2 Statement of Significance	31
6. Potential Heritage Impact.....	32
6.1 Proposed Development	32
6.2 Potential Historical Archaeological Impact	32
7. Results and Recommendations.....	35
8. References	38

LIST OF FIGURES

Figure 1. The general location of the study area, circled in red (source of map: Google Maps).....	7
Figure 2. A recent aerial photograph of the study area, outlined in red (source: LPI, SIX Viewer).	8
Figure 3. The study area, outlined in red, in relation to the 5400 acres granted to John Macarthur (source of map: LPI, Parish of Camden, County of Camden, 1887).....	18
Figure 4. Detail of an 1847 plan of the Camden Estate, with the approximate location of the study area outlined in red (source of map: The Camden estate containing 28,350 acres, 1847, National Library of Australia, MAP F 441, online resource). ...	19
Figure 5. Paling’s selection of the Cawdor farms, outlined in blue. The study area is in Farm 62. Note that this plan is oriented with north to the right (source of plan: Hardie and Gorman, 1887, Camden Park Estate, Cawdor Farms, for auction sale on Queens birthday 24 th May 1887 at Camden, National Library of Australia, MAP Folder 33, LFSP 440, online resource).	19
Figure 6. The study area in 1888 (source: Plan of Grasmere Estate presented to Lord Carrington by WH Paling 1888, ML MSS 4825/42x, reproduced in Noel Bell Ridley Smith & Partners, May 2006, Fig.12).....	20
Figure 7. Detail of the 1888 plan, showing the structures, paddock and vineyard in the study area (source: Plan of Grasmere Estate presented to Lord Carrington by WH Paling 1888, ML MSS 4825/42x, reproduced in Noel Bell Ridley Smith & Partners, May 2006, Fig.11).	20
Figure 8. The study area in 1956 (source of photograph: LPI).	21
Figure 9. The study area in 1984 (source of photograph: LPI).	21
Figure 10. An overlay of the features shown in the 1888 plan, onto a recent aerial photograph of the study area. Fencelines are shown in yellow, the locations of the former structures are circled in blue, and the dam location is circled in yellow. Note that the overlay is approximate only (source of photograph: LPI, SIX Viewer).	23
Figure 11. The approximate location of the former cottage.....	25
Figure 12. Looking from the former cottage site across Werombi Road to Grasmere Cottage.	25
Figure 13. The cistern.....	25
Figure 14. Detail of the cistern.	25
Figure 15. Interior of the cistern.	25
Figure 16. Gully trap near the cistern.	25
Figure 17. To the north of the former cottage site.	26
Figure 18. Gate post to the north of the former cottage site.	26
Figure 19. The approximate location of the former shed.	26
Figure 20. The approximate location of the former structure ‘W.H.’ or ‘W.N.’.....	26
Figure 21. A harrow, near the former cottage site.	26
Figure 22. An item currently used as a feed trough for cattle.	26
Figure 23. A reinforced concrete trough.	27
Figure 24. The concept master plan for the study area (source: Jackson Teece, 30.11.2011, Smalls Road - Concept Master Plan).	33
Figure 25. The approximate location of the former cottage, circled in blue, in relation to the concept plan.	34

Executive Summary

Carrington Centennial Care proposes to redevelop the land known as 5 Smalls Road, Grasmere, to accommodate seniors housing, a child care centre, a medical centre, and retail premises. This would form an expansion to the existing Carrington Centennial Care facility located on the opposite side of Werombi Road. As part of the planning process, Camden Council has lodged a planning proposal for the rezoning of the study area with the Department of Planning and Infrastructure.

A Gateway Determination has been issued by the Department of Planning and Infrastructure, allowing the planning proposal to proceed. One of the conditions of the Determination is that an assessment of the historical archaeological potential of the study area be undertaken prior to the public exhibition of the proposal. The present report has been completed to address this requirement.

The study area is part of the second grant made to John Macarthur in the Cowpastures area, in 1825. It was incorporated into the Macarthurs' Camden Estate, and remained in the ownership of the family through to the 1880s. No development is known to have occurred on the study area during this period, although it is likely that at least some clearing for agricultural use took place.

In the 1880s, the Camden Estate was subdivided into a number of smaller farms. Several of these, including the study area, were bought by William Henry Paling in 1882. Paling undertook substantial works on his farms; including the establishment of a vineyard, and the construction of a cottage and outbuildings in the study area. In 1888, Paling donated his land, and a substantial sum of money, to the state for the establishment of the Carrington Convalescent Hospital. He remained in occupation of part of the land, including the study area, until 1901.

The subsequent use of the study area by the Hospital is not known. The vineyard appears to have remained for a time. However, by the mid-twentieth century, the vineyard and structures had been removed. It is probable that the study area was used as cattle pasture, which is its present use.

Remains of the c.1882 structures exist in the study area in the form of an underground cistern. There are also likely to be archaeological remains of the cottage. These structural remains are likely to have been impacted to at least some degree by the subsequent agricultural use of the property. Remains of the outbuildings are less likely to survive, as these would have been less substantial structures. There are also some items which may relate to the historical occupation and agricultural use of the study area; including troughs, a harrow, a gatepost, and items discarded in the cistern.

The cistern and potential archaeological remains of the cottage are considered to have local heritage significance, as they are associated with WH Paling, the founder of Carrington Convalescent Hospital. However, the potential remains are unlikely to provide substantial additional information regarding the use of the property by Paling, or the development of the local area in the late nineteenth century. In addition, the cistern is unlikely to be considered a relic, as defined in the *Heritage Act 1977*, as it is a complete structure. Similarly, the possible historical items are not considered relics under the Act.

The proposed development of the study area is at concept master plan stage, and the exact extent of impact is therefore unknown. However, the cistern and potential cottage remains are within an area proposed for the development of a residential aged care facility. It is therefore probable that the proposed redevelopment will result in the complete removal of these features.

In general, archaeological relics are protected by the *Heritage Act 1977*, and no impact to relics is permitted without an Excavation Permit issued by the Heritage Branch of the Office of Environment and Heritage, on behalf of the Heritage Council of NSW. However, a number of standard Exceptions have been granted by the Heritage Council.

It is considered that impact to the potential archaeological remains of the cottage would be consistent with the following Exception:

1c a statement describing the proposed excavation demonstrates that evidence relating to the history or nature of the site, such as its level of disturbance, indicates that the site has little or no archaeological research potential.

Considering the local heritage significance of the identified historical features, and the low research potential of the archaeological remains, the following recommendations are made:

- An archival photographic record should be made of the remnant features and items related to the late nineteenth century occupation of the study area. Copies of this record should be lodged with the Heritage Branch, Camden Council, and Carrington Centennial Care archives or records.
- Once development plans have been drawn up, the level of impact to the potential archaeological remains of the former cottage should be assessed. If the development is likely to result in the complete or partial removal of the potential remains:
 - An Exception Notification should be submitted to the Heritage Branch of the Office of Environment and Heritage. No excavation

should be undertaken until the Notification has been endorsed and returned by the Heritage Branch.

- The location of the former cottage, so far as it will be impacted, should be archaeologically excavated and recorded. Should the investigation reveal remains of the former cottage, copies of the excavation report should be lodged with the Heritage Branch, Camden Council, and Carrington Centennial Care archives or records.
- Archaeological relics are protected by the *Heritage Act 1977*. Should any unexpected relics, or possible relics, be uncovered in the course of the proposed development, work should cease in the vicinity of the find, and the Heritage Branch should be contacted for advice.

1. INTRODUCTION

1.1 Study Area

The following assessment relates to the property known as 5 Smalls Road, Grasmere, referred to as the study area (**Figure 1** and **Figure 2**). The study area consists of Lot 201 in Deposited Plan (DP) 734620. It is within the Camden Local Government Area, and in the Parish of Camden, County of Camden.

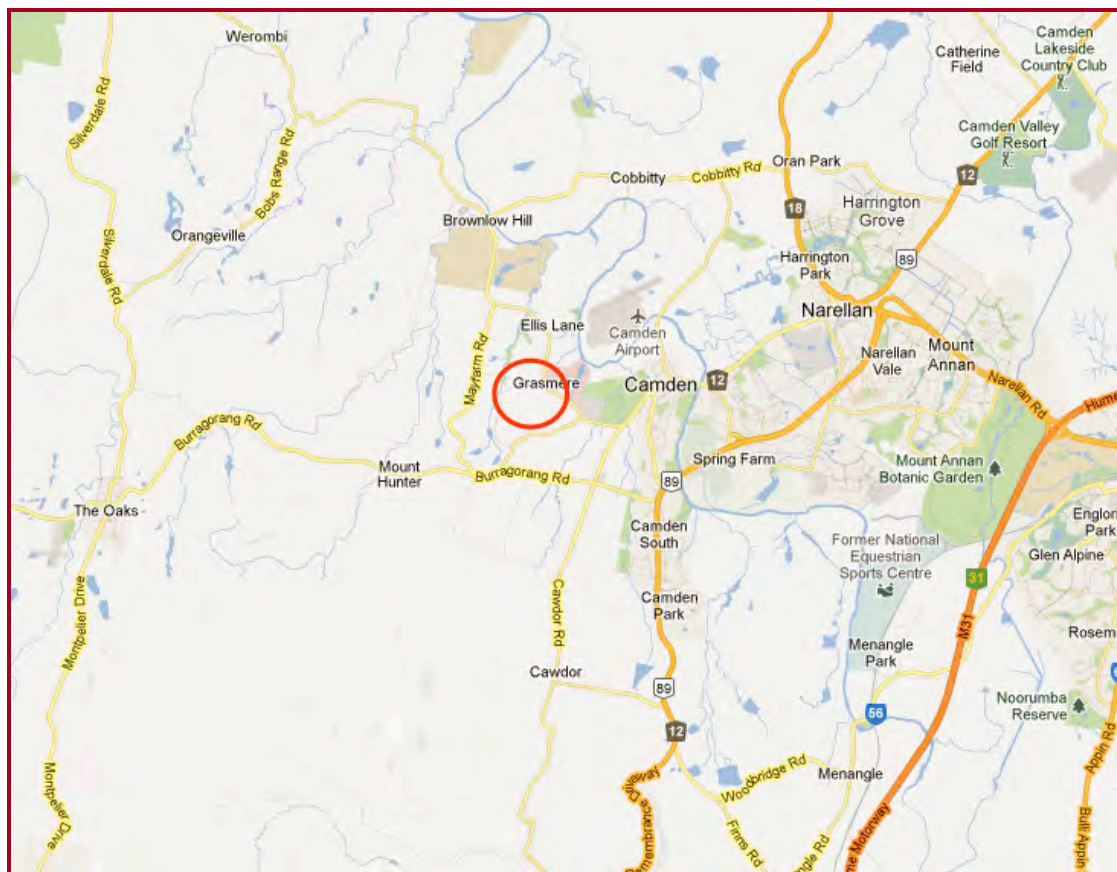


Figure 1. The general location of the study area, circled in red (source of map: Google Maps).



Figure 2. A recent aerial photograph of the study area, outlined in red (source: LPI, SIX Viewer).

1.2 Background

Carrington Centennial Care proposes to redevelop the study area to accommodate seniors housing, a child care centre, a medical centre, and retail premises. This would form an expansion to the existing Carrington Centennial Care facility located on the opposite side of Werombi Road. As part of the planning process, Camden Council has lodged a planning proposal for the rezoning of the study area with the Department of Planning and Infrastructure.

A Gateway Determination has been issued by the Department of Planning and Infrastructure, finding that the planning proposal should proceed. The Determination contains the following conditions with regard to the archaeological potential of the study area:

5. Council is to ensure that the Aboriginal Archaeological Survey and Assessment is updated and an assessment into potential additional heritage value of the land is undertaken prior to community consultation.

6. *It is noted that the subject site contains Aboriginal archaeological items on parts of the site that are proposed for development. In addition, it is noted that the site contains remnants of a former cottage that is not listed but may contain some historical value. Therefore, Council needs to ensure that the Aboriginal Archaeological Survey and Assessment is updated and an assessment into potential additional heritage value of the land forms part of the public exhibition material. Council should also consult the NSW Office of Environment and Heritage and the relevant Local Aboriginal Land Councils and address any issues raised. Council needs to address any inconsistencies with S117 Direction 2.3 Heritage Conservation and amend the planning proposal accordingly, if necessary, prior to public consultation.*

The present report has been completed to address the possible historical values of the former cottage, as outlined above. The Aboriginal heritage values of the study area are addressed in a separate report.¹

1.3 Authorship

This report was written by Fenella Atkinson, Archaeologist, and reviewed by Susan McIntyre-Tamwoy, Associate Director.

1.4 Acknowledgements

AHMS would like to acknowledge the assistance of the following people:

- Raad Richards, Carrington Centennial Care;
- Michael Brown, Michael Brown Planning Strategies;
- Tony Lowe, Casey and Lowe Associates;
- Elizabeth Robertson, Librarian, Heritage Branch, Office of Environment and Heritage;
- Robert Parkinson, Land and Property Information.

1.5 Limitations

The following limitations apply to the report:

- The report addresses historical heritage only. It does not consider any potential Aboriginal, built or landscape heritage values.

¹ AHMS, in preparation.

- The report addresses the potential historical heritage impact of the proposed development outlined in **Section 6**. This is a preliminary impact assessment only, as the proposal is at concept master plan stage.

1.6 Guidelines

The following guidelines have informed the preparation of this report:

- Australia ICOMOS, 2000, *The Australian ICOMOS Charter for the Conservation of Places of Cultural Significance* (The Burra Charter);
- Heritage Office, 2001, *Assessing Heritage Significance*;
- Heritage Office, 2002, *Statements of Heritage Impact*; and
- Heritage Branch, 2009, *Assessing Significance for Historical Archaeological Sites and Relics*.

2. STATUTORY CONSIDERATIONS AND HERITAGE LISTINGS

Historical archaeological resources in New South Wales are protected by a number of pieces of Commonwealth and State legislation. These are summarised below, with an explanation of how they apply to the proposed development of the study area.

2.1 Environment Protection and Biodiversity Conservation Act 1999 (Cwlth)

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) provides a statutory framework for protecting and managing significant environmental and cultural heritage places, flora, fauna and environmental communities. The Act establishes the National Heritage List (NHL) and the Commonwealth Heritage List (CHL) and provides protection for places included in the two lists. The Act also provides protection for those Australian places inscribed on the World Heritage List (WHL).

The study area is not included on the WHL, the NHL, or the CHL.

2.1 Environmental Planning and Assessment Act 1979 (NSW)

The *Environmental Planning and Assessment Act 1979* (EP & A Act), together with the *Heritage Act 1977* and the *National Parks and Wildlife Act 1974*, combine to form an integrated system for managing environmental heritage in NSW.

The study area falls within the Camden Local Government Area (LGA). The relevant environmental planning instrument, established under the EP & A Act is the *Camden Local Environmental Plan 2010*. This contains a schedule of heritage items, and provisions for protecting and managing listed heritage items.

The subject area is not listed as a heritage item in the *Camden LEP 2010*.

Carrington Hospital is listed as a heritage item of local significance (Item I118) in the *Camden LEP 2010* (Schedule 5 Environmental Heritage). However, this listing is defined as 90 Werombi Road (Lot 10 DP 845472) and does not include the study area.

2.2 Heritage Act 1977 (NSW)

The NSW *Heritage Act 1977* is designed to conserve the environmental heritage of New South Wales and regulate development impacts on the State's heritage assets. Historical archaeological resources of local and State heritage significance are afforded automatic statutory protection by the relics provisions of the Act. A 'relic' is defined as:

any deposit, artefact, object or material evidence that:

- a) *relates to the settlement of the area that comprises New South Wales, not being Aboriginal settlement, and*
- b) *is of State or local heritage significance*

It is an offence to disturb or excavate land, where this may affect a relic, without an Excavation Permit or endorsed Exception or Exemption Notification issued by the Heritage Branch, Office of Environment and Heritage, Department of Premier and Cabinet, on behalf of the Heritage Council of NSW.

The significance of the potential historical archaeological remains within the study area, and therefore their potential definition as relics according to the *Heritage Act 1977*, is assessed in **Section 5**.

The *Heritage Act 1977* establishes the State Heritage Register (SHR), a list of places and items of State heritage significance. The Act provides statutory protection for items included on the SHR. Approval from the Heritage Council of NSW is required prior to undertaking work that results in the alteration or modification of an SHR-listed item.

The study area is not included on the SHR.

The *Heritage Act 1977* requires that State government agencies maintain registers of heritage assets within land that they own and/or manage. These listings are incorporated into the State Heritage Inventory (SHI).

The study area does not include any items listed in State Government Heritage and Conservation Registers, as reproduced in the SHI.

Carrington Hospital is listed on the SHI, as a result of its listing as a heritage item in the *Camden LEP 2010*. However, this listing is defined as 90 Werombi Road (Lot 10 DP 845472) and does not include the study area.

2.1 Non-Statutory Listings and Heritage Studies

Non-Statutory Heritage Lists

The following relevant non-statutory heritage lists have been searched:

- Register of the National Estate (RNE),
- State Heritage Inventory (SHI),
- Register of the National Trust of Australia (NSW).

The study area is not listed on the Register of the National Estate or the Register of the National Trust of Australia (NSW).

As outlined above, Carrington Hospital is listed on the SHI, as a result of its listing as a heritage item in the *Camden LEP 2010*. However, this listing is defined as 90 Werombi Road (Lot 10 DP 845472) and does not include the study area.

3. HISTORY

In the following sections, the historical information relating to the study area, is taken from the Heritage Curtilage Assessment prepared by Noel Bell Ridley Smith and Partners (March 2006) unless otherwise referenced. Limited additional research has been undertaken using the collections of the Heritage Branch Library, the State Library, and Land and Property Information.

3.1 Grasmere

Several of the cattle brought on the First Fleet to Port Jackson were lost shortly after arrival. The cattle had strayed to an area to the south-west of the settlement. An official party was sent to investigate, and Governor Hunter visited the area himself in 1795. The area was named Cowpastures, after the now wild cattle found there. A hut was built near what is now Elderslie, to house a stockman to look after the cattle.²

A track to the area developed, as people visited for hunting and tours.³ The track may have been marked out as early as 1803, by John Warby, who was Stockman of the Wild Cattle.⁴ In 1805, James Meehan surveyed the line of the track leading south-west from Prospect and a rough road was formed. This became the Old Cowpasture Road, most of which is now known as Camden Valley Way.⁵ The present road still follows much of the original route.⁶

The first grant of land in the area was made in 1805 to John Macarthur. The property consisted of 5,000 acres, and was named Camden Park.⁷ Macarthur was granted the land in support of his idea that there was potential for the production of fine quality wool in the colony.⁸ Wool was the first main industry of the Camden area.⁹

With the exception of the grant made to Macarthur, and another made to Walter Davidson, no further land was granted in the Camden district until Macquarie became governor in 1810.¹⁰ A second grant of land at Cowpastures was made to

² Wrigley, 2001, pp. 7-9.

³ Mylrea, 2002, p. 7.

⁴ Mylrea, 2002, p. 41.

⁵ Wrigley, 2001, p. 9.

⁶ Mylrea, 2002, p. 41.

⁷ Wrigley, 2001, p. 10.

⁸ Mylrea, 2002, p. 17.

⁹ Wrigley, 2001, p. 18.

¹⁰ Mylrea, 2002, p. 8.

Macarthur in 1825. This comprised 5,400 acres and included the study area. By the late 1830s Macarthur's property had expanded to 28,000 acres.¹¹

On Macarthur's death in 1834, Camden Park Estate was inherited by his sons James and William. In 1836 the town of Camden was surveyed on part of the Macarthur property.¹² Before the establishment of this town, the rural properties in the area were developed as almost self-contained communities.¹³ Camden soon eclipsed Narellan as the main centre of the district. The present suburb Grasmere is part of the area known as West Camden.

In the early 1840s, wheat growing became the main focus of agriculture in the region. However, the onset of rust in the district in the early 1860s brought an end to wheat cultivation.¹⁴ In 1885, 3,600 acres of the Camden Park Estate, including the study area, were subdivided into small farms of up to 130 acres each. In this period, dairy farming became the main industry in the area. It remained a major industry in Camden West until recently.¹⁵ One of the larger farms in the area, Paling's Grasmere (see below) gave its name to the suburb.

3.2 Study Area

The study area is within the second grant made to Macarthur at Cowpastures (Figure 3). This was referred to as the North Cawdor or North Camden Estate, and later as Cawdor Park. Macarthur died in 1834, leaving Camden Park Estate to his sons James and William. The two parts of the Estate were then inherited by Elizabeth Macarthur-Onslow, James Macarthur's daughter; in 1867 and 1882, on the deaths of James and William respectively.

The use of the study area in particular during the Macarthur family ownership is not known. From the 1840s much of the Camden Estate was cultivated as clearing leases for wheat growing. The study area may have been included in one of these leases. However, the 1847 plan suggests that the study area was not part of the land divided into leased farms, at least at this time (Figure 4). The onset of rust in the district in the 1860s brought an end to wheat cultivation.

In 1881 a syndicate of four (William Henry Paling, Benjamin James Jnr, William Stimson, and Andrew Hardie McCulloch) agreed with the Macarthur family to purchase an area of 5,100 acres. This comprised the North Cawdor farms, and all the unsold portions of the town of Camden. At the time of the sale all the farms

¹¹ Wrigley, 2001, p. 10.

¹² Wrigley, 2001, p. 10.

¹³ Wrigley, 2001, p. 11.

¹⁴ Robinson, 2008.

¹⁵ Robinson, 2008.

were tenanted. The farms were offered for sale in 1882; however, sales were slow, and the farms were offered again in 1883, 1887 and 1888.

William Henry Paling selected some of the land for himself, comprising Farms 12, 13, 45, 46, 47 and 62 (Figure 5). Farm 62 included the study area. Paling (1825-1895) had immigrated to Australia from the Netherlands in 1853. He settled in Sydney, where he established himself as a music teacher and concert promoter, and established a business selling pianos and sheet music. His business interests included speculation in mining and land. He regularly served on the Bench of Magistrates, and was an Alderman and later Mayor of Petersham Council. Paling was noted for his philanthropy, and had a particular concern with health reform.

The 1887 sales brochure describes some of the improvements Paling had made to his property:

North Cawdor Estate is desirable as sites for farms and homesteads as evidenced by the fact that Mr WH Paling, JP, the well-known musician and piano forte importer (who has built a commodious site), Mr McCulloch, Mr Cliff and Mr Porter, all purchased large farms in the centre of the estate. These gentlemen have expended large amounts in fencing, making dams and reservoirs and laying down hundreds of acres of English Grasses.

The brochure also contained three sketches of Paling's farm, showing the cottage, dairy and stockyard. Paling's farm records contain a list of expenditure on his Camden Farms over the period from 26 April 1882 to 23 April 1887. Over £1,000 had been spent on fencing, clearing land and in the construction of small dams and water holes. Paling appears to have called his property as a whole the Grasmere Estate, and his house Grasmere Villa.

Farm 62, which included the study area, was referred to as 'Vineyard Farm'. Paling had established 5,250 vines on this Farm, and there was also a cottage valued at £75. The 1888 plan shows that Farm 62 had been cleared, and paddocks created (Figure 6 and Figure 7). The north-eastern corner of the Farm is distinguished from the rest, and contains a vineyard and paddock. Three structures are shown; a cottage (consisting of three components), a shed, and a structure labelled W.H. (or W.N.). There are also lines of shrubbery along Mulgoa Forest Road (now Werombi Road), and along the fence line running between the cottage and the Road.

In 1888 the purchase of the Cawdor Farms by the syndicate was finalised, and the land was converted from leasehold to freehold. Paling's purchase in April 1888 appears to have been the first completed sale. On the same day Paling transferred the land as a Centennial Gift for the state of NSW to Lord Carrington, the Governor, for the construction of a hospital for incurables and convalescents.

Paling also donated £10,000 towards the establishment of the hospital. The main hospital building was officially opened on 20 August 1890, along with a Masonic Cottage Hospital.

Paling negotiated to lease his home Grasmere Villa and a section of land for the benefit of himself, and his stepsons Maney and Willem Lake, to occupy at a peppercorn rent for their lifetime. The leased land included Farms 12, 13 and 62 (including the study area), part of Farm 45, and an option of leasing Farm 47 for a five-year term.

The Grasmere Estate farmland that was not occupied by the new hospital was managed by John Carter. Carter appears to have been the farm manager during Paling's ownership of the property, and had half shares in the livestock and equipment on the property. In 1891 Carter decided not to renew his lease and a date was set for the sale of livestock and dairy utensils. The Grasmere Estate Farm was then leased to H Greigg for 5½ years at an annual rate of £150.

Paling continued to lease Grasmere Villa and the surrounding orchard, vineyard and paddock (which included some land on the opposite side of Werombi Road) at a peppercorn rental, and the family continued to use this area until 1901. The land then came under the control of the Trustees of the Carrington Hospital.

The restoration of the vineyard was undertaken under the supervision of Mr Downes, and following advice from the Government fruit expert WE Allen. However, the subsequent use of Farm 62 by the Hospital is unclear.

The 1888 structures are not visible in the 1956 aerial photograph, and are likely to have been removed by this time (**Figure 8**). However, the location of the former cottage is marked by a cluster of trees. Similarly, there is no evidence of the vineyard or shrubbery shown in the 1888 plan. The property is largely clear of vegetation, and is likely to have been in use as pasture. The 1984 image is similar, and suggests that the property remained in use as pasture (**Figure 9**). By this time, the route of Werombi Road had been slightly altered, cutting off a small amount of the north-east corner of Farm 62.

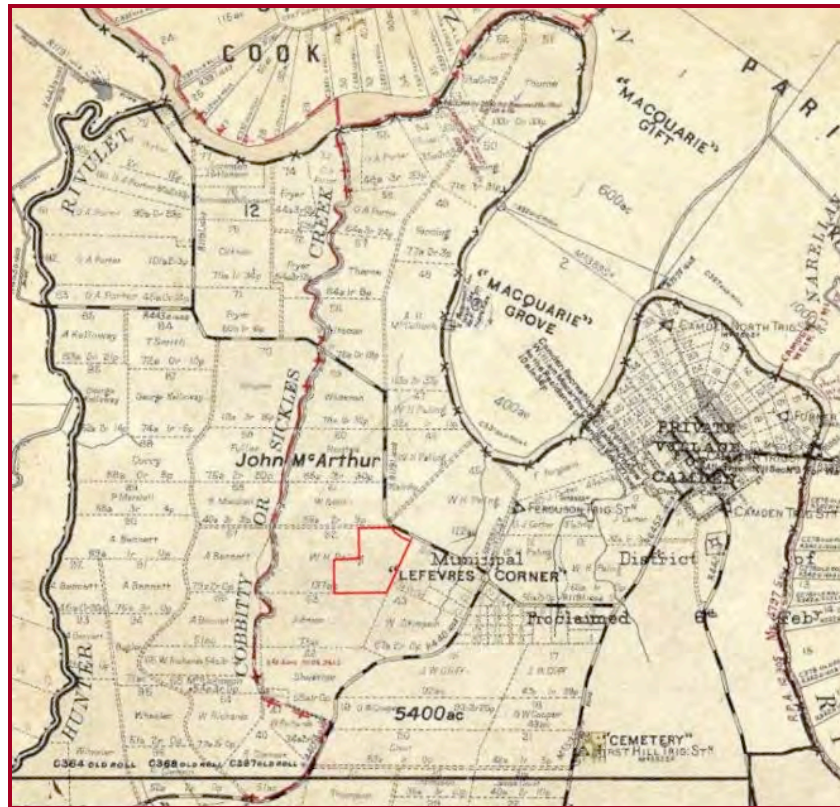


Figure 3. The study area, outlined in red, in relation to the 5,400 acres granted to John Macarthur (source of map: LPI, Parish of Camden, County of Camden, 1887).

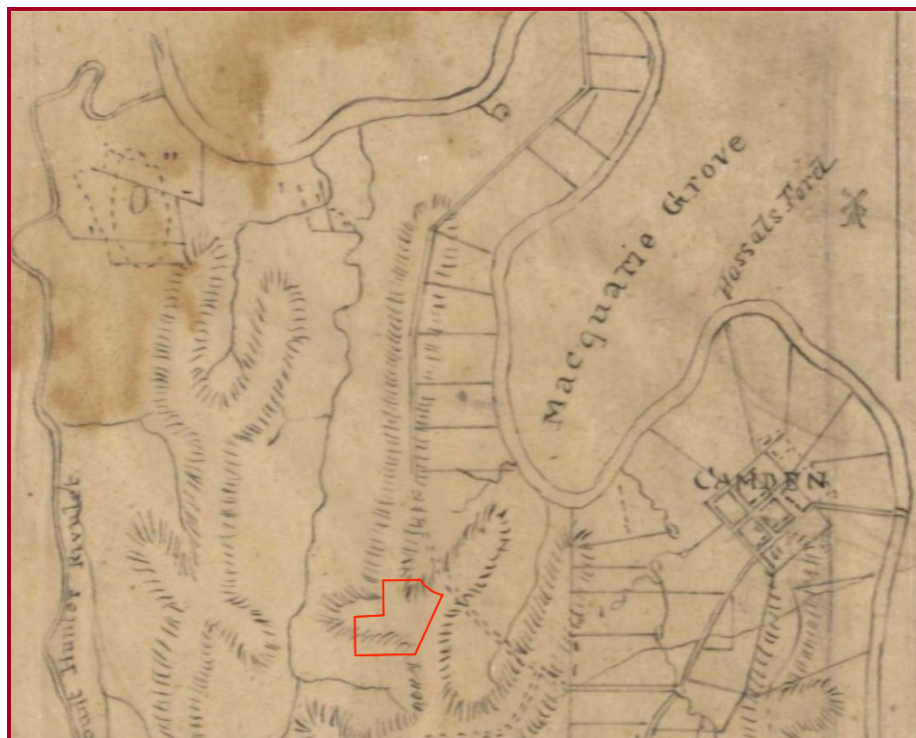


Figure 4. Detail of an 1847 plan of the Camden Estate, with the approximate location of the study area outlined in red (source of map: The Camden estate containing 28,350 acres, 1847, National Library of Australia, MAP F 441, online resource).

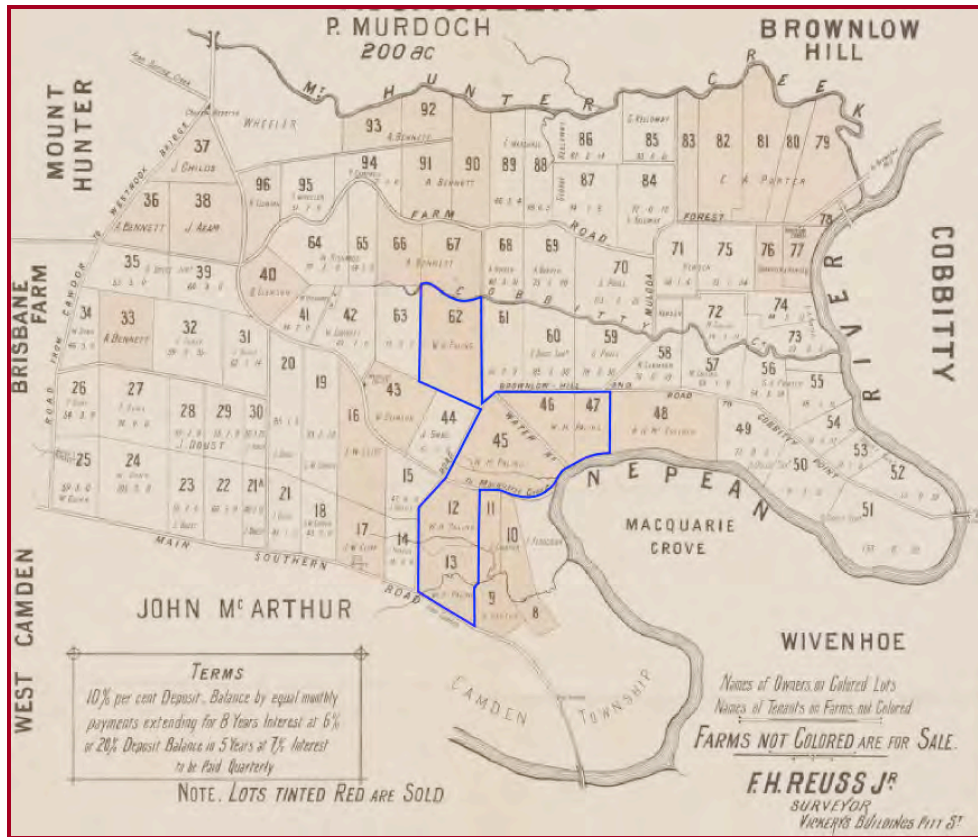


Figure 5. Paling’s selection of the Cawdor farms, outlined in blue. The study area is in Farm 62. Note that this plan is oriented with north to the right (source of plan: Hardie and Gorman, 1887, Camden Park Estate, Cawdor Farms, for auction sale on Queens birthday 24th May 1887 at Camden, National Library of Australia, MAP Folder 33, LFSP 440, online resource).

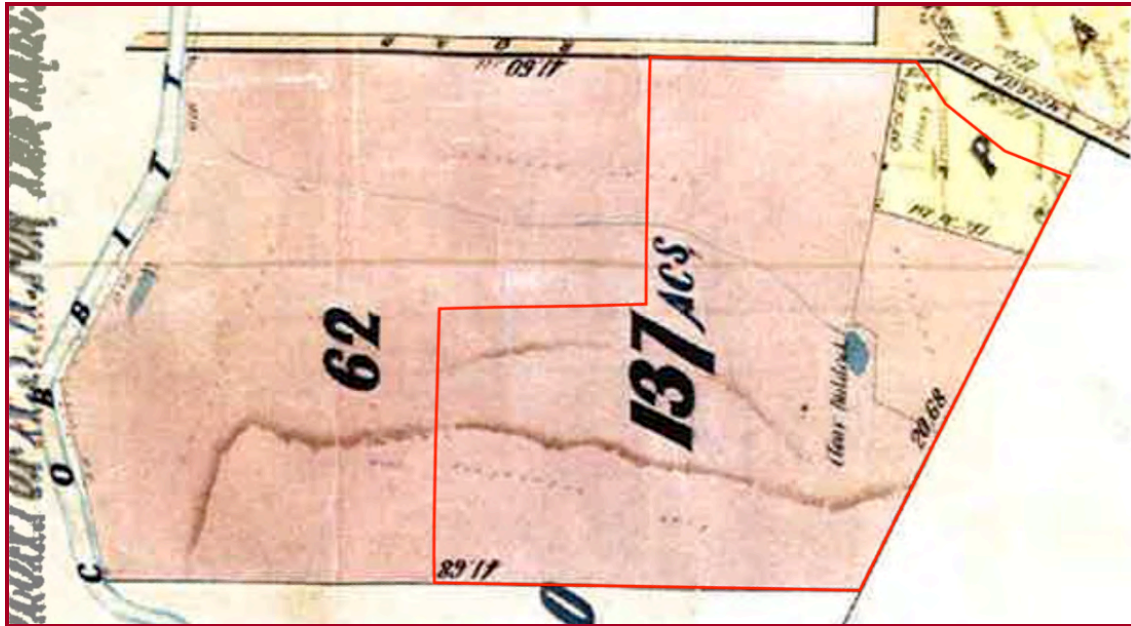


Figure 6. The study area in 1888, outlined in red (source: Plan of Grasmere Estate presented to Lord Carrington by WH Paling 1888, ML MSS 4825/42x, reproduced in Noel Bell Ridley Smith & Partners, May 2006, Fig.12).

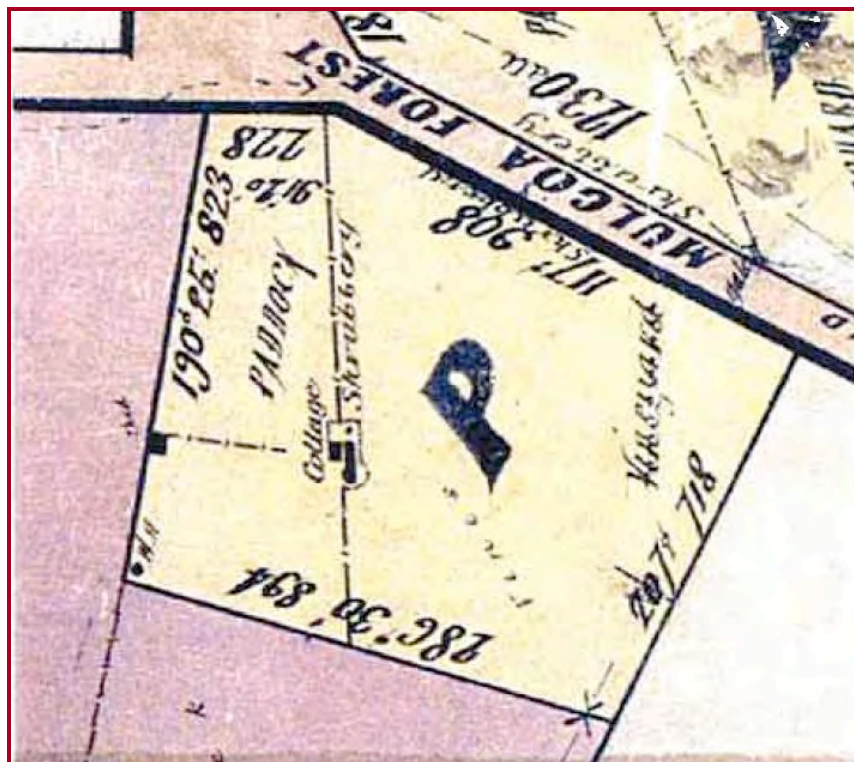


Figure 7. Detail of the 1888 plan, showing the structures, paddock and vineyard in the study area (source: Plan of Grasmere Estate presented to Lord Carrington by WH Paling 1888, ML MSS 4825/42x, reproduced in Noel Bell Ridley Smith & Partners, May 2006, Fig.11).



Figure 8. The study area in 1956 (source of photograph: LPI).



Figure 9. The study area in 1984 (source of photograph: LPI).

4. HISTORICAL ARCHAEOLOGICAL POTENTIAL

4.1 Historical Development

The study area was alienated in 1825, as part of a grant made to John Macarthur. It remained in the ownership of the Macarthur family through to 1888. The study area is not in the vicinity of the Macarthur homesteads, or other known structures from this period. As part of the Macarthurs' Estate, the study area is likely to have been used for agricultural purposes. However, it is not within the known boundaries of the leased farms, and it is therefore unlikely to have been the location of the residence of a tenant farmer. Development during the Macarthur period is likely to have been limited to vegetation clearing, and fencing.

By 1888, a cottage and two smaller structures had been constructed on the study area. A vineyard had also been established, and a dam constructed. As discussed above, there is no evidence to suggest that these developments had taken place under the Macarthurs. It is likely that they were undertaken after Paling took up occupation of the farms including the study area, in c.1882. This is supported by the location of the cottage and vineyard in close proximity to Paling's residence Grasmere Villa, on the opposite side of Werombi Road.

The 1888 plan shows the cottage consisting of three structures. One of these is likely to have been the house; the second the kitchen, although there was perhaps also some facility for processing or packing the grapes; and the third a well or cistern. A shed is shown to the west of the cottage. A structure with an unknown function (labelled W.H. or W.N.) is shown to the south-west. It is possible that this was the privy, although it seems a little far from the house.

The study area is likely to have remained in Paling's occupation through to 1901, when the lease from the Hospital ended. It appears that an attempt was made to continue use of the vineyard during the early twentieth century. However, the vineyard had been removed by 1956, and it appears that the cottage and associated structures had also been removed by this time.

Based on the documentary evidence, any historical archaeological evidence preserved in the study area is likely to relate largely to the Paling period of occupation, from 1882 to 1901. Remains of the cottage and two associated structures may include footings, postholes and services. Due to construction and waste disposal methods in use in the late nineteenth century, it is unlikely that substantial rubbish or occupation deposits would have been created. However, if a well or cistern was present, as indicated in the 1888 plan, this may have been filled

with rubbish when it was taken out of use. There may also be evidence deriving from the agricultural use of the property, such as postholes from fencing and vine trellises, and surfaces of tracks.

Any historical archaeological evidence from the earlier Macarthur period, or later Hospital period, is likely to be limited, and relatively ephemeral in nature. It may include postholes from fencing, and burnt-out tree roots from clearing.



Figure 10. An overlay of the features shown in the 1888 plan, onto a recent aerial photograph of the study area. Fencelines are shown in yellow, the locations of the former structures are circled in blue, and the dam location is circled in green. Note that the overlay is approximate only (source of photograph: LPI, SIX Viewer).

4.2 Site Inspection

The study area was inspected by Fenella Atkinson on 22 November 2012. The site inspection targeted the areas of the known former structures, rather than being a

comprehensive survey of the whole property. The study area is presently in use as cattle pasture.

The entrance to the study area is at the junction of Smalls and Werombi Road. The first section of the entrance driveway follows the ridgeline running into the study area. This is also the line of one of the fencelines shown in the 1888 plan (see **Figure 10**).

The site of the former cottage consists of a fairly level terrace located just below the crest of the ridge (**Figure 11**). This site has views across Werombi Road to Grasmere Cottage (**Figure 12**). The location is grassed, with little other vegetation, apart from a small area of regrowth native vegetation. The ground is uneven in places, which may indicate the presence of remnant footings or may be simply a result of its use for pasture. No artefacts or other archaeological remains were visible on the surface.

An underground cistern, with associated gully trap, is present in this location (**Figure 12 to Figure 16**). This is a cylindrical structure, with a domed top, constructed of brick with cement render, with an external diameter of approximately 2 m. The brick is not dry-pressed, but is a late form of hand-made brick. There is an earthenware pipe, incorporated into the downslope wall, which presumably released overflow. The gully trap is also cement-rendered brick, with depressions in the upper wall, where the inlet pipes originally sat. The cistern did not contain water at the time of the site inspection, but did contain a number of items, including a tyre, a large sheet metal tub, glass jars and bottles, and timber.

The area to the north of the former cottage location, where the 1888 plan indicates a fence and line of shrubbery, presently has a small stand of recent regrowth vegetation (**Figure 17**). There is a gate post in this area, which may have been part of the former fenceline (**Figure 18**).

The approximate locations of the other two former structures shown in the 1888 plan were also inspected (**Figure 19 and Figure 20**). These two areas are located beside the current entrance track, and are presently densely grassed. No artefacts or other archaeological remains were visible, but there was no ground surface visibility in these locations. As with the former cottage site, the unevenness of the ground may indicate the presence of structural remains, or may result from agricultural use.

In the vicinity of the sites of the three former structures, a number of items were noted that may relate to the historical use of the property (**Figure 21 to Figure 23**). These include a harrow, a reinforced concrete trough, and a large sheet metal item presently used as a cattle feed trough.



Figure 11. The approximate location of the former cottage.



Figure 12. Looking from the former cottage site across Werombi Road to Grasmere Cottage.



Figure 13. The cistern.



Figure 14. Detail of the cistern.



Figure 15. Interior of the cistern.



Figure 16. Gully trap near the cistern.



Figure 17. To the north of the former cottage site.



Figure 18. Gate post to the north of the former cottage site.



Figure 19. The approximate location of the former shed.



Figure 20. The approximate location of the former structure 'W.H.' or 'W.N.'



Figure 21. A harrow, near the former cottage site.



Figure 22. An item currently used as a feed trough for cattle.



Figure 23. A reinforced concrete trough.

4.3 Comparative Local Sites

A search of the records collated in the Heritage Branch Library and the 'NSW Archaeology On-Line: Grey Literature Archive' indicates that little historical archaeological investigation has been undertaken in the local area, although it should be noted that these collections are not comprehensive. Most of the excavation undertaken has been in and around the main Belgenny Farm complex; the first site occupied by the Macarthur family within the Camden estate, and the agricultural focus of the estate during the Macarthur period.

A programme of archaeological test and salvage excavation was undertaken at Belgenny Farm in the 1980s.¹⁶ The work was undertaken as part of restoration works, and was focussed on the outbuildings, particularly the Stables, Carpenter's Shop, Blacksmith's Shop, Slaughterhouse, and Creamery. The investigation resulted in the recovery and recording of archaeological evidence relating to the period from the 1820s into the twentieth century. The evidence related to landscaping, construction, and drainage, as well as the occupation and use of the structures.

A programme of research and archaeological excavation was undertaken at Belgenny Farm from 2006 to 2009, with the aim of locating and recording the original hut constructed for the Macarthurs in c.1810, and used as a temporary residence by the family.¹⁷ Remains of the hut were uncovered and recorded, along with evidence of alterations and additions made through to the 1840s. The remains of three additional structures were also excavated; cottages dating to the 1820s,

¹⁶ Thorp, 1989.

¹⁷ Edward Higginbotham and Associates, January 2010.

and occupied through to the mid to late nineteenth century. Artefacts associated with the occupation of the hut and cottages were also recovered.

4.4 Summary

The only substantial development known to have taken place on the study area is the construction of a cottage and two outbuildings. These are likely to have been built after 1882, when WH Paling took up occupation of the land including the study area, and were standing by 1888. As Paling's residence was Grasmere Villa, on the opposite side of Werombi Road, the cottage on the study area is likely to have been occupied by a tenant or farm manager.

The cottage and outbuildings had been removed by at least 1956. The presence of the cistern shows that the demolition did not involve complete removal of all parts of the buildings, and suggests that archaeological remains may have survived in the locations of the former structures. Subsequent agricultural use of the property is likely to have resulted in disturbance to any remains. In particular the remains of the two outbuildings are likely to have been significantly disturbed or entirely removed. This is because they are likely to have been relatively ephemeral in the first place (probably consisting of postholes) and they are located just beside the entrance track to the property, which has received traffic (vehicles and animals) through to the present.

The cottage is likely to have been a more substantial structure. Certainly the extant cistern, which was built with the cottage, is a well-constructed, solid item. It is therefore possible that archaeological evidence of the cottage remains in the study area. Because of the late-nineteenth-century date of construction, any remains are likely to be structural in nature; such as footings, postholes, services and paving. Substantial rubbish and occupation deposits, containing artefacts deriving from the occupation of the structure, are unlikely to exist. However, at least some of the items present in the cistern may relate to the occupation of the cottage. In addition, some items in the vicinity of the three former structures may also relate to the historical agricultural use of the property.

It appears that only limited historical archaeological excavation has been undertaken in the locality. This work has been undertaken in and around the Belgenny Farm complex, and relates largely to the Macarthurs' occupation and use of their Camden estate. The historical archaeological remains that may be preserved in the study area relate to the subdivision of this estate into smaller farms, from the late nineteenth century onwards. This period does not appear to have been subject to archaeological investigation in the region.

5. ASSESSMENT OF HERITAGE SIGNIFICANCE

‘Heritage significance’ and ‘cultural significance’ are terms used to define and describe an item’s value or importance to our society. The Australian ICOMOS Burra Charter defines cultural significance as

Aesthetic, historic, scientific or social value for past, present or future generations.

These values may be contained in the fabric of the item, its setting and relationship to other items, the response that the item stimulates in those who value it now, or the meaning of that item to contemporary society.

Heritage significance is a key definitional threshold for determining whether archaeological remains are ‘relics’ according to the *Heritage Act*. Remains must have local and/or State significance in order to be protected by the ‘relics’ provisions of the *Heritage Act*.

Accurate assessment of the cultural significance of sites, places and items is an essential component of the NSW heritage assessment and planning process. A clear determination of a site’s cultural significance allows informed planning decisions, in addition to ensuring that heritage values are maintained, enhanced, or at least minimally affected by development.

Seven standard evaluation criteria are used in NSW to assess heritage significance.¹⁸ Of particular relevance to historical archaeological sites is Criterion E, relating to the potential of an item to yield historical information.

5.1 Evaluation

Criterion A - An item is important in the course, or pattern, of NSW’s cultural or natural history (or the cultural or natural history of the local area)

No evidence has been found to indicate that the study area is of significance according to this criterion.

¹⁸ Heritage Office, 2001, *Assessing Heritage Significance*, online edition, <www.heritage.nsw.gov.au/docs/assessingheritagesignificance.pdf>

Criterion B - An item has strong or special association with the life or works of a person, or group of persons, of importance in NSW's cultural or natural history (or the cultural or natural history of the local area)

The study area is associated with William Henry Paling. He is of particular significance in the history of the local area, partly as one of the syndicate involved in the subdivision of the Camden estate, but more particularly as the philanthropist responsible for the foundation of Carrington Convalescent Hospital. Paling did not live on the study area. However, the study area was developed as part of Paling's overall estate, being the location of a vineyard and associated structures.

The study area is of local significance according to this criterion.

Criterion C - An item is important in demonstrating aesthetic characteristics and/or a high degree of creative or technical achievement in NSW (or the local area).

No evidence has been found to indicate that the study area is of significance according to this criterion.

Criterion D - An item has strong or special association with a particular community or cultural group in NSW (or the local area) for social, spiritual or cultural reasons.

No evidence has been found to indicate that the study area is of significance according to this criterion.

Criterion E - An item has potential to yield information that will contribute to an understanding of NSW's cultural or natural history (or the cultural or natural history of the local area).

The study area may contain archaeological evidence of a former cottage that was built in c.1882. This evidence is likely to be structural in nature. Due to the date of construction and occupation of the cottage, it is unlikely that substantial rubbish or occupation deposits have been created. The potential archaeological evidence is unlikely to yield information that would supplement the historical information available from documentary sources.

No evidence has been found to indicate that the study area is of significance according to this criterion.

Criterion F - An item possesses uncommon, rare or endangered aspects of NSW's cultural or natural history (or the cultural or natural history of the local area).

The study area retains a cistern and potential archaeological remains dating to the late nineteenth century. This was a period of relatively rapid growth and development in New South Wales, and the items are not considered to be rare at a State level. However, the occupation of the Camden area at this time was sparse, and the items are therefore considered to be rare at a local level.

The study area is of local significance according to this criterion.

Criterion G - An item is important in demonstrating the principal characteristics of a class of NSW's cultural or natural places or cultural or natural environments (or a class of the local area's cultural or natural places or cultural or natural environments).

No evidence has been found to indicate that the study area is of significance according to this criterion.

5.2 Statement of Significance

The study area is of local heritage significance. This is due largely to its association with WH Paling, the founder of Carrington Hospital, but also relates to its development and occupation in the late nineteenth century. This significance is represented in the material remains from this period, being an underground cistern, potential archaeological remains of the cottage, and a number of items which may relate to the historical occupation of the study area. However, due to the date of construction and occupation, and the available documentary evidence, it is considered that the research potential of the material evidence is low.

6. POTENTIAL HERITAGE IMPACT

6.1 Proposed Development

Carrington Centennial Care proposes to redevelop the study area to accommodate seniors housing, a child care centre, a medical centre, and retail premises. This would form an expansion to the existing Carrington Centennial Care facility located on the opposite side of Werombi Road. A concept master plan for the proposed development is shown in **Figure 24**.

6.2 Potential Historical Archaeological Impact

The concept master plan indicates that the cistern and potential archaeological remains are located within an area set aside for the development of the residential aged care facility (**Figure 25**). As development plans have not yet been drawn up, the level of impact across this area is not known. Tentative asset protection zones are proposed, surrounding the regrowth native vegetation. However, as the probable location of the former cottage is largely or entirely outside these areas of regrowth, it is unlikely that the potential relics will be included in these asset protection zones. Based on the concept master plan, it is therefore likely that the proposed development will result in the entire removal of the cistern and any archaeological remains of the cottage.

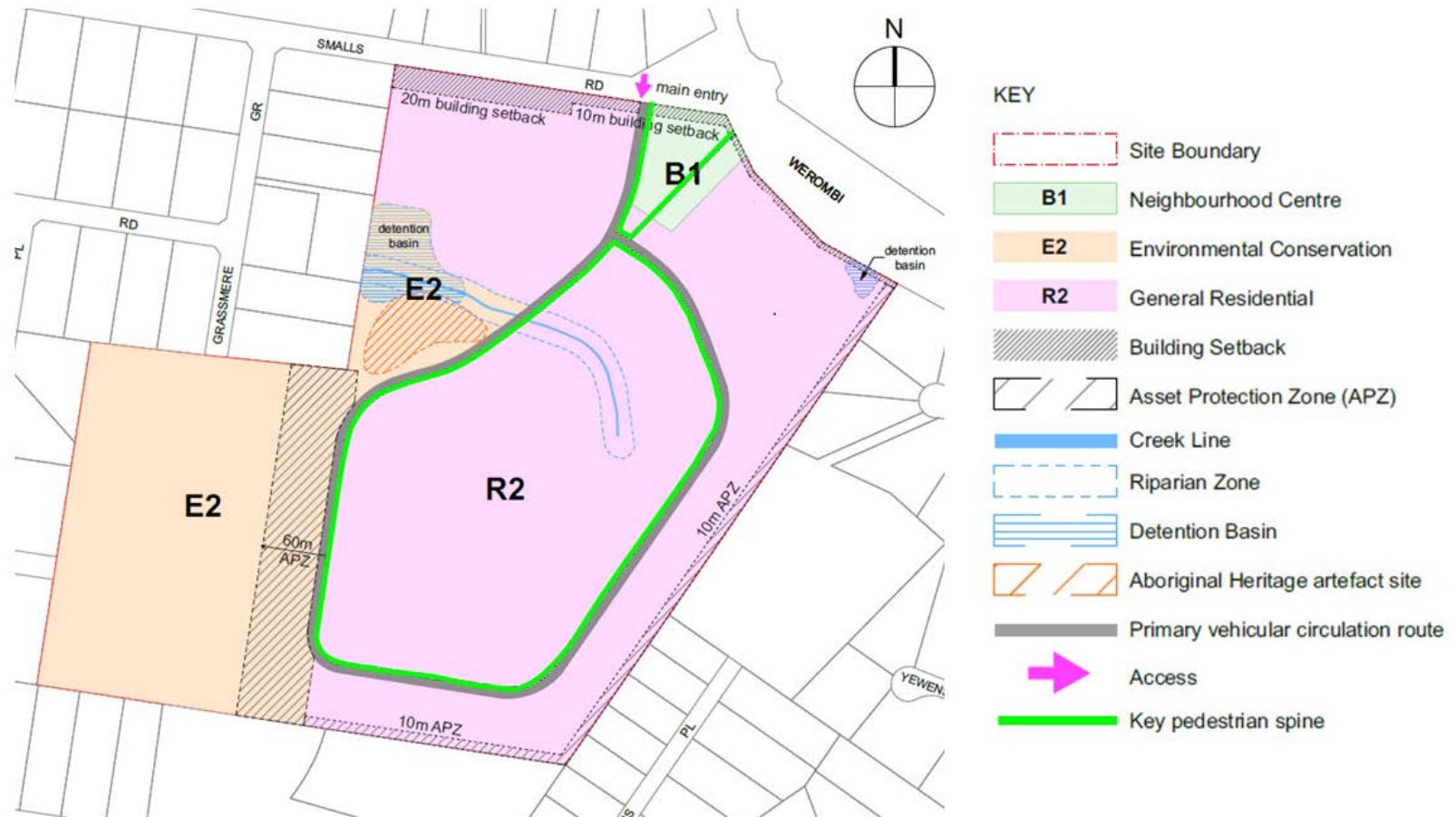


Figure 24. The concept master plan for the study area (source: Jackson Teece, 11.2.2013, Smalls Road - Concept Master Plan).



Figure 25. The approximate location of the former cottage, circled in blue, in relation to the concept plan.

7. RESULTS AND RECOMMENDATIONS

The study area is part of the second grant made to John Macarthur in the Cowpastures area, in 1825. It remained in the ownership of the Macarthur family through to the 1880s. No development is known to have occurred on the study area during this period, although it is likely that at least some clearing and agricultural use took place.

In the 1880s, the Camden Estate was subdivided into a number of smaller farms. Several of these, including the study area, were bought by William Henry Paling in 1882. Paling undertook substantial works on his farms; including the establishment of a vineyard, and the construction of a cottage and outbuildings in the study area. In 1888, Paling donated his land, and a substantial sum of money, to the state for the establishment of the Carrington Convalescent Hospital. He remained in occupation of part of the land, including the study area, until 1901.

The subsequent use of the study area by the Hospital is not known. The vineyard appears to have remained for a time. However, by the mid-twentieth century, the vineyard and structures had been removed. It is probable that the study area was used as cattle pasture, which is its present use.

Remains of the c.1882 structures exist in the study area in the form of an underground cistern. There are also likely to be archaeological remains of the cottage. These are likely to be structural remains, are to have been impacted to at least some degree by the subsequent agricultural use of the property. Remains of the outbuildings are less likely to survive, as these would have been less substantial structures. There are also some items which may relate to the historical occupation and agricultural use of the study area; including troughs, a harrow, a gatepost, and items discarded in the cistern.

The cistern and potential archaeological remains of the cottage are considered to have local heritage significance, as they are associated with WH Paling, the founder of Carrington Convalescent Hospital. However, the potential remains are unlikely to provide substantial additional information regarding the use of the property by Paling, or the development of the local area in the late nineteenth century. In addition, the cistern is unlikely to be considered a relic, as defined in the *Heritage Act 1977*, as it is a complete structure. Similarly, the moveable items located on the surface of the property, although possibly historic, are not considered relics under the Act.

Carrington Centennial Care proposes to redevelop the study area to accommodate seniors housing, a child care centre, a medical centre, and retail premises. This would form an expansion to the existing Carrington Centennial Care facility located

on the opposite side of Werombi Road. The proposed development is at concept master plan stage, and the exact extent of impact is therefore unknown. However, the cistern and potential cottage remains are within an area proposed for the development of a residential aged care facility. It is therefore probable that the proposed redevelopment will result in the complete removal of these features.

In general, archaeological relics are protected by the *Heritage Act 1977*, and no impact to relics is permitted without an Excavation Permit issued by the Heritage Branch of the Office of Environment and Heritage, on behalf of the Heritage Council of NSW. However, a number of standard Exceptions have been granted by the Heritage Council.

It is considered that impact to the potential archaeological remains of the cottage would be consistent with the following Exception:

1c a statement describing the proposed excavation demonstrates that evidence relating to the history or nature of the site, such as its level of disturbance, indicates that the site has little or no archaeological research potential.

Considering the local heritage significance of the identified historical features, and the low research potential of the archaeological remains, the following recommendations are made:

- An archival photographic record should be made of the remnant features and items related to the late nineteenth century occupation of the study area. Copies of this record should be lodged with the Heritage Branch, Camden Council, and Carrington Centennial Care archives or records.
- Once development plans have been drawn up, the level of impact to the potential archaeological remains of the former cottage should be assessed. If the development is likely to result in the complete or partial removal of the potential remains:
 - An Exception Notification should be submitted to the Heritage Branch of the Office of Environment and Heritage. No excavation should be undertaken until the Notification has been endorsed and returned by the Heritage Branch.
 - The location of the former cottage, so far as it will be impacted, should be archaeologically excavated and recorded. Should the investigation reveal remains of the former cottage, copies of the excavation report should be lodged with the Heritage Branch, Camden Council, and Carrington Centennial Care archives or records.
- Archaeological relics are protected by the *Heritage Act 1977*. Should any unexpected relics, or possible relics, be uncovered in the course of the

proposed development, work should cease in the vicinity of the find, and the Heritage Branch should be contacted for advice.

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Flood Risk Management Review

5 Smalls Road Grasmere

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Prepared for Michael Brown
Michael Brown Planning Strategies

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Table of Contents

1	Introduction	4
2	The Site	4
3	Proposed Development	6
4	Camden Council Flood Risk Management Policy	7
5	Flood Risk Assessment	10
5.1	Regional Flooding	10
5.2	Local Flooding	11
5.3	Potential Flood Impacts	11
6	Conclusion	11

1 Introduction

Cardno NSW/ACT has been commissioned by Michael Brown Planning Strategies to prepare a Flood Risk Management Review for a site located at 5 Smalls Road Grasmere. The site, which forms part of the Grasmere Carrington Centennial Care Estate, is proposed to be developed into seniors housing and related facilities.

Through the rezoning process Camden Council has requested a Gateway Determination under section 56 of the Environmental Planning Assessment Act 1979 ("EP&A Act"). The determination issued by the Minister of Planning and Infrastructure states that the planning proposal should proceed subject to a series of conditions.

This report will address Condition 9 of the Gateway Determination by assessing the proposed development's consistency with the Environmental Planning and Assessment Act S117 Direction 4.3 – Flood Prone Land. To address this condition Cardno has reviewed the following reports and documents:

- Floodplain Development Manual – The management of flood liable land – New South Wales Government, April 2005;
- Flood Risk Management Policy – Camden Council, April 2006;
- Engineering Design specifications – Camden Council, February 2009; and
- Carrington Aged Care Facility Flora & Fauna, Riparian and Bushfire Study – Offset Strategy Report – Eco Logical, November 2012.

2 The Site

Carrington Centennial Care Estate is located in Grasmere in the Camden Council Local Government Area (LGA), and comprises two areas north and south of Werombi Road as shown in Figure 1. The northern portion of the site (Lot 10, DP845472) is comprised of aged care and assisted living facilities surrounded by vegetated areas. The southern portion of the site (Lot 201, DP734620) is a grazing property surrounded by low density residential housing. This report will focus on the southern area which is proposed to be rezoned, and is referred to from here on as The Site.

The site is currently undeveloped with large areas of pastures and two smaller areas of remnant bushland. Typically, the topography of the area comprises gentle to moderate slopes and rolling hills with the site sitting on the top of the catchment. The majority of the site drains north west through two water courses with two smaller catchment areas draining north east and south west (refer Figure 2). The two water courses together with the area draining south west will discharge into Sickles Creek which ultimately discharges into the Nepean River approximately 3km to the north. The area draining north east will discharge into the existing large dam at the northern portion of the Carrington Centennial Care Estate.



Figure 1 - Site Location

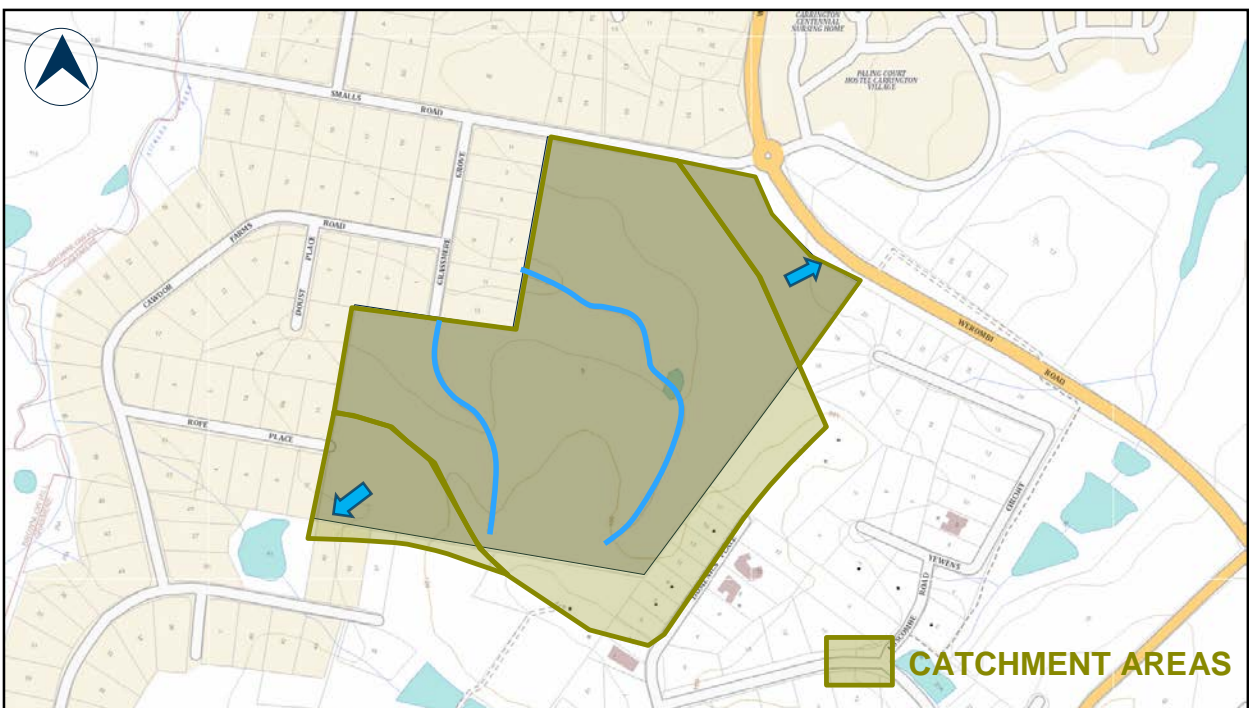


Figure 2- Catchment Areas

3 Proposed Development

As an extension to the existing Carrington Centennial Care Estate, the site is proposed to be developed into seniors housing, health services facility and related premises. It is understood the associated facilities will be available for use by the general public and as demonstrated in the concept masterplan (refer figure 3) will comprise the following:

- Residential aged care facility (RACF) that contains approximately 120 beds;
- Child care centre;
- Medical centre; and
- Café/restaurants/local shops.

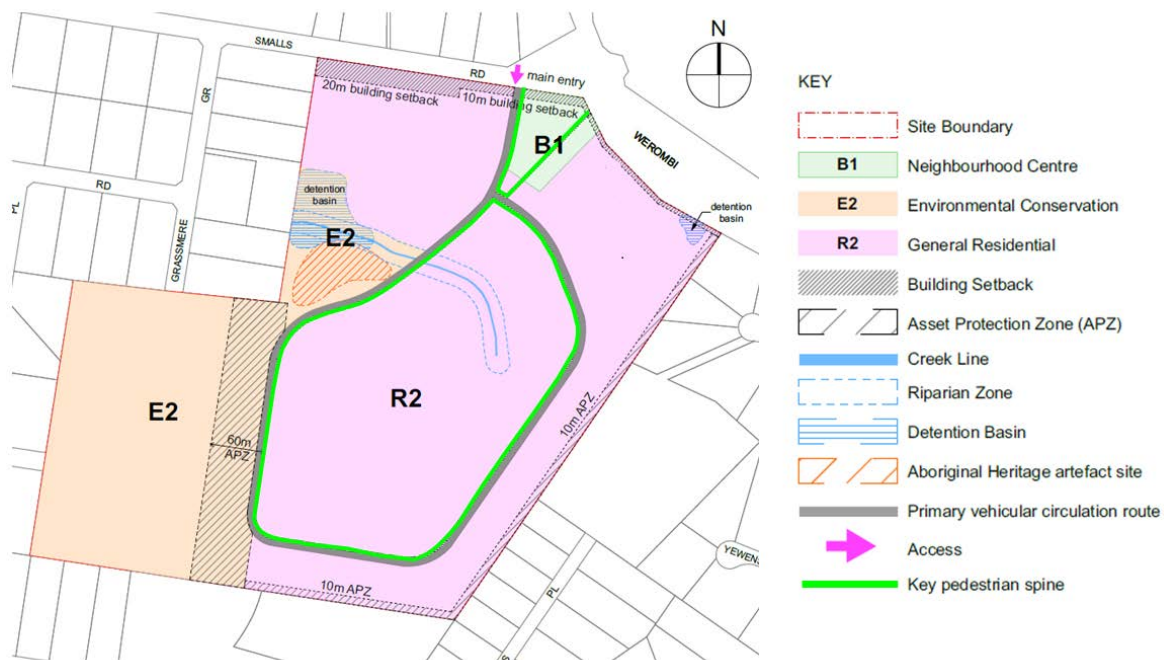


Figure 3 - Site Concept Masterplan (Source: Eco Logical Flora & Fauna, Riparian and Bushfire Study Offsets Strategy Report)

The initial assessment conducted by Eco Logical outlined in the Carrington Aged Care Facility Flora & Fauna, Riparian and Bushfire Study Offsets Strategy Report (Nov 2012), shows how the existing water courses will be incorporated into the proposed development.

The water course running south to north at the western portion of the site will be retained in the proposed conservation zone. The second watercourse which runs east to west through the middle of the site has been discussed in the report as having two distinct areas. The western end of the channel has some significant environmental value and will be maintained as part of the development. The eastern section of the watercourse has “little to no environmental value and appropriate to be removed for urban development”.

4 Camden Council Flood Risk Management Policy

Flood risk management planning and development procedures for all flood prone land within the Camden LGA are established by Council's Flood Risk Management Policy. This policy, which is aligned with the NSW Floodplain Development Manual, has the following main objectives:

- Inform applicants of Council's development controls in flood risk areas;
- Adopt Flood Planning Level (FPL);
- Alert the community to the extent of hazard of flooding in the Camden LGA;
- Reduce the impact of flooding on individual properties;
- Limit private and public liability resulting from flooding;
- Limit the potential risk to life and property resulting from flooding;
- Prevent non-compatible development in flood prone areas;
- Ensure development in flood prone areas is sympathetic with the character of the surrounding land uses and character;
- Ensure, where practical, that buildings and services required for evacuation and emergency needs are located above the Probable Maximum Flood (PMF); and
- Assess all proposed developments on flood prone properties on a 'merits based' approach taking account of social, economic, environmental and flooding considerations.

Camden Councils Flood Risk Management Policy has clear development guidelines which will support the site's masterplan. The initial step will be determining the hydraulic and hazard categories applicable to flood prone areas. These categories will be based on detailed information on flood behaviour for a range of flood events up to and including the PMF derived from available flood studies and future studies.

The NSW Floodplain Development Manual describes the three main hydraulic categories as follows:

- **Floodways** - Areas where a significant volume of water flows during floods and are often aligned with obvious natural channels. They are areas that, even if only partially blocked, would cause a significant increase in flood levels and/or a significant redistribution of flood flow, which may in turn adversely affect other areas. They are often, but not necessarily, the areas with deeper flow or the areas where the higher velocities occur
- **Flood Storages** - Parts of the floodplain that are important for the temporary storage of floodwaters during the passage of a flood. If the capacity of flood storage is substantially reduced, flood levels in nearby areas may rise and the peak discharge downstream may be increased. Substantial reduction of the capacity of a flood storage area can also cause a significant redistribution of flood flows.
- **Flood Fringe** - The remaining area of land affected by flooding, after floodway and flood storage areas have been defined.

Each hydraulic category is further divided into Hazard Categories (High Hazard and Low Hazard). These categories are defined in the NSW Floodplain Development Manual as:

- **High Hazard** – possible danger to personal safety; evacuation by trucks difficult; able-bodied adults would have difficulty in wading to safety; potential for significant structural damage to buildings;
- **Low hazard** – Should it be necessary truck could evacuate people and their possessions; able bodied adults would have little difficulty in wading to safety.

Once the flood affected areas within the site are categorized, all proposed development within these areas will follow the existing Development Guidelines Matrix described in Council's Flood Risk Management Policy.

Generally the proposed development will fall into two land use categories:

1. Subdivision which includes the residential aged care facilities and
2. Commercial which includes all the related facilities (child care, medical centre, cafés, restaurants and local shops).

A series of development control considerations for the flood affected areas are discussed in Council's development guidelines matrix. Subdivision and commercial areas works are generally not permitted in floodway. Works on flood storage, flood fringe and outer floodplain (Above 1% AEP Flood level to PMF) are regulated by the guidelines described in the matrix.

In summary the matrix will determine development conditions to Ground Levels, Evacuation & Access, Flood Affection, Flood Awareness and Building Management. Ground levels within the site allotments will be set to a minimum 300mm above the 1%AEP. For events higher than the 1%AEP evacuation strategies for pedestrians and cars will be considered. This strategy will define continuous safe routes to areas above the PMF. In addition the development will need to provide enough information to show that the existing flood storage is maintained and that there is no adverse impact upstream or downstream of the site. Figure 4 below shows all the detailed conditions which will be applicable to all flood prone land within the site.

DEVELOPMENT CONTROL CONSIDERATION	GROUND LEVEL OF FLOOD PRONE LAND																								
	OUTER FLOODPLAIN (ABOVE 1% AEP FLOOD LEVEL TO PMF)						FLOOD FRINGE (UP TO THE 1%AEP FLOOD LEVEL)						FLOOD STORAGE (UP TO THE 1%AEP FLOOD LEVEL)						FLOODWAY (UP TO THE 1%AEP FLOOD LEVEL)						
	SUBDIVISION	RESIDENTIAL	MINOR RESIDENTIAL ADDITIONS	COMMERCIAL OR INDUSTRIAL	RURAL (NON URBAN)	OPEN SPACE/RECREATION CRITICAL UTILITIES & PUBLIC FACILITIES	SUBDIVISION	RESIDENTIAL	MINOR RESIDENTIAL ADDITIONS	COMMERCIAL OR INDUSTRIAL	RURAL (NON URBAN)	OPEN SPACE/RECREATION CRITICAL UTILITIES & PUBLIC FACILITIES	SUBDIVISION	RESIDENTIAL	MINOR RESIDENTIAL ADDITIONS	COMMERCIAL OR INDUSTRIAL	RURAL (NON URBAN)	OPEN SPACE/RECREATION CRITICAL UTILITIES & PUBLIC FACILITIES	SUBDIVISION	RESIDENTIAL	MINOR RESIDENTIAL ADDITIONS	COMMERCIAL OR INDUSTRIAL	RURAL (NON URBAN)	OPEN SPACE/RECREATION CRITICAL UTILITIES & PUBLIC FACILITIES	
FLOOR LEVEL		1	2	1,3	1			1	1,2	1,3	1,2			1	1,2	1,3	1,2				1,2		1,2		
GROUND LEVEL	1,2,3	3			2,3	3	1,2,3	3			3	3	1,2,3	3			3	3					3	3	
STRUCTURAL SOUNDNESS		1	1	1	1	1		1	1	1	1	1		1	1	1	1	1			1		1	1	
EVACUATION & ACCESS	2,3	1,2		1,2,3	1,2		1,2,3	1,2		1,2,3	1,2	2	1,2,3	1,2		1,2,3	1,2	2					1,2	2	
FLOOD AFFECTATION	2	2	2	2	2	2	1,2,3	1,2	1,2	1,2	1,2	1,2	1,2,3	1,2,3	1,2,3	1,2,3	1,2,3	1,2,3					1,2,3	1,2,3	
FLOOD AWARENESS	1,2	1,2	2,3	1,2	1,2	2	1,2	1,2	2,3	1,2	1,2	2	1,2	1,2	2,3	1,2	1,2	2	1,2	1,2	2,3	1,2	1,2	2	
BUILDING MANAGEMENT	4			4			4	1,2,3		1,2,3,4	1,2,3	3,4	4	1,2,3		1,2,3,4	1,2,3	3,4					1,2,3	3,4	

NOT RELEVANT
 UNSUITABLE LAND USE

FLOOR LEVEL

1 Habitable floor levels are to be equal to or greater than the FPL. The FPL is the 1% AEP flood event level plus a freeboard of 600mm. See glossary for definitions of habitable rooms for residential/industrial/commercial situations

2 Notwithstanding the provisions of (1), Council may permit a once only minor addition of habitable floor area of up to 30m² of habitable floor area to an existing dwelling that has been lawfully constructed providing the work must not increase the number of bedrooms within the dwelling. A minor addition shall be allowed at the same level as the existing ground floor level of the dwelling. Council may consider applications for major additions of greater than 30m² providing the work must not increase the number of bedrooms within the dwelling. For a major addition the requirements of RESIDENTIAL apply, as well as Section 4.5 of this Policy.

3 Notwithstanding the provisions of (1), Council may approve additions to existing flood liable industrial/commercial buildings, allowing habitable floor levels below the FPL. The applicant must demonstrate that all practical measures will be taken to minimise the impact of flooding. In determining such an application, Council will assess the application on a merits based approach with consideration to nature of business, frequency and depth of flooding and whether the raising of floor levels will be out of character with adjacent land uses or streetscapes.

GROUND LEVEL

1 All allotments in future subdivisions are to be a minimum of 300mm above the 1% AEP flood level.

2 For rural residential subdivisions, all proposals must nominate a building envelope which is a minimum of 300mm above the 1% AEP flood level. The building envelope must have a minimum area of 500m² and a minimum one way dimension of 15m, suitable for the erection of a dwelling. The building envelope, and access from the road, must be free of any site constraints such as mainstream flood affectation, local overland flow paths, required sewage and stormwater disposal areas, setbacks and significant trees/vegetation.

3 Where on-site sewerage management systems are to be installed and operated, no portion of the sewerage management system (ie treatment tanks, pumps, etc) is permitted below the 1% AEP flood level. No portion of the irrigation area, absorption or evapo-transpiration area is permitted to be located below the 5% AEP flood level or within 40m of the top of bank of a watercourse.

STRUCTURAL SOUNDNESS

1 Engineers report required to prove that any portion of a structure can withstand the force of flood water, debris and buoyancy, up to and including the PMF flood event.

EVACUATION & ACCESS

1 Reliable safe access for pedestrians and vehicles required during the PMF flood event.

2 Consideration required regarding an appropriate flood evacuation strategy and pedestrian/vehicular access route during a flood event up to the PMF. In the case of amenities building, which are not used for any storage or which will not have any valuable chattels permanently located in them, this consideration will not apply.

3 The evacuation route from land above the 1% AEP flood level in each proposed allotment in future subdivisions must be contiguous to land not lower than the PMF flood level so as to allow evacuation in extreme events.

FLOOD AFFECTATION

1 Engineers report required to prove that the proposed development will not adversely increase flood affectation elsewhere

2 The impact of the proposed development on flooding elsewhere is to be considered

3 No net reduction in flood storage below the 1% AEP flood level

FLOOD AWARENESS

1 Restrictions to be placed on title advising of flood planning levels (floor level) required relative to the 1% AEP flood level

2 S149 certificates to notify affectation by the PMF flood

3 Restrictions to be placed on title advising that a once only addition of habitable area has been undertaken and no further addition of habitable floor area will be permitted.

BUILDING MANAGEMENT

1 Flood management plans are required where floor levels are below the FPL.

2 Applicant to demonstrate that there are adequate storage areas are available for hazardous materials and valuable goods and equipment at or above the FPL.

3 No external storage of material below the 1%AEP flood level which may be hazardous during flood events

4 Applicant to demonstrate that potential development as a consequence of a subdivision proposal can be undertaken in accordance with this policy

Figure 4 - Development Control Matrix

5 Flood Risk Assessment

5.1 Regional Flooding

In order to determine flood affected areas within the LGA, Council has conducted a series of flood studies for the major floodplains including the Nepean River and its tributaries and South Creek and its tributaries. Flood mapping and information derived from these studies currently indicates that the site sits outside all regional flood events up to and including the PMF (refer Figure 3).

However, from discussions with Council we understand that some of these areas are currently under review by new flood studies which may result in revised flood levels. In addition, to define flooding caused by the local catchment affecting the site's two water courses previously described in this report, detailed flood studies will be required to support the Development Application Process.

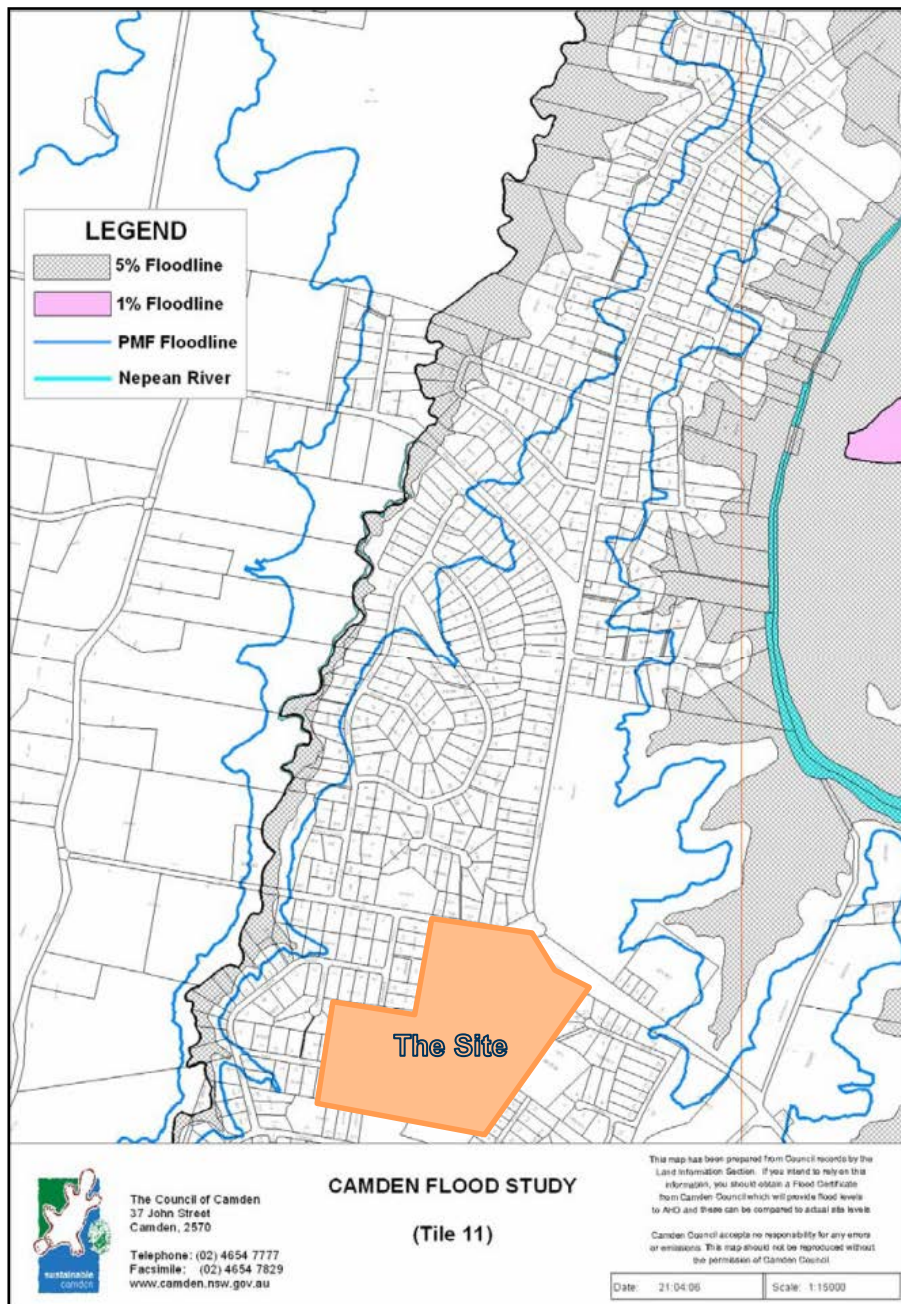


Figure 2 - Camden Flood Study Tile 11

5.2 Local Flooding

Camden Council Flood Risk Management Policy states that properties affected by local overland flow or major drainage not identified in their flood mapping will still be subjected to the same development controls and policies previously discussed.

As part of the rezoning process the local catchments will be assessed to determine any flood impact due to local water courses. The assessment will inform the design of proposed channels and riparian corridor as well as determine the following:

- The hydraulic category of the site;
- Any potential increase in flood levels or hazard;
- Proposed land forming; and
- Design flood levels of proposed buildings.

5.3 Potential Flood Impacts

To avoid any potential flood impact downstream of the site, the total flow rate and concentrations of runoff in the post development case will be no more than existing pre development flows. Post development flows will be controlled by the adoptions of on-site detention (OSD) storages.

Detention basins will be designed to comply with Camden Council Design Guidelines in particular the following:

- The maximum discharge from the post development site shall not exceed the pre development flows for all storms up to and including the 1% AEP; and
- All habitable floor levels shall be a minimum of 300 mm above the 1% AEP.

6 Conclusion

As requested by the Minister of Planning and Infrastructure through a Gateway Determination under section 56 of the Environmental Planning Assessment Act 1979 ("EP&A Act") this report discuss the proposed rezoning and future development of 5 Smalls Road, Grasmere in light of Section 117 Direction 4.3 – Flood Prone Land.

This report highlights the process in which flood prone land will be defined and later ensured that any development within these areas will be consistent with the principles of the NSW Floodplain Development Manual 2005 and local LEP.

In summary, based on our review of the site and the applicable flood planning policies, the site is suitable for the proposed development, subject to detailed analysis and planning of flood risk and construction of suitable mitigations measures.

**TRAFFIC AND ACCESS ASSESSMENTS
TO ACCOMPANY
A DEVELOPMENT APPLICATION**

FOR

**REZONING AND MASTERPLAN TO
PROVIDE RESIDENTIAL AND
INDEPENDENT LIVING**

**ON
SMALLS ROAD
GRASMERE**

Ref. 11131r2

November 2011
Revised December 2013 and April 2016

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CONTENTS

1.0	INTRODUCTION	1
2.0	SITE DETAILS	2
2.1	Site Location	2
2.2	Site Description and Existing Development	2
2.3	Adjoining Development	2
3.0	DEVELOPMENT PROPOSAL	3
3.1	Development Concept	3
3.2	Road Layout and Guideline Standards	4
3.3	Council Guidelines	5
3.4	Access	6
4.0	THE EXISTING SITUATION	8
4.1	Access Roads	8
4.2	Existing Intersection	8
4.3	Existing Traffic Volumes	8
	4.3.1 Average Daily Traffic	8
	4.3.2 Peak Hour Volumes	8
4.4	Existing Service Levels	9
5.0	TRAFFIC GENERATION AND IMPLICATIONS	11
5.1	Trip Generation	11
5.2	Post Development Traffic Impacts	13
	5.2.1 Trip Assignments	13
	5.2.2 Traffic Impacts	13
5.3	Service Levels	13
5.4	Car Parking and Servicing	14
	5.4.1 Car Parking	14
	5.4.2 Servicing and Manoeuvring	15
6.0	CONCLUSIONS	16

ILLUSTRATIONS

Figure 1 and 2 Site Location

APPENDICES

Appendix 1 Masterplan Layout
 Appendix 2 Traffic Counts

1.0 INTRODUCTION

This report has been prepared as a Traffic Impact Assessment on behalf of the applicant "Carrington Centennial Care Board" to accompany a proposed rezoning and development masterplan for staged residential development to be located off Smalls Road at Grasmere.

A draft masterplan by Jackson Teece dated 20 December 2011 has been prepared for the site and updates the masterplan prepared by Ingham Planning Pty Ltd in May 2006 which provided a long-term vision for the development of the Werombi Road (Carrington Campus Site) and Smalls Road Site for a comprehensive range of aged care and support facilities to meet the unique heritage and environmental qualities of the land holdings in conjunction with the existing planning and environmental legislation at the time.

The longer term proposal detailed in this application involves a residential development comprising:

- 112 independent living units;
- 95 apartment units; and
- 120 bed aged care facility.

In addition the non residential uses (conceptual at this stage) comprise:-

- Administration Centre
- A 30 place child care facility;
- Medical services (including specialist medical rooms for visiting doctors);
- Neighbouring shops; and
- Café/restaurant

Access is proposed from Smalls Road at 2 locations and from Werombi Road left in/out only at 1 location.

These assessments have been prepared in accordance with the aims and objectives of State Environmental Planning Policy Infrastructure ISEPP and in accordance with the guidelines and procedures for traffic generating developments as prepared by the Traffic Authority of NSW 2002 Ver 2.0.

This report also references the planning controls of Camden Council and considers the following matters:

- The site and adjoining road layouts;
- Vehicular access to Smalls Road and Werombi Road;
- Public transport provisions;
- Traffic Generation; and
- Future traffic impacts and car parking requirements.

This study is based on the site master plan and the site layouts accompanying this proposal.

2.0 SITE DETAILS

2.1 Site Location

The subject land, approximately 27 hectares in area, is located on the western side of Werombi Road and south side of Smalls Road of Camden township with access from Smalls Road west of the Werombi Road roundabout.

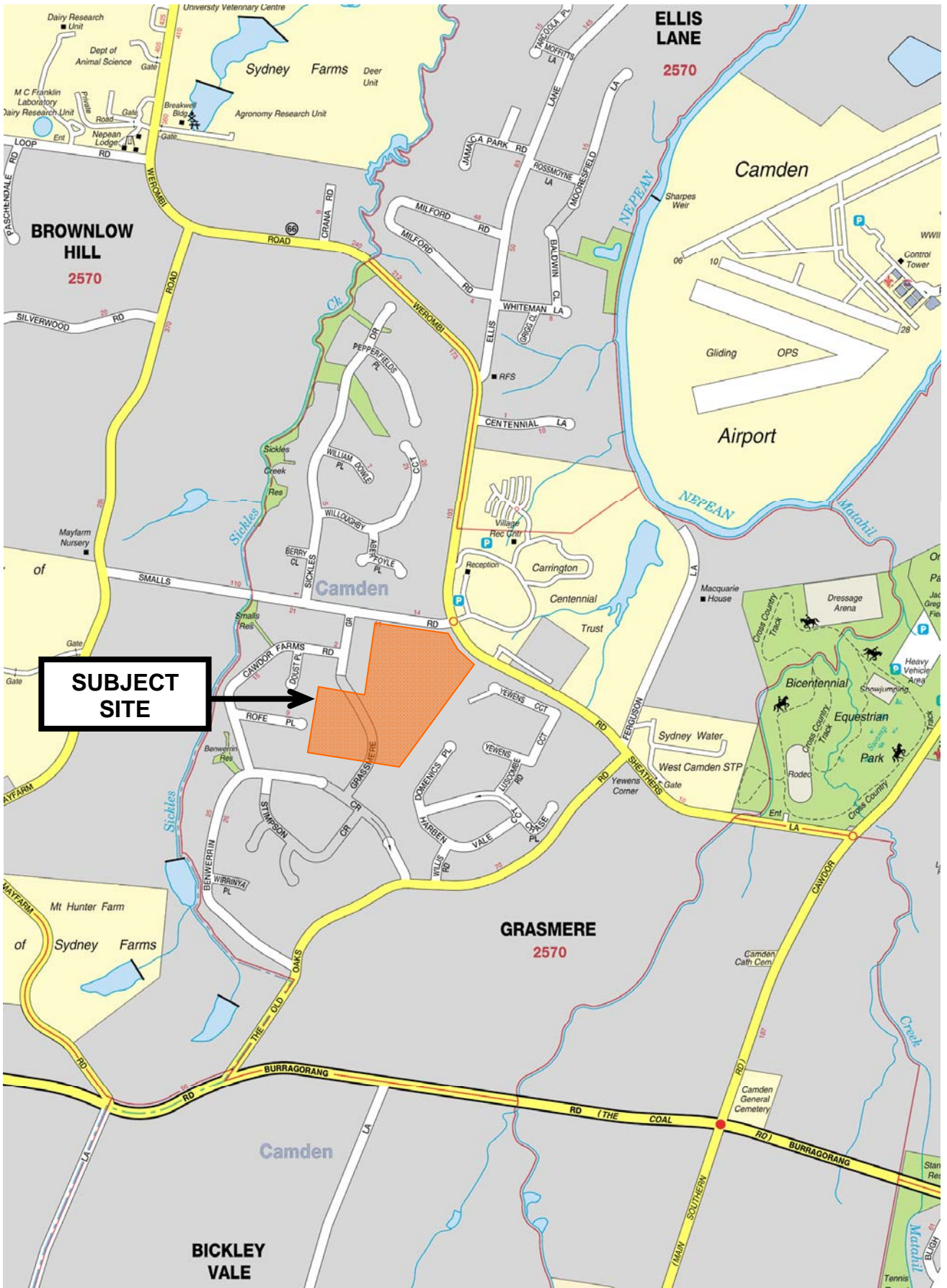
The location of the land in the regional context is shown in **Figure 1** and in the local context in **Figure 2**.

2.2 Site Description and Existing Development

Except for minor rural improvements the subject land is described as Lot 10 in DP 845472 (No. 90 Werombi Road Grasmere) the site is currently vacant with a moderate level of scrub and light tree vegetation.

2.3 Adjoining Development

Adjoining developments consist primarily of historic Carrington Village and buildings to the north east and newer freestanding residential and rural residential dwellings to the north, west and south.



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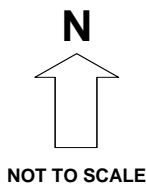
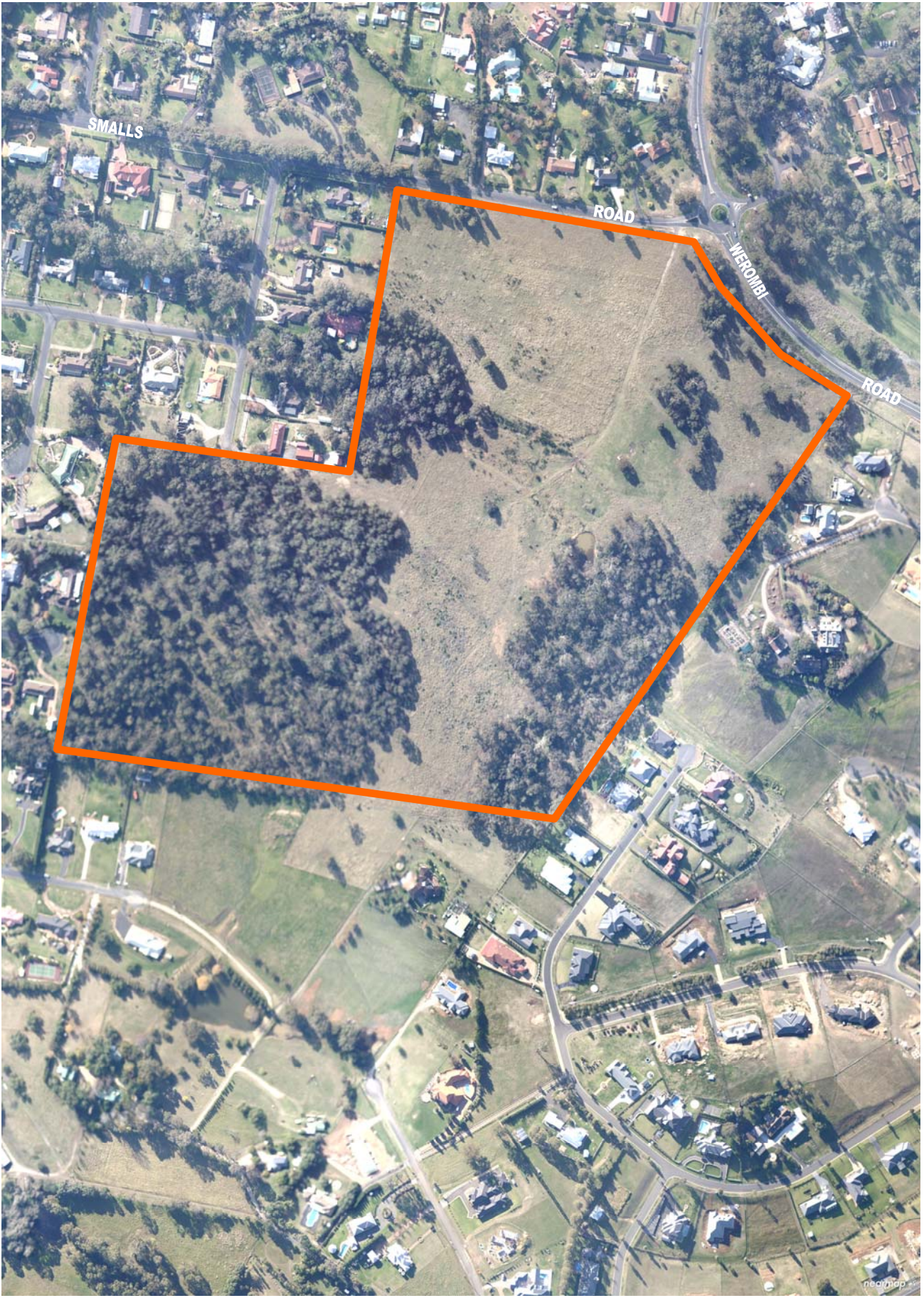


FIGURE 1
 WEROMBI ROAD AND SMALLS ROAD,
 GRASMERE
SITE LOCATION
 JOB NO. 11131



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NOT TO SCALE

FIGURE 2
WEROMBI ROAD AND SMALLS ROAD,
GRASMERE

SUBJECT SITE

JOB NO. 11131

3.0 DEVELOPMENT PROPOSAL

3.1 Development Concept

The concept Masterplan is designed to integrate the proposed development elements:

Vehicular connectivity

The plan proposed a single access point along Smalls Road, (one main entrance) and an additional entry from Werombi Road is proposed primarily as a service access.

Pedestrian connectivity

A key feature of the concept Masterplan is the north-south pedestrian walkway “spine” through the centre of the site. This connects to a pedestrian walk proposed at the Carrington Centennial Care sites to the north of Werombi Road providing a continuous link to facilities and amenities between the sites to their residents. The option for pedestrian link is to be made via a proposed pedestrian crossing at/or to the south of the Werombi Road Smalls Road roundabout.

However advice from Carrington Management is that the two sites will operate as two separate self sufficient villages with all services (excluding laundry and food for the RACF) operating independently allowing the two villages to develop their own identify and culture.

In the longer term and subject to further negotiation between the applicant, Camden Council and the RMS the opportunity to remove the existing roundabout and control the intersection with traffic control signals including signalised pedestrian facilities may be realised, subject to warrants and agreements by the above stakehold authorities, but this infrastructure upgrade is not part of the Masterplan proposal.

Built Form

The Masterplan proposal involves a mix of medium density units and an aged care residential facility as shown in the concept layout plan (**Appendix 1**) prepared by Jackson Teece Architects.

The ultimate staged development proposes a mix of medium density (1 to 2 bedroom) and residential dwelling, non residential proposals including:

- 112 independent living units;
- 95 apartment units;
- 120 bed aged car facility;
- 30 place child care facility;
- Administration centre;
- Small shop group including pharmacy;
- Specialist medical rooms; and
- Café/restaurant.

3.2 Road Layout and Guideline Standards

The internal and private road layout is proposed generally in accordance with Landcom and Council Subdivision Guidelines where a hierarchical road network is essential to maximise road safety, residential amenity and legibility. Access roads within the site will serve a distinct set of residential functions and will be designed accordingly. The design will convey to motorists the predominant low volume, low speed function of the internal streetscape.

Within the site the access roads will reflect a role in the road hierarchy by its visual appearance and related physical design standards. Access roads will differ in alignment and design standard according to the volume they are intended to carry, the desirable traffic speeds and other factors.

The number of turning movements at junctions that a resident or visitor is required to undertake to reach a particular address within the development will be minimised.

Low speeds are desirable in lightly trafficked access roads to protect pedestrian/cyclists and allow them to share the accessway with vehicles

Existing bus services to the Grasmere area may be extended from Smalls Road into the site to loop around inside the proposed development. Future bus stops will be within acceptable walking distance of all dwellings.

The aims of the proposed road system within the site are to achieve:

- Convenient and safe access to all allotments for pedestrians, vehicles and cyclists.
- Safe, logical and hierarchical transport linkages with existing street system.
- Appropriate access, emergency and service vehicles.
- A quality product that minimises maintenance costs.
- An opportunity for street landscaping.
- Convenient parking for visitors.

Landcom via Amcord Guidelines recommends the following standards for the various classes of roads in new subdivisions including private roads.

RECOMMENDED GUIDELINES

Road Classification	Recommended Pavement Width	Max. Flow veh/day	Max. Road Length	Max. Dwellings Served
Access Place	3.5 – 3.7 metres	300	100 metres	30
Local Access Streets (A)	5.0 – 5.5 metres	1000	250 metres	100
Local Access Streets (B)	5.5 or 7.0 metres	2000	N/A	200
Collector Road	7.0 – 7.5 metres	3000	N/A	N/A

These roads should in terms of amenity and road safety afford the following environmental capacity/performance standards.

Road Class	Road Type	Desirable Max. Speed (km/hr)	Desirable Max. Peak Hour Volume (veh/hr)
Local	Accessway (with footpath) Street	25	100
	Street	40	200 environmental goal
	Street	40	300 maximum
Collector	Street	50	300 environmental goal
	Street	50	500 maximum

The development proposes an access street design and carriageway width (including kerbing) in accordance with Council's sub division code, i.e. AADT <500 veh/day and carriageway width nominally 5.0m to 6.0m.

The proposed intersections are generally located in such a way that:

- The streets intersect at right angles;
- The landform allows clear sight distance on each of the approach legs of the intersection;
- The minor street intersects the convex side of the major street;
- The vertical grade lines at the intersection do not impose undue driving difficulties;
- The vertical grade lines at the intersection will allow for any direct surface drainage;
- Adequate stopping and sight distances will be provided for horizontal and vertical curves at all intersections.

3.3 Council Guidelines

Camden Council DCP 2011 for residential subdivisions indicates amongst other development standards that:-

The provision of a road system within a subdivision is to be designed so as to achieve the following aims:

- Provide convenient and safe access to all allotments for pedestrians, vehicles and cyclists;
- Provide safe, logical and hierarchical transport linkages with the existing street system;
- Provide appropriate access for buses, emergency and service vehicles;
- Provide for a quality product that minimises maintenance costs;
- Provide a convenient way for public utilities;
- Provide an opportunity for street landscaping;
- Provide convenient parking for visitors;
- Have appropriate regard for the climate, geology and topography of the area.

- **Car Parking**

1. The parking requirements for normal levels of activity associated with any land use should be accommodated on site in accordance with Camden Council's Development Control Plan 2011 and development conditions.
2. All off street parking should be designed in accordance with Development Control Plan 2006 Part D Car Parking which indicates:

SEPP (Seniors Living) 2004:	
(a) Crown Development	1 space per 5 dwellings
(b) Private Self Contained Units	0.5 spaces for dwellings less than 55m ² 0.85 spaces for dwellings between 55m ² and 85m ² 1 spaces for dwellings greater than 85m ²
(c) Nursing/Hostel Convalescent Homes	1 per 10 beds; plus 1 per 2 employees; plus 1 ambulance space

• **Bus Routes**

1. Council will normally identify bus routes. Roads identified as bus routes shall be designed to local distributor standards.

TABLE 3.1

BUS BAY AND BUS SHELTER REQUIREMENTS

Road	Carriageway Width (Min)	Stops (Spacings)	Bays
Access	9m	400 metre*	Single
Collector	11m	400 metre	Shelters ** and Bays
Local Distributor	13m	400 metre	Shelters ** and Bays

* Loop Roads with single entry/exit only require stops and bays on one side road.

** Shelters are subject to Council's requirements.

3.4 Access

The site is accessed via Werombi Road, thence Smalls Road. A two way access and pedestrian access to the site is proposed from Smalls Road at location approximately 80 metres west of Werombi Road.

Left turn only in/out service vehicle access is also proposed from Werombi Road at the southern end of the site. It is likely that a central median will be required at this access to provide a right turn movement. Pedestrian only access is proposed to Werombi Road at the northern end of the site utilising the existing roundabout splitter islands as a refuge to cross Werombi Road to the east side of Werombi Road and Carrington Village.

A hierarchy of entry points is provided to ensure efficient access into the development. The main entry into the site is off Smalls Road, from the access point nearest to the Werombi Road, Smalls Road roundabout. This access point is flanked by village centre type development and uses the act as gateways into the site to establish a clearly legible entrance into the development. This main entry provides direct access to the village hub of the development consisting of the commercial and community uses of the site.

A second, primarily service related access point is proposed along Werombi Road. This would provide service access to the Residential Aged Care Facility and commercial/community uses in the village hub avoiding the need for service traffic to travel through the village centre.

- **Vehicular circulation**

The road network consists of a hierarchy of routes to establish a legible and efficient means of circulation through the site. The roads from the two Smalls Road access points are the primary vehicular circulation routes in the development. These intersect near the centre of the site to form a primary circulation loop that services the southern half of the site.

In the northern half of the site a network of secondary vehicular circulation routes link the primary routes to service the development in this area, establishing a highly permeable road network. In the southern half of the site, secondary spur routes off the primary route services the residential community. Together, the primary and secondary routes provide a highly permeable road network with access to the various uses within the site and the residential communities.

- **Pedestrian Links**

A very low level of pedestrian interaction between the two, Carrington Campus site and Smalls Road site can be expected for the aged care support facilities i.e. medical, pharmaceutical etc and some of the small shop group services i.e. café/restaurant, to this end a future the pedestrian link between the two sites is an option via a pedestrian crossing/refuge over Werombi Road at or south of the Smalls Road roundabout, with a view to replacing the roundabout with traffic signals in the longer term subject to warrants and RMS concurrence.

4.0 THE EXISTING SITUATION

4.1 Access Roads

Werombi Road is an undivided 2 lane semi rural road speed zoned to 60km/h and having a 6.5m – 7.0 metre sealed pavement and includes 1-2 metre gravel shoulders. The existing alignments approaching Smalls Road are curved and undulating with moderate to good sight lines.

Smalls Road is also a 2 lane undivided semi rural road speed zoned to 60km/hr and having a sealed pavement 6.3m to 6.5 metre and 0.5 to 1.0 metre gavel shoulders. The existing alignment west of Werombi Road are generally level and straight.

4.2 Existing Intersection

The existing 4 way intersection of Werombi Road, Smalls Road and “Carrington Village” access is conditioned by a one lane roundabout (10 metre annulus).

4.3 Existing Traffic Volumes

4.3.1 Average Daily Traffic

Existing average Monday – Friday daily traffic volumes on Werombi Road and Smalls Road adjacent to the site are:

- Werombi Road NB 3,000veh/day + SB 3,000veh/day 2 way 6,000veh/day
- Smalls Road EB 750veh/day + WB 750veh/day 2 way 1,500veh/day

4.3.2 Peak Hour Volumes

Recent AM and PM peak and Saturday peak hour traffic counts undertaken for the assessment are attached in **Appendix 2** and summarised as follows:

TABLE 4.1

PEAK HOURLY VOLUMES – NOVEMBER 2011

Day	Time	Werombi Road			Smalls Road		
		Northb'd veh/hr	Southb/d veh/hr	2 way veh/hr	Eastb'd veh/hr	Westb'd veh/hr	2 way veh/hr
Wed	7-8am	159	274	433	87	30	117
	8-9am	153	350	503	87	34	121
Sat	11am-noon	250	262	512	67	81	148
	noon-1pm	253	236	489	49	68	117
Wed	3.30-4.30pm	293	217	510	45	89	134
	4.30-5.30pm	302	243	545	44	85	129

In summary, two way peak hour volumes on Werombi Road are in the order of 500 to 550 vehicles per hour and 120 to 150 vehicles per hour on Smalls Road.

4.4 Existing Service Levels

To assess the existing operation of the Werombi Road and Smalls Road roundabout intersections during peak hours, a SIDRA analysis has been undertaken using the existing geometry for the intersections and the peak hour volumes shown in **Appendix 2** above.

SIDRA is an RMS approved traffic simulation model and assesses the operational performance of intersections under traffic signal, roundabout or sign control. Criteria for interpreting Level of Service (LOS) modelling results are reproduced below Table 4.2.

For intersections controlled by Give Way or Stop signs, satisfactory intersection performance is achieved where no individual movement (highest movement delay) through the intersection experiences a delay greater than 40 secs.

The results of the modelling are shown below and reveal that the existing Tee intersection currently operates at a satisfactory Level of Service (LOS) 'A' operation with acceptable average vehicle delays.

TABLE 4.2

**EXISTING PEAK HOUR SIDRA ANALYSIS FOR
WEROMBI ROAD AND SMALLS ROAD INTERSECTION
ROUNDBOUT CONTROL – YEAR 2011**

		AM Peak				PM Peak				Saturday Midday			
		DS	LOS	AVD	95% back of Vehicles	DS	LOS	AVD	95% back of Vehicles	DS	LOS	AVD	95% back of Vehicles
South: Werombi Rd													
1	L	0.122	A	6.7	0.7	0.220	A	6.7	1.3	0.191	A	6.7	1.1
2	T	0.122	A	6.6	0.7	0.220	A	6.6	1.3	0.191	A	6.6	1.1
3	R	0.122	A	11.0	0.7	0.218	A	11.0	1.3	0.191	A	11.0	1.1
Approach		0.122	A	7.4	0.7	0.220	A	6.8	1.3	0.191	A	7.0	1.1
East: Carrington Village													
4	L	0.024	A	9.1	0.1	0.037	A	8.4	0.2	0.036	A	8.6	0.2
5	T	0.024	A	8.2	0.1	0.038	A	7.5	0.2	0.036	A	7.7	0.2
6	R	0.024	A	12.6	0.1	0.037	A	12.0	0.2	0.035	A	12.1	0.2
Approach		0.024	A	9.6	0.1	0.037	A	8.7	0.2	0.036	A	8.8	0.2
North: Werombi Rd													
7	L	0.273	A	8.0	1.7	0.175	A	7.5	1.0	0.186	A	7.8	1.1
8	T	0.276	A	7.3	1.7	0.170	A	6.9	1.0	0.188	A	7.1	1.1
9	R	0.274	A	11.6	1.7	0.171	A	11.2	1.0	0.191	A	11.3	1.1
Approach		0.276	A	7.5	1.7	0.170	A	7.1	1.0	0.188	A	7.2	1.1
West: Smalls Rd													
10	L	0.090	A	8.2	0.5	0.049	A	8.6	0.2	0.069	A	8.4	0.3
11	T	0.088	A	7.1	0.5	0.050	A	7.6	0.2	0.070	A	7.4	0.3
12	R	0.090	A	11.6	0.5	0.049	A	12.1	0.2	0.069	A	11.9	0.3
Approach		0.090	A	11.1	0.5	0.049	A	11.3	0.2	0.069	A	11.5	0.3
All Vehicles		0.276	A	8.2	1.7	0.220	A	7.3	1.3	0.191	A	7.7	1.1

Where:
 LS Level of Service
 DS Degree of Saturation
 AVD Average Vehicle Delay in seconds
 95% 95% back of queuing vehicles

LOS	Roundabouts	Highest Movement Delay (in seconds)
A	Good	0-14
B	Acceptable delays and spare capacity	15-28
C	Satisfactory but accident study required	29-42
D	Near capacity and accident study required	43-56
E	At capacity and requires other Control Delays Mode	57-70
F	Unsatisfactory and requires other Control Mode	>70

The above SIDRA output summary indicates the existing intersection operates at a LOS A with minimal vehicle delays.

4.5 Road Safety

A review of Police records for the above intersection did not reveal any recorded accidents at the site in the last three years to end 2009. The intersection approach and exit sight lines satisfy Austroad and RTA standards for intersections and stopping sight distances within a 60km/h zone. Accordingly, it is our view that there are no current sight distance constraints or road safety issues with the existing intersection.

Existing sight lines at the proposed Smalls Road (and Werombi Road) access locations satisfy the minimum Austroad requirements SISD for 60km/h speed environments.

4.6 Public Transport

Werombi Road and adjoining Smalls Road are both access corridors linking to Camden and the broader Macarthur road system. Bus connections are available along Werombi Road providing access to Camden and Narellan town centres.

5.0 TRAFFIC GENERATION AND IMPLICATIONS

5.1 Trip Generation

Trip generation for the proposal has been determined in order to assess the likely impact of the development on road safety and network efficiency. The proposal's trip generation rate can also be utilised to assess the impact on the adjoining intersections.

The Roads and Traffic Authority's (RTA) Guide to Traffic Generating Developments (2002 Ver 2.2) provides the following trip generation rates for aged, disabled person and medium density residential developments:

Housing for Aged and Disabled Persons

Rates

- *Daily vehicle trips = 1-2 per dwelling*
- *Evening peak hour vehicle trips = 0.1-0.2 per dwelling*

Factors

These figures at the lower end of the above rates are based on research conducted by the Authority. This research concentrates on subsidised developments (often run by religious organisations). Generation rates of resident funded developments are often greater, as indicated at the higher end of the range.

The primary level of traffic generation is more likely to relate to staff trips at shift changeover times i.e. 7.00-9.00am and 2.30-4.00pm and able bodied resident trips 8.30-9.30am (outbound) and 4.00-5.00pm (inbound).

Child Care Facilities

The RTA's Guide also suggests that Long Day Care Centres have the following traffic generation rates and characteristics during the AM and PM peak periods:

- *0.8 trips/child in the 2 hour AM arrival period between 7.00am – 9.00am;*
- *0.7 trips/child in the 2 hour PM pick up period between 4.00pm – 6.00pm;*
- *Vehicle occupancy of 1.2 children per vehicle.*
- *Mode split by car – 94%*

Adopting the RTA traffic generation rates and assuming that a 60% proportion of trips will occur over the 1 hour in the 8-9am and 5-6pm periods then the peak hour traffic generation of the proposed Long Day Care Centre (30 children) will be:

- 17 arrivals and 17 departures in the AM peak hour (i.e. 14 trips); and
- 6 arrivals and 7 departures in the PM peak hour (i.e. 13 trips).

NB: This assumes that no traffic trips relate to staff working on site.

Admin Centre

The Administration Centre is primarily an ancillary use (and would include admin staff operating the aged care facility) to other site activities but assuming a floor area of 200m² and the RTA Traffic Generation rates of 2 PM peak hour trips per 100m² of floor area.

Then the PM peak should realise 4 peak hour trips.

Neighbourhood Shops

Shopping centre surveys undertaken in the 1990's for the RTA/RMS indicated that car based trips to similar centres had reduced by about 15% since the late 1970's and that trips per 100m² GLFA of a centre reduced as the centre size increased for centres over 10,000m². Assuming a moderate floor area of 300m² GLFA for the shops i.e. newsagency, pharmacy, bakery, milk bar, hair dresser etc, then we would adopt an evening peak hour traffic generation rate of 16.0 trips per 100m² GLFA.

This would equate to 48 trips per hour in the evening peak i.e. 24 in + 24 out.

Specialist Medical Rooms

RTA data is not available for specialist medical rooms, but assuming the rooms (3) are open for appointments 8.00am to 6.00pm Monday to Friday and each appointment duration is 15 minutes, then each room can be expected to turn over up to 5 patients per hour 8.00am to 6.00pm.

With three specialist rooms available, this would evaluate to 30 vehicle trips per hour if every patient is a single vehicle self drive trip i.e. 15 arrivals and 15 departures/trips.

Café/Restaurant

The café is specifically for use of on site residents, workers and visitors and to this end ancillary to all other site uses and activities and unlikely to generate any additional traffic (apart from servicing) in its own right.

TABLE 5.1

PROJECTED TRAFFIC GENERATION LEVELS
Vehicle trips per hour

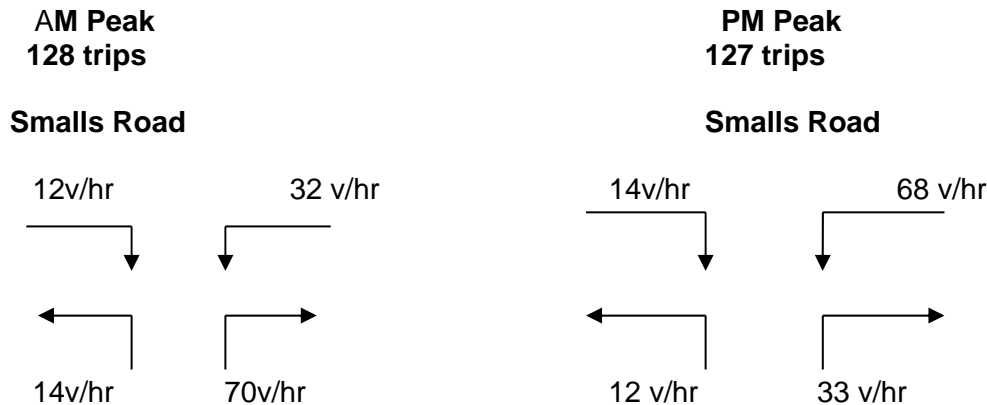
Use	Time					
	6.30-7.30am	7.30-8.30am	8.30-9.30am	2-3pm	3-4pm	4-5pm
112 Independent Living Units	12	17	22	12	17	22
95 Apartment Units	10	15	19	10	15	19
120 Bed Aged Care	4	8	4	4	8	4
Child Care	5	14	11	10	13	7
Administration	1	1	4	0	1	4
Shops	10	20	38	38	48	48
Specialist Medical	Closed	15	30	30	30	30
Café/Restaurant	-	-	-	-	-	-
TOTALS	42veh/hr	90 veh/hr	128 veh/hr	104veh/hr	119veh/hr	127 veh/hr

The projected AM/PM peak hours are 8.30-9.30am with 128 vehicles per hour and 4.00-5.00pm with 127 vehicles per hour entering or leaving site including staff, service vehicle, and visitor trips.

5.2 Post Development Traffic Impacts

5.2.1 Trip Assignments

An assignment of projected design (peak) hour traffic movements to/from the site via Smalls Road is shown below.



The post development traffic assignments, (including service vehicles) equates to about 2 vehicle movement every 60 seconds in the AM peak and 2 vehicle movement every 60 seconds in the PM peak (i.e. 127 trips) realising a an increase in existing AM and PM traffic generation levels on Smalls Road. But not beyond any capacity or environmental threshold.

5.2.2 Traffic Impacts

Two way vehicular access and egress to/from the on site car parking area is proposed from Smalls Road. The additional post development peak traffic flows are expected to be (at a maximum) an additional +128 trips per hour AM and 127 trips per hour PM over existing traffic levels.

Two additional vehicle movements (every 60 seconds AM and PM) upon Smalls Road or to/from adjacent intersections is unlikely to compromise existing traffic accessibility or road safety entering or exiting the site at any time.

5.3 Service Levels

The impact of up to 128 additional, (inbound plus outbound), vehicle movements from Smalls Road or at adjoining intersections commensurate with AM and PM is unlikely to realise any noticeable traffic impact on existing favourable traffic service levels on Smalls Road or at the Werombi Road roundabout access intersections during these times as shown in Table 4.2.

5.4 Car Parking and Servicing

5.4.1 Car Parking

On site car parking for residents, staff and visitors is proposed about the site in marked spaces in accord with Council's Car Parking DCP 2011 Part B, allocated as follows:

- **Residential**

- Independent living units	112 x .85	= 95.2 spaces
- Apartment units	95 x .5	= 47.5 spaces
- Visitor Spaces (say 1 space per 10 units)		= 20.7 spaces
	Sub-total	= 164 spaces

- **Aged Care**

- Staff		= 10 spaces
- Visitors		= 10 spaces
	Subtotal	= 20 spaces

- **Child Care**

- Staff		= 5 spaces
- Parent/Carers		= 3 spaces
	Subtotal	= 8 spaces

- **Administration**

- Staff		= 4 spaces
- Visitors		= 2 spaces
	Subtotal	= 6 spaces

- **Specialist Medical**

- Staff		= 3 spaces
- Visitors/Patients		= 9 spaces
	Subtotal	= 12 spaces

- **Café/shops**

- Staff		= 6 spaces
- Visitors		= 6 spaces
	Subtotal	= 12 Spaces

A total of **216** on site car parking spaces, displaced about the site is envisaged in the masterplan.

It is our view that for developments requiring 3 or more off-street parking spaces, parking areas should be designed to enable all vehicles to enter and leave a site in a forward direction with sufficient room provided so as to require only one reversing movement to enter or leave a parking space. These objectives in our view will be achieved with this proposal.

5.4.2 Servicing and Manoeuvring

Service vehicle traffic generated by the proposed development is to be confined to business hours. It is intended that only medium rigid, service and courier vehicles will access this site. A review of the road network serving the site and the traffic conditions on that road network indicates that the majority of trucks traffic generated by the proposed development and up to 90% will approach/depart the site via Werombi Road.

Truck manoeuvring areas to access service areas and the like should be adequate in width. This width should allow all MRV vehicles (to 8.8 metres), to drive into manoeuvring aiseways and reverse into the loading dock areas provided and depart the site in a forward direction to Werombi Road or Smalls Road as required.

No loading or unloading should occur within the on-site access driveway nor the entrance to the site. Operations within the property regarding loading and unloading and waiting to unload will be no different from similar strata residential unit developments. All loading and/or unloading will occur within the site. There is no possibility of queuing occurring at Werombi or Smalls Road due to loading and unloading.

Traffic arrivals and departures can generally be expected at 20% northbound and 80% southbound to/from Werombi.

6.0 CONCLUSIONS

This report examines the traffic access and parking impacts of a rezoning and Masterplan proposal to provide residential independent living and aged care facilities on a land parcel located on the south west corner of Werombi Road and Smalls Road at Grasmere. The use is permissible with the consent of Camden Council.

The development proposal envisages 112 independent living units, 95 apartment units and 120 bed aged care facilities. The proposal also includes a 30 place child care facility, administration centre (including specialist medical consulting rooms) small shop group and ancillary cafe for residents, staff and visitors.

Car parking for 216 cars on site for residents, staff and visitors is proposed.

The village hub of the development is located along the Werombi Road, Smalls Road frontage is in the vicinity of the roundabout. It would have a street presence suitable to its function and location in this semi rural setting and be seen in relation to other existing aged care related facilities to the north of the site along Werombi Road.

The village hub is the focal centre for the proposed retirement community with the proposed commercial and community uses creating a more active public realm. It would also service the surrounding communities fostering social interaction between the proposed aged car community and the surrounding residential community helping to integrate the different communities. The range of public uses and circulation patterns encourage passive surveillance.

An assessment of the proposal based on RMS Guidelines and similar use surveys indicates that there will be a maximum (indicative) traffic generation level of up to 128 vehicle trips per hour during the morning peak hours and 127 vehicle trips per hour in the afternoon peak hour, i.e. about two additional vehicles every 60 seconds in peak times.

Peak hour traffic generation varies from 40 vh/hr 7.30am – 8.30am to 26 vh/hr 2.00pm – 3.00pm commensurate with shift change over times.

A low level of pedestrian activity between the two Carrington sites and across Werombi Road can be expected, in this regard a future marked foot crossing and/or pedestrian refuge (depending on actual demand and warrants) is an option but not proposed over Werombi Road south of the existing roundabout at Smalls Road at this time. In the longer term and subject to negotiation between RMS, Council and the applicant the Smalls Road roundabout may be replaced with traffic signals depending on future warrants.

The existing traffic conditions on the adjoining Werombi Road and Smalls Road network surrounding the site are acceptable with a Level of Service A operation in Monday – Friday peak hours and will remain at these acceptable service levels post development.

The access to and from the site is proposed from a single two way entry/exit driveway on Smalls Road some 80 metres west of Werombi Road. The entry/exit access will generally operate as one way in before shift changes and one way out after shift changes.

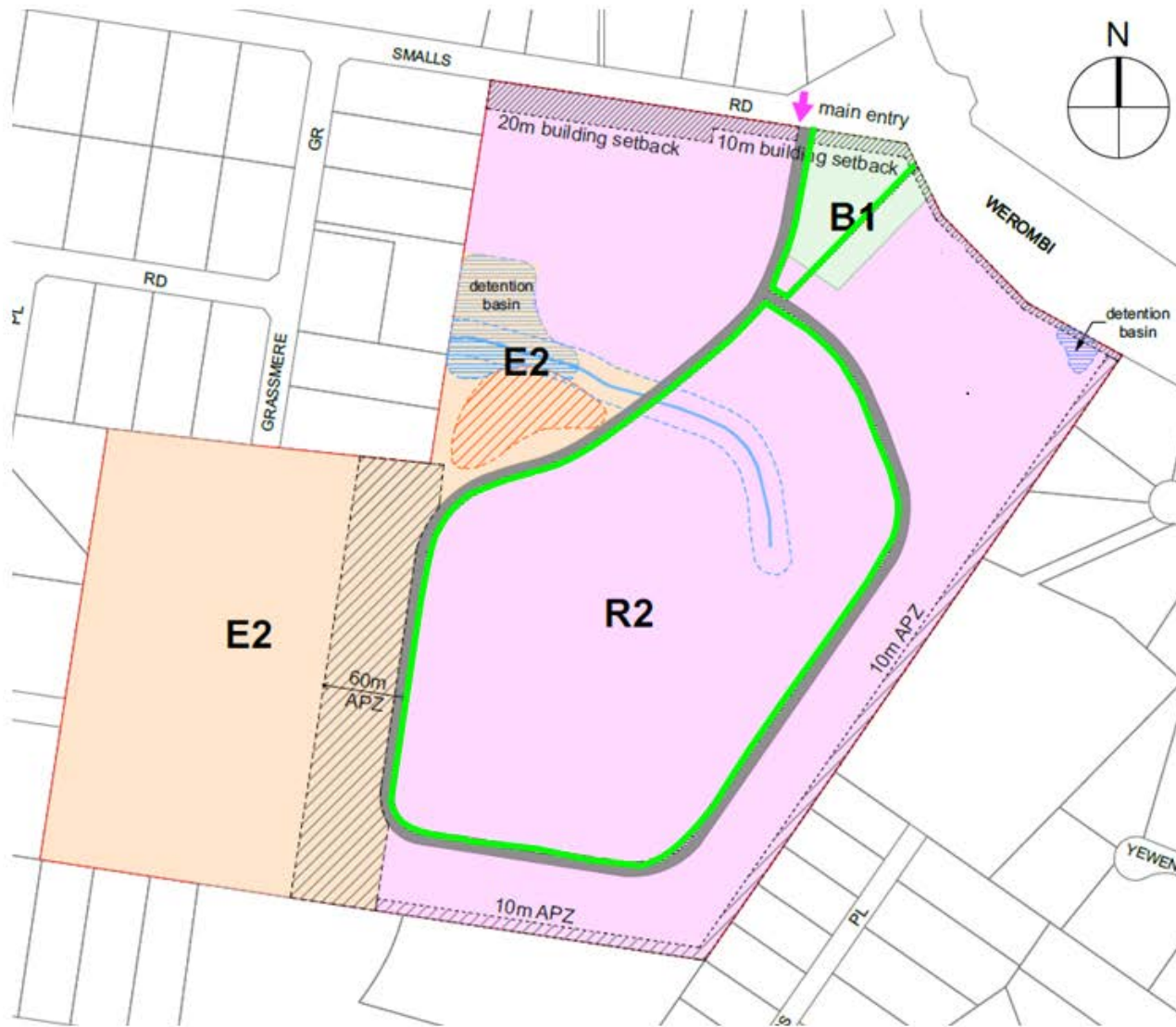
The sight distances at the access location is good and meets Austroad requirements for the 60km/h operating speed limits within the precinct and on the adjoining access roads.

The proposal in terms of vehicle manoeuvring provisions is proposed in accordance with AS 2890.1.


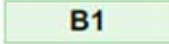
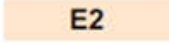
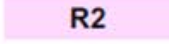









In concluding the proposal is a 7 day use moderate traffic generating development in shoulder peaks and in off peak times and will result in minimal traffic and or pedestrian impacts on the adjacent road network. The proposal will have adequate car parking available in the proposed on site car park areas and the internal low volume vehicle circulation and manoeuvring for the 85th% design vehicle is considered to be satisfactory.

The impact of increased traffic and car parking demands as a result of the proposal on the adjoining area or road system during overlapping peak hours is minimal and within the available capacity of the site and access road network.

It is **recommended** that Camden Council approve this application so that the proposed seniors living and aged care facilities can proceed.



KEY

-  Site Boundary
-  **B1** Neighbourhood Centre
-  **E2** Environmental Conservation
-  **R2** General Residential
-  Building Setback
-  Asset Protection Zone (APZ)
-  Creek Line
-  Riparian Zone
-  Detention Basin
-  Aboriginal Heritage artefact site
-  Primary vehicular circulation route
-  Access
-  Key pedestrian spine

Joray Enterprises Pty Ltd

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Telephone and Fax : (02) 9624 5472

1 Ajax Place Blacktown, NSW 2148

Count Number J11-117

Client TRANSPORT & URBAN PLANNING

Count Date Wednesday 09 November 2011

Location CARRINGTON CENTENNIAL TRUST/ WEROMBI RD/SMALLS RD

Suburb GRASMERE

Weather Fine

Job Number

Comments

Vehicle Movements

Lights

Time Period	NORTH			EAST			SOUTH			WEST			Total
	Werombi Rd			Carrington C.T.			Werombi Rd			Smalls Rd			
	L	T	R	L	T	R	L	T	R	L	T	R	
7:00 - 7:15	0	40	0	2	0	0	4	18	5	1	0	12	82
7:15 - 7:30	2	39	4	6	0	0	4	16	3	3	0	21	98
7:30 - 7:45	0	40	0	2	0	2	8	23	7	2	0	21	105
7:45 - 8:00	1	50	2	3	0	0	6	29	13	5	0	20	129
8:00 - 8:15	0	46	0	3	0	1	3	23	4	7	0	17	104
8:15 - 8:30	2	52	0	1	0	1	4	24	10	0	1	23	118
8:30 - 8:45	2	64	1	5	0	0	10	16	7	2	0	14	121
8:45 - 9:00	3	78	1	5	1	1	3	31	7	1	0	21	152
Period Ending	10	409	8	27	1	5	42	180	56	21	1	149	909

Time Period	NORTH			EAST			SOUTH			WEST			Total
	Werombi Rd			Carrington C.T.			Werombi Rd			Smalls Rd			
	L	T	R	L	T	R	L	T	R	L	T	R	
7:00 - 8:00	3	169	6	13	0	2	22	86	28	11	0	74	414
7:15 - 8:15	3	175	6	14	0	3	21	91	27	17	0	79	436
7:30 - 8:30	3	188	2	9	0	4	21	99	34	14	1	81	456
7:45 - 8:45	5	212	3	12	0	2	23	92	34	14	1	74	472
8:00 - 9:00	7	240	2	14	1	3	20	94	28	10	1	75	495

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Count Date Wednesday 09 November 2011

Location CARRINGTON CENTENNIAL TRUST/ WEROMBI RD/SMALLS RD

Suburb GRASMERE

Weather Fine

Job Number

Comments

Heavy

Time Period	NORTH			EAST			SOUTH			WEST			Total
	Werombi Rd			Carrington C.T.			Werombi Rd			Smalls Rd			
	L	T	R	L	T	R	L	T	R	L	T	R	
7:00 - 7:15	0	1	0	0	0	0	1	8	0	1	0	0	11
7:15 - 7:30	0	4	0	0	0	0	0	5	1	1	0	0	11
7:30 - 7:45	0	4	0	0	0	0	1	1	0	0	0	0	6
7:45 - 8:00	0	8	0	1	0	0	0	6	0	0	0	0	15
8:00 - 8:15	0	2	0	0	0	0	0	3	0	0	0	0	5
8:15 - 8:30	0	4	0	0	0	0	0	2	0	1	0	0	7
8:30 - 8:45	0	9	1	0	0	0	0	2	0	0	0	0	12
8:45 - 9:00	0	5	0	1	0	0	1	2	1	0	0	0	10
Period Ending	0	37	1	2	0	0	3	29	2	3	0	0	77

Time Period	NORTH			EAST			SOUTH			WEST			Total
	Werombi Rd			Carrington C.T.			Werombi Rd			Smalls Rd			
	L	T	R	L	T	R	L	T	R	L	T	R	
7:00 - 8:00	0	17	0	1	0	0	2	20	1	2	0	0	43
7:15 - 8:15	0	18	0	1	0	0	1	15	1	1	0	0	37
7:30 - 8:30	0	18	0	1	0	0	1	12	0	1	0	0	33
7:45 - 8:45	0	23	1	1	0	0	0	13	0	1	0	0	39
8:00 - 9:00	0	20	1	1	0	0	1	9	1	1	0	0	34

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 Location CARRINGTON CENTENNIAL TRUST/ WEROMBI RD/SMALLS RD Suburb GRASMERE
 Weather Fine Job Number

Comments

Combined

Time Period	NORTH			EAST			SOUTH			WEST			Total
	Werombi Rd			Carrington C.T.			Werombi Rd			Smalls Rd			
	L	T	R	L	T	R	L	T	R	L	T	R	
7:00 - 7:15	0	41	0	2	0	0	5	26	5	2	0	12	93
7:15 - 7:30	2	43	4	6	0	0	4	21	4	4	0	21	109
7:30 - 7:45	0	44	0	2	0	2	9	24	7	2	0	21	111
7:45 - 8:00	1	58	2	4	0	0	6	35	13	5	0	20	144
8:00 - 8:15	0	48	0	3	0	1	3	26	4	7	0	17	109
8:15 - 8:30	2	56	0	1	0	1	4	26	10	1	1	23	125
8:30 - 8:45	2	73	2	5	0	0	10	18	7	2	0	14	133
8:45 - 9:00	3	83	1	6	1	1	4	33	8	1	0	21	162
Period Ending	10	446	9	29	1	5	45	209	58	24	1	149	986

Time Period	NORTH			EAST			SOUTH			WEST			Total
	Werombi Rd			Carrington C.T.			Werombi Rd			Smalls Rd			
	L	T	R	L	T	R	L	T	R	L	T	R	
7:00 - 8:00	3	186	6	14	0	2	24	106	29	13	0	74	457
7:15 - 8:15	3	193	6	15	0	3	22	106	28	18	0	79	473
7:30 - 8:30	3	206	2	10	0	4	22	111	34	15	1	81	489
7:45 - 8:45	5	235	4	13	0	2	23	105	34	15	1	74	511
8:00 - 9:00	7	260	3	15	1	3	21	103	29	11	1	75	529

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Suburb GRASMERE

Weather Fine

Job Number

Comments

Pedestrian Movements

All Pedestrians

	NORTH	EAST	SOUTH	WEST	
Time Period	Werombi Rd	Carrington C.T.	Werombi Rd	Smalls Rd	Total
7:00 - 7:15	0	0	0	0	0
7:15 - 7:30	0	2	0	0	2
7:30 - 7:45	0	2	0	0	2
7:45 - 8:00	0	0	0	0	0
8:00 - 8:15	0	0	0	0	0
8:15 - 8:30	0	0	0	0	0
8:30 - 8:45	0	0	0	0	0
8:45 - 9:00	0	0	0	0	0
Period Ending	0	4	0	0	4

	NORTH	EAST	SOUTH	WEST	
Time Period	Werombi Rd	Carrington C.T.	Werombi Rd	Smalls Rd	Total
7:00 - 8:00	0	4	0	0	4
7:15 - 8:15	0	4	0	0	4
7:30 - 8:30	0	2	0	0	2
7:45 - 8:45	0	0	0	0	0
8:00 - 9:00	0	0	0	0	0

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Count Number J11-117 Client TRANSPORT & URBAN PLANNING Count Date Wednesday 09 November 2011

Location CARRINGTON CENTENNIAL TRUST/ WEROMBI RD/SMALLS RD Suburb GRASMERE

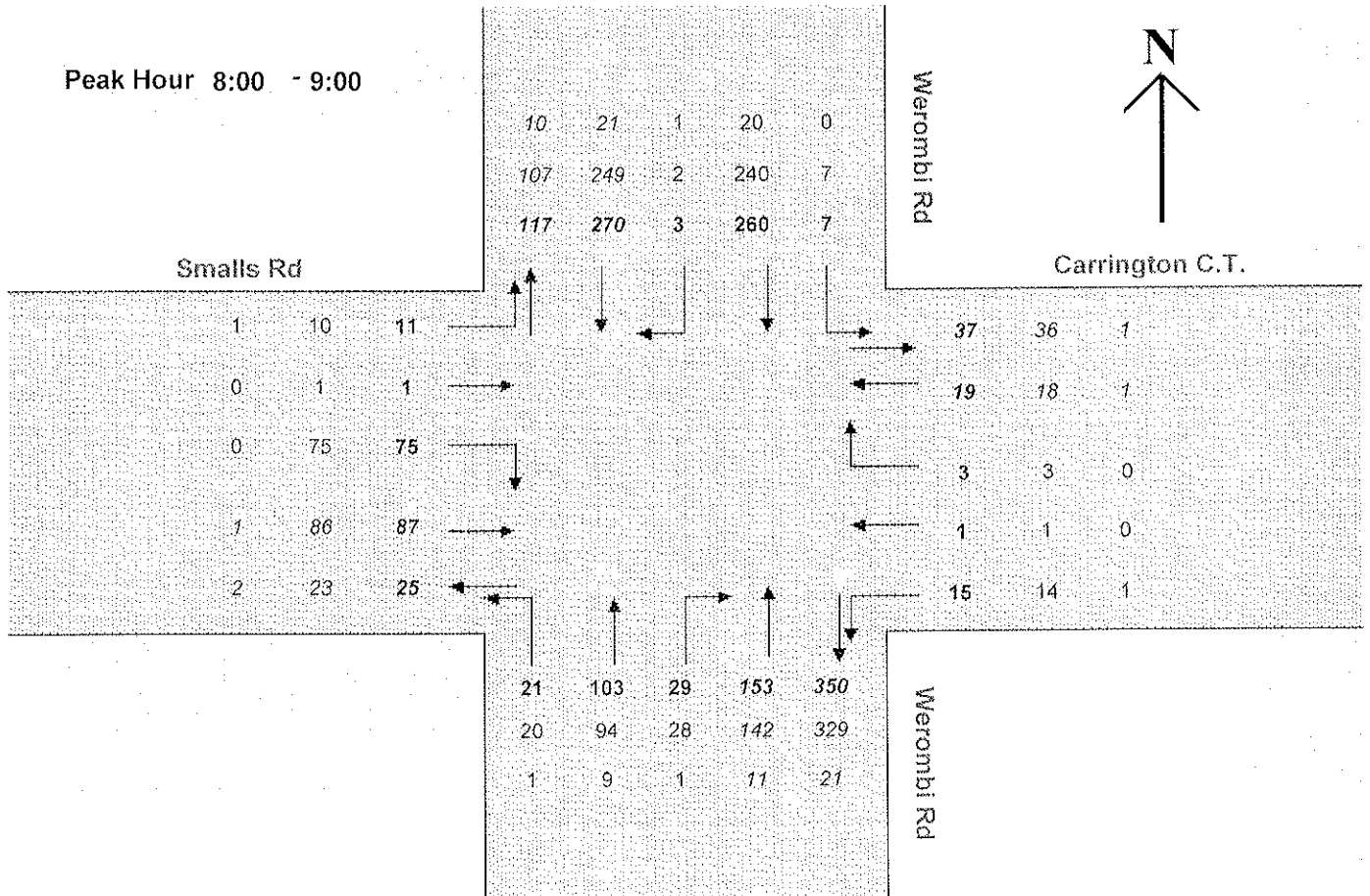
Weather Fine Job Number

Comments

Vehicle Class	Werombi Rd			Carrington C.T.			Werombi Rd			Smalls Rd			Total
	L	T	R	L	T	R	L	T	R	L	T	R	
Lights	7	240	2	14	1	3	20	94	28	10	1	75	495
Heavy	0	20	1	1	0	0	1	9	1	1	0	0	34
Total	7	260	3	15	1	3	21	103	29	11	1	75	529

PEDESTRIAN	Werombi Rd	Carrington C.T.	Werombi Rd	Smalls Rd	Total
All Pedestrians	0	0	0	0	0
Total	0	0	0	0	0

Peak Hour 8:00 - 9:00



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Count Date Wednesday 09 November 2011

Location CARRINGTON CENTENNIAL TRUST/ WEROMBI RD/SMALLS RD

Suburb GRASMERE

Weather Fine

Job Number

Comments

Vehicle Movements

Lights

Time Period	NORTH			EAST			SOUTH			WEST			Total
	Werombi Rd			Carrington C.T.			Werombi Rd			Smalls Rd			
	L	T	R	L	T	R	L	T	R	L	T	R	
15:30 - 15:45	0	33	1	12	1	1	17	45	6	3	0	11	130
15:45 - 16:00	0	40	0	9	0	0	18	41	8	2	0	8	126
16:00 - 16:15	0	36	2	5	0	0	21	46	6	1	1	6	124
16:15 - 16:30	0	32	1	4	2	1	21	43	2	0	0	8	114
16:30 - 16:45	0	45	2	16	0	0	16	50	2	1	0	7	139
16:45 - 17:00	1	38	2	2	0	0	18	48	4	3	1	10	127
17:00 - 17:15	0	49	2	5	0	1	24	59	3	2	0	6	151
17:15 - 17:30	1	41	0	6	0	2	17	49	2	2	0	11	131
Period Ending	2	314	10	59	3	5	152	381	33	14	2	67	1042

Time Period	NORTH			EAST			SOUTH			WEST			Total
	Werombi Rd			Carrington C.T.			Werombi Rd			Smalls Rd			
	L	T	R	L	T	R	L	T	R	L	T	R	
15:30 - 16:30	0	141	4	30	3	2	77	175	22	6	1	33	494
15:45 - 16:45	0	153	5	34	2	1	76	180	18	4	1	29	503
16:00 - 17:00	1	151	7	27	2	1	76	187	14	5	2	31	504
16:15 - 17:15	1	164	7	27	2	2	79	200	11	6	1	31	531
16:30 - 17:30	2	173	6	29	0	3	75	206	11	8	1	34	548

Joray Enterprises Pty Ltd

ABN 80 061 513 933

Telephone and Fax : (02) 9624 5472

1 Ajax Place Blacktown, NSW 2148

Count Number J11-117

Client TRANSPORT & URBAN PLANNING

Count Date Wednesday 09 November 2011

Location CARRINGTON CENTENNIAL TRUST/ WEROMBI RD/SMALLS RD

Suburb GRASMERE

Weather Fine

Job Number

Comments

Heavy

Time Period	NORTH			EAST			SOUTH			WEST			Total
	Werombi Rd			Carrington C.T.			Werombi Rd			Smalls Rd			
	L	T	R	L	T	R	L	T	R	L	T	R	
15:30 - 15:45	0	3	0	0	0	0	0	2	0	1	0	1	7
15:45 - 16:00	0	4	0	0	0	0	0	3	0	1	0	0	8
16:00 - 16:15	0	1	1	0	0	0	3	5	0	1	0	1	12
16:15 - 16:30	0	3	0	0	0	0	1	5	0	0	0	0	9
16:30 - 16:45	0	2	0	0	0	0	2	4	0	0	0	1	9
16:45 - 17:00	0	1	0	0	0	0	0	0	0	0	0	0	1
17:00 - 17:15	0	2	0	0	0	0	1	1	0	0	0	0	4
17:15 - 17:30	0	1	1	0	0	0	0	2	0	0	0	0	4
Period Ending	0	17	2	0	0	0	7	22	0	3	0	3	54

Time Period	NORTH			EAST			SOUTH			WEST			Total
	Werombi Rd			Carrington C.T.			Werombi Rd			Smalls Rd			
	L	T	R	L	T	R	L	T	R	L	T	R	
15:30 - 16:30	0	11	1	0	0	0	4	15	0	3	0	2	36
15:45 - 16:45	0	10	1	0	0	0	6	17	0	2	0	2	38
16:00 - 17:00	0	7	1	0	0	0	6	14	0	1	0	2	31
16:15 - 17:15	0	8	0	0	0	0	4	10	0	0	0	1	23
16:30 - 17:30	0	6	1	0	0	0	3	7	0	0	0	1	18

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Count Date Wednesday 09 November 2011

Location CARRINGTON CENTENNIAL TRUST/ WEROMBI RD/SMALLS RD

Suburb GRASMERE

Weather Fine

Job Number

Comments

Combined

Time Period	NORTH			EAST			SOUTH			WEST			Total
	Werombi Rd			Carrington C.T.			Werombi Rd			Smalls Rd			
	L	T	R	L	T	R	L	T	R	L	T	R	
15:30 - 15:45	0	36	1	12	1	1	17	47	6	4	0	12	137
15:45 - 16:00	0	44	0	9	0	0	18	44	8	3	0	8	134
16:00 - 16:15	0	37	3	5	0	0	24	51	6	2	1	7	136
16:15 - 16:30	0	35	1	4	2	1	22	48	2	0	0	8	123
16:30 - 16:45	0	47	2	16	0	0	18	54	2	1	0	8	148
16:45 - 17:00	1	39	2	2	0	0	18	48	4	3	1	10	128
17:00 - 17:15	0	51	2	5	0	1	25	60	3	2	0	6	155
17:15 - 17:30	1	42	1	6	0	2	17	51	2	2	0	11	135
Period Ending	2	331	12	59	3	5	159	403	33	17	2	70	1096

Time Period	NORTH			EAST			SOUTH			WEST			Total
	Werombi Rd			Carrington C.T.			Werombi Rd			Smalls Rd			
	L	T	R	L	T	R	L	T	R	L	T	R	
15:30 - 16:30	0	152	5	30	3	2	81	190	22	9	1	35	530
15:45 - 16:45	0	163	6	34	2	1	82	197	18	6	1	31	541
16:00 - 17:00	1	158	8	27	2	1	82	201	14	6	2	33	535
16:15 - 17:15	1	172	7	27	2	2	83	210	11	6	1	32	554
16:30 - 17:30	2	179	7	29	0	3	78	213	11	8	1	35	566

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Count Date Wednesday 09 November 2011

Location CARRINGTON CENTENNIAL TRUST/ WEROMBI RD/SMALLS RD

Suburb GRASMERE

Weather Fine

Job Number

Comments

Pedestrian Movements

All Pedestrians

Time Period	NORTH	EAST	SOUTH	WEST	Total
	Werombi Rd	Carrington C.T.	Werombi Rd	Smalls Rd	
15:30 - 15:45	0	0	0	0	0
15:45 - 16:00	0	0	0	0	0
16:00 - 16:15	0	0	0	0	0
16:15 - 16:30	0	1	0	0	1
16:30 - 16:45	2	3	0	0	5
16:45 - 17:00	0	0	0	0	0
17:00 - 17:15	0	0	0	0	0
17:15 - 17:30	0	0	0	0	0
Period Ending	2	4	0	0	6

Time Period	NORTH	EAST	SOUTH	WEST	Total
	Werombi Rd	Carrington C.T.	Werombi Rd	Smalls Rd	
15:30 - 16:30	0	1	0	0	1
15:45 - 16:45	2	4	0	0	6
16:00 - 17:00	2	4	0	0	6
16:15 - 17:15	2	4	0	0	6
16:30 - 17:30	2	3	0	0	5

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Location CARRINGTON CENTENNIAL TRUST/ WEROMBI RD/SMALLS RD

Suburb GRASMERE

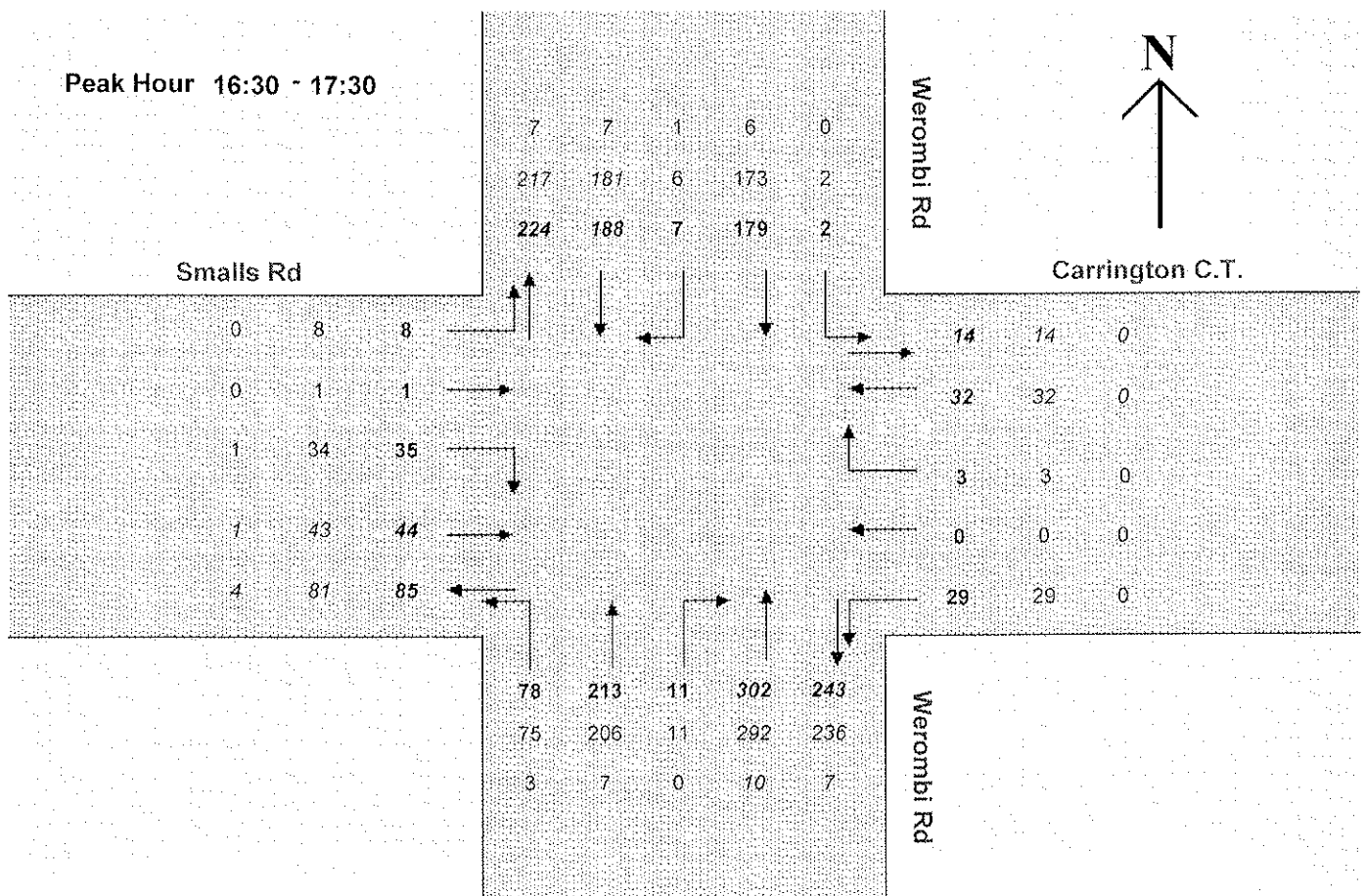
Weather Fine

Job Number

Comments

Vehicle Class	Werombi Rd			Carrington C.T.			Werombi Rd			Smalls Rd			Total
	L	T	R	L	T	R	L	T	R	L	T	R	
Lights	2	173	6	29	0	3	75	206	11	8	1	34	548
Heavy	0	6	1	0	0	0	3	7	0	0	0	1	18
Total	2	179	7	29	0	3	78	213	11	8	1	35	566

PEDESTRIAN	Werombi Rd	Carrington C.T.	Werombi Rd	Smalls Rd	Total
All Pedestrians	2	3	0	0	5
Total	2	3	0	0	5



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Client TRANSPORT & URBAN PLANNING

Count Date Saturday 12 November 2011

Location

CARRINGTON CENTENNIAL TRUST/WEROMBI RD/SMALLS RD

Suburb GRASMERE

Weather

Fine

Job Number

Comments NO PEDESTRIANS DURING SURVEY

Vehicle Movements

Lights

Time Period	NORTH			EAST			SOUTH			WEST			Total
	Werombi Rd			Carrington C.T.			Werombi Rd			Smalls Rd			
	L	T	R	L	T	R	L	T	R	L	T	R	
11:00 - 11:15	0	40	2	6	0	0	17	41	4	0	1	15	126
11:15 - 11:30	2	52	0	3	1	1	18	47	3	4	0	15	146
11:30 - 11:45	1	39	2	5	0	0	19	32	4	1	0	23	126
11:45 - 12:00	0	44	1	6	0	0	18	34	9	1	0	9	122
12:00 - 12:15	0	46	1	12	1	1	21	47	8	0	0	10	147
12:15 - 12:30	0	31	3	8	0	0	12	48	2	1	0	13	118
12:30 - 12:45	0	50	0	1	0	1	11	32	5	0	1	10	111
12:45 - 13:00	0	36	3	5	2	0	11	46	5	1	0	11	120
Period Ending	3	338	12	46	4	3	127	327	40	8	2	106	1016

Time Period	NORTH			EAST			SOUTH			WEST			Total
	Werombi Rd			Carrington C.T.			Werombi Rd			Smalls Rd			
	L	T	R	L	T	R	L	T	R	L	T	R	
11:00 - 12:00	3	175	5	20	1	1	72	154	20	6	1	62	520
11:15 - 12:15	3	181	4	26	2	2	76	160	24	6	0	57	541
11:30 - 12:30	1	160	7	31	1	1	70	161	23	3	0	55	513
11:45 - 12:45	0	171	5	27	1	2	62	161	24	2	1	42	498
12:00 - 13:00	0	163	7	26	3	2	55	173	20	2	1	44	496

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Count Date Saturday 12 November 2011

Location

CARRINGTON CENTENNIAL TRUST/WEROMBI RD/SMALLS RD

Suburb GRASMERE

Weather

Fine

Job Number

Comments

NO PEDESTRIANS DURING SURVEY

Heavy

Time Period	NORTH			EAST			SOUTH			WEST			Total
	Werombi Rd			Carrington C.T.			Werombi Rd			Smalls Rd			
	L	T	R	L	T	R	L	T	R	L	T	R	
11:00 - 11:15	0	0	0	0	0	0	1	0	0	0	0	0	1
11:15 - 11:30	0	1	0	0	0	0	1	1	0	0	0	0	3
11:30 - 11:45	0	2	0	0	0	0	0	0	0	0	0	0	2
11:45 - 12:00	0	2	0	0	0	0	1	0	0	0	0	0	3
12:00 - 12:15	0	0	0	0	0	0	0	0	0	0	0	0	0
12:15 - 12:30	0	0	0	1	0	0	0	0	0	0	0	0	1
12:30 - 12:45	0	0	0	0	0	0	1	1	0	0	0	2	4
12:45 - 13:00	0	0	0	0	0	0	2	1	0	0	0	0	3
Period Ending	0	5	0	1	0	0	6	3	0	0	0	2	17

Time Period	NORTH			EAST			SOUTH			WEST			Total
	Werombi Rd			Carrington C.T.			Werombi Rd			Smalls Rd			
	L	T	R	L	T	R	L	T	R	L	T	R	
11:00 - 12:00	0	5	0	0	0	0	3	1	0	0	0	0	9
11:15 - 12:15	0	5	0	0	0	0	2	1	0	0	0	0	8
11:30 - 12:30	0	4	0	1	0	0	1	0	0	0	0	0	6
11:45 - 12:45	0	2	0	1	0	0	2	1	0	0	0	2	8
12:00 - 13:00	0	0	0	1	0	0	3	2	0	0	0	2	8

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Weather

Fine

Job Number

Comments

NO PEDESTRIANS DURING SURVEY

Combined

Time Period	NORTH			EAST			SOUTH			WEST			Total
	Werombi Rd			Carrington C.T.			Werombi Rd			Smalls Rd			
	L	T	R	L	T	R	L	T	R	L	T	R	
11:00 - 11:15	0	40	2	6	0	0	18	41	4	0	1	15	127
11:15 - 11:30	2	53	0	3	1	1	19	48	3	4	0	15	149
11:30 - 11:45	1	41	2	5	0	0	19	32	4	1	0	23	128
11:45 - 12:00	0	46	1	6	0	0	19	34	9	1	0	9	125
12:00 - 12:15	0	46	1	12	1	1	21	47	8	0	0	10	147
12:15 - 12:30	0	31	3	9	0	0	12	48	2	1	0	13	119
12:30 - 12:45	0	50	0	1	0	1	12	33	5	0	1	12	115
12:45 - 13:00	0	36	3	5	2	0	13	47	5	1	0	11	123
Period Ending	3	343	12	47	4	3	133	330	40	8	2	108	1033

Time Period	NORTH			EAST			SOUTH			WEST			Total
	Werombi Rd			Carrington C.T.			Werombi Rd			Smalls Rd			
	L	T	R	L	T	R	L	T	R	L	T	R	
11:00 - 12:00	3	180	5	20	1	1	75	155	20	6	1	62	529
11:15 - 12:15	3	186	4	26	2	2	78	161	24	6	0	57	549
11:30 - 12:30	1	164	7	32	1	1	71	161	23	3	0	55	519
11:45 - 12:45	0	173	5	28	1	2	64	162	24	2	1	44	506
12:00 - 13:00	0	163	7	27	3	2	58	175	20	2	1	46	504

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Location CARRINGTON CENTENNIAL TRUST/WEROMBI RD/SMALLS RD

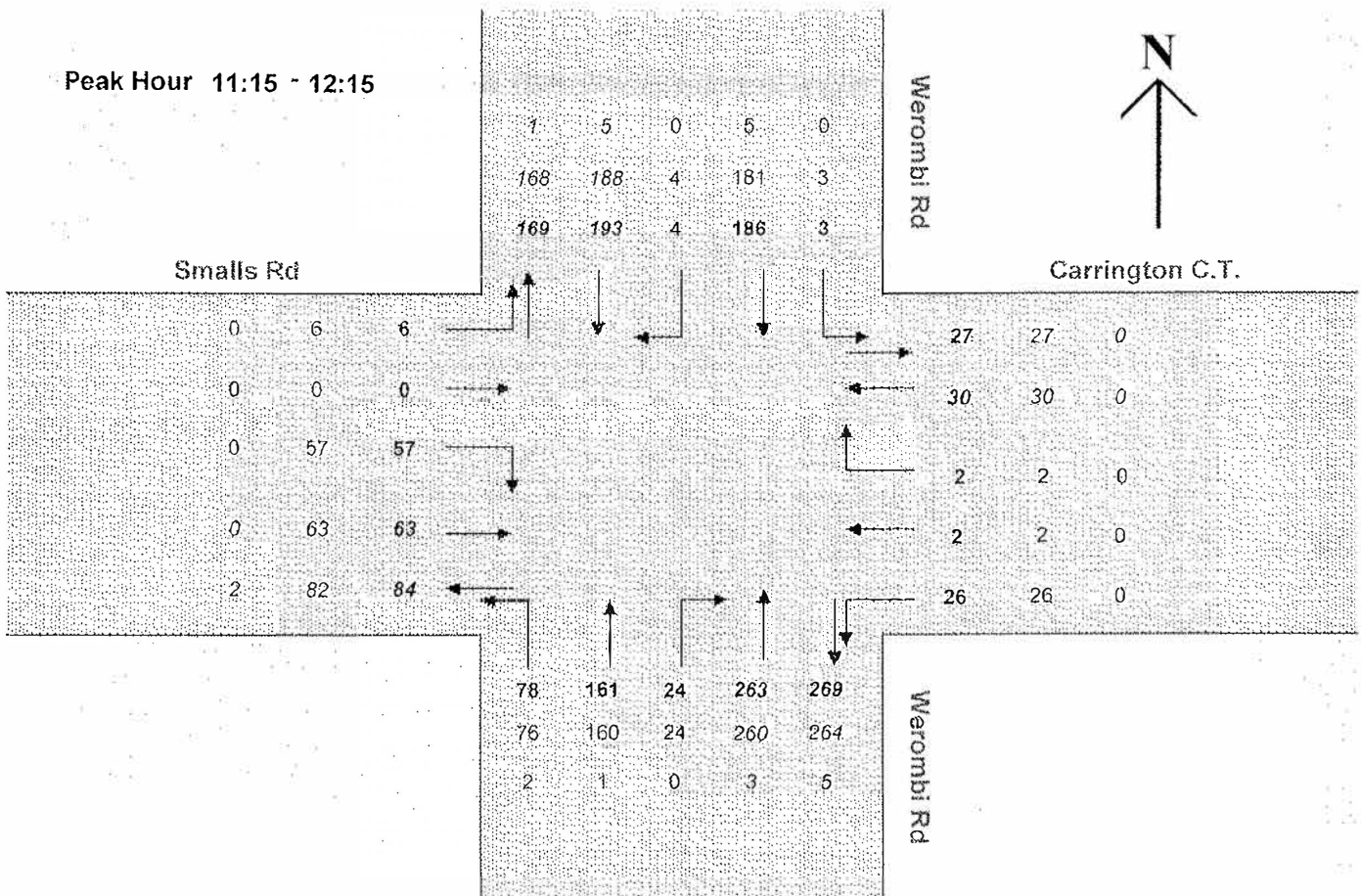
Suburb GRASMERE

Weather Fine

Job Number

Comments NO PEDESTRIANS DURING SURVEY

Vehicle Class	Werombi Rd			Carrington C.T.			Werombi Rd			Smalls Rd			Total
	L	T	R	L	T	R	L	T	R	L	T	R	
Lights	3	181	4	26	2	2	76	160	24	6	0	57	541
Heavy	0	5	0	0	0	0	2	1	0	0	0	0	8
Total	3	186	4	26	2	2	78	161	24	6	0	57	549





GeoEnviro Consultancy Pty Ltd

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8th September 2016

Our Ref: JC12114A-L3(rev2)

Michael Brown Planning Strategies
PO BOX 295
CAMDEN NSW 2570

Attention: Mr Michael Brown

Dear Sir

**Re Acid Sulphate Soil Assessment
 Proposed Residential Dwellings
 Lot 201 DP 734620 – No 5 Smalls Road, Grasmere**

This letter report presents our comments and assessment on potential acid sulphate soil for the subject site referred to as Lot 10 DP 845472 – No 90 Werombi Road, Grasmere.

We understand that the proposed development will include construction of residential dwellings. GeoEnviro Consultancy Pty Ltd was involved in the preparation of a Preliminary Contamination, Geotechnical and Salinity Investigation for the adjacent site referred to as Carrington Gateway, Lot 10 DP 845472 – No 90 Werombi Road, Grasmere and this is documented in our report referenced JC12114A dated June 2012.

Our comments and assessment on the potential acid sulphate soil for the subject site are based on;

- Our knowledge of the surface ground conditions obtained from available geological and soil landscape maps
- Results of our previous subsurface investigation for the adjacent site.
- Previous soil acidity test results for the adjacent site.

1.0 Site Locality

The site is located on the south western corner of Smalls Road and Werombi Road Grasmere, with an approximate 290m frontage to Smalls Road and 200m to Werombi Road.

The site has an irregular shape extending about 570m to the southern rear boundary and 630m to the western boundary from Werombi Road. Reference should be made to Drawing No 1 for site locality plan.

2.0 Geological Setting and Soil Landscape

The site is situated on gently undulating terrain. Ground surface within the site slopes down in a general direction to the north east at angles of about 4 to 10 degrees. Based on nearby survey drawing and Google Earth, the site is at Reduced Level (RL) between 90m and 100m Australian Height Datum (AHD).

The 1:100,000 Soil Landscape of Penrith Series 9030 (Reference 1) prepared by the Soil Conservation Services of NSW indicates the major portion of the site to be underlain by Blacktown soil of the Residual Soil Landscape group. The soil typically consists of shallow to moderately deep red and brown podzolic soils in upper slope and well drained area, and yellow podzolic soil in lower slope and poor drained area.

The 1:100,000 geological map of Penrith (Reference 2) indicates the site is underlain by Bringelly shale of the Wianamatta Group comprising of unnamed sandstone member with fine to medium grained quartz lithic sandstone.

3.0 Subsurface Conditions

GeoEnviro Consultancy Pty Ltd undertook a test pit investigation in 2012 for the adjacent site referred to as Carrington Gateway, Lot 10 DP 845472 – No 90 Werombi Road, Grasmere. A total of 28 test pits were excavated using a rubber tyred backhoe and the test pits revealed the site to be predominantly underlain by the following;

- Topsoil/fill and topsoil on the surface comprising typically of low to medium plasticity of Silty Clay and low liquid limit Clayey Silt. Generally the topsoil/fill and topsoil was found to be moist with thickness varying from 150mm to 900mm.
- Beneath the topsoil/fill, some fill was encountered consisting of predominantly of Silty Clay with some Clayey Silt and gravel inclusion. The fill was found to generally be dry with thickness ranging from 250mm to 700mm.
- Natural Silty Clay was encountered underlying topsoil and fill at depths of about 0.2m to 0.9m below existing ground surface.
- Shale bedrock was encountered in some test pits at depths typically ranging from about 0.7m to 2.9m below existing ground level. Generally the shale was found to have very low strength and to be extremely weathered.
- All test pits were found to be dry during and shortly after completion of the investigation.

The soil samples were tested for acidity and sulphate and the following were encountered;

- The insitu soil was found to be slightly acidic to neutral with a pH range of 5.3 to 7.7.
- The insitu soil was found to have low sulphate content with concentrations ranging from 13 to 120mg/kg.

4.0 Acid Sulphate Soil Assessment

Acid sulfate soils are the common name given to sediments and soils containing iron sulfides which when exposed to oxygen generate sulfuric acid. Formation conditions which normally exist in mangroves, salt marsh vegetation or tidal areas and at the bottom of coastal rivers and lakes, require a number of elements such as;

- the presence of iron-rich sediments,
- the presence of sulfate,
- removal of reaction products (ie bicarbonate),
- the presence of sulfate reducing bacterial and
- a plentiful supply of organic matter.

The relatively specific conditions under which acid sulfate soils are formed usually limit their occurrence to low lying areas with soil horizon less than RL 5m AHD (Reference 3).

The site is located on gently undulating terrain with ground surface slopes around Reduced Level (RL) 90m to 100m AHD.

From our nearby investigation, the site is known to be underlain by residual Silty Clay of the Blacktown Soil Landscape overlying shale/siltstone and there were no obvious signs of acid sulphate which is normally characterised by pungent odour being released into the air, discolouration of soil (eg green and blue tinge) and leaching of iron from the soil.

The laboratory test results indicate the nearby soil to be slightly acidic to neutral ranging from 5.3 to 7.7 and the concentration of sulphate was found to be low ranging from 13 to 120mg/kg.

Based on the foregoing, we are of the opinion that the site is not impacted by acid sulphate soil and therefore an acid sulphate soil management plan is not required.

Notwithstanding the above, we recommend the proposed development be monitored for the presence of Acid Sulphate soil during construction and appropriate remedial works should be carried out in the event where acid sulphate soil is encountered during construction.

In the event where acid sulphate soils are identified during construction, the soil should be properly managed as follows;

- The excavated stockpile material may either be treated on site using 3% by weight of lime or removed off-site to a landfill for treatment and disposal.
- The excavated acid sulphate soils should be treated immediately otherwise the excavated soil should be capped with non-porous clay soils greater than 0.5m thick.
- All material to be removed from the site should be carried out by a licensed contractor. This material should be sealed and contained on the truck during haulage using appropriate lining and capping material.
- Avoid as much as possible from disturbing acid sulphate soils by minimising excavation works.

Should you need any further information please do not hesitate to contact the undersigned.

Yours faithfully

GeoEnviro Consultancy Pty Ltd



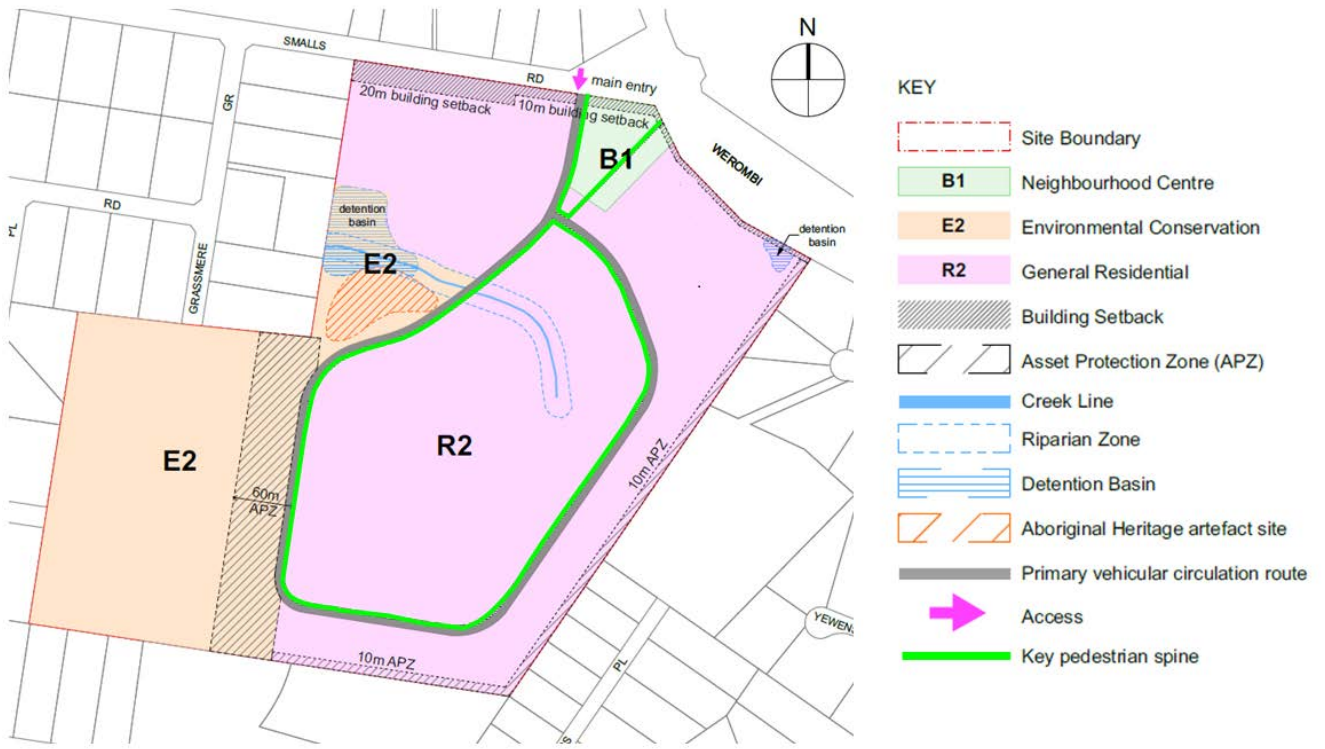
Solern Liew CPEng (NPER)
Director

Attachment : Site Locality

D:\12PROP\114\JC12114A-L3(rev2).DOC

REFERENCES

1. *1:100,000 Geological Series Sheet 9030 (Edition 1) 1991 of Penrith – NSW Department of Minerals and Energy , Sydney*
2. *1:100,000 Soil Landscape Series Sheet 9030 of Penrith - Soil Conservation Services of NSW*
3. *Acid Sulfate Soil Manual – NSW Acid Sulfate Soil Management Advisory Committee August 1998*



5 Smalls Rd, Grasmere, NSW

Retail impact assessment

June 2014



MacroPlan Dimasi

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Prepared for: Carrington Centennial Care

MacroPlan Dimasi staff responsible for this report:

James Turnbull, Manager – Retail

Fraser Brown, Consultant

Table of contents

Executive summary	i
Introduction	v
Section 1: Background	1
Section 2: Retail potential and impacts	5
2.1 Trade area population	5
2.2 Competition	8
2.3 Trade area market gap	9
2.4 Estimated trading impacts	11
2.4.1 Indicative sales	11
2.4.2 Estimated impacts	12
2.5 Other economic impacts	13
2.6 Other community benefits	15

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Executive summary

- i. 5 Smalls Road, Grasmere (Lot 201 in DP 734620) is located approximately 3 km from the Camden Town Centre, adjacent to the existing Carrington Centennial Care aged care facility on the northern side of Werombi Road.
- ii. The Smalls Road site is presently zoned R5 – Large Lot Residential under the Camden Local Environmental Plan (LEP) 2010 (gazetted 3 September 2010).
- iii. This report seeks to examine the potential economic impacts were the subject site to be rezoned to R2 – Low Density Residential, which would reinstate the previously permissible use of seniors housing, with part of the site to be rezoned B1 – Neighbourhood Centre.
- iv. We have assumed that the proposed rezoning could enable the development of up to 1,000 sq.m of retail gross floor area, as this is the floorspace restriction that council has indicated it might apply were the site rezoned to B1. However we understand that the proponents only seek to provide a small general store, a cafe/restaurant, and one other convenience based retail shop, which would total much less than 1,000 sq.m of retail floorspace.
- v. The main trade area population that could potentially be served by neighbourhood shopping facilities at the subject site is estimated at 3,550 as at June 2014. The main trade area population is estimated to grow at an average annual rate of 2.9% to reach 5,000 by 2026. The trade area population growth estimates do not include the Mayfarm Road strategic investigate site, which could potentially yield in excess of 3,000 dwellings over the longer term.
- vi. There are currently no retail facilities located within the main trade area, nor any approved or planned retail facilities. The closest retail facilities are located in Camden Town Centre, which is located some 3 km east of the subject site, with higher order retail facilities provided at Narellan, some 7.5 km away.

- vii. We estimate the main trade area population generates demand for approximately 7,810 sq.m of retail floorspace, and this is estimated to grow to 11,000 sq.m by 2026. There will be additional demand generated by residents in the rural area west of the catchment, who would utilise Werombi Road.
- viii. We estimate neighbourhood retail facilities at the subject site could potentially generate a total sales volume of \$6.0 million in 2016/17, reflecting a retail turnover density of \$6,000 per sq.m.
- ix. Presently main trade area residents would generally need to travel to Camden Town Centre to access their closest convenience retail facilities. Indeed, there are not many other retail facilities in the region. However residents in the main trade area may access convenience goods elsewhere as part of an employment trip, a trip to collect children from school, a social/sporting engagement or combined with a petrol station refuelling stop. Therefore, a significant proportion of estimated sales would also be likely to come from a redirection of trade from a broad range of retail facilities across the region.
- x. We estimate that impacts on the Camden Town Centre will be in the order of \$4.0 million in 2016/17, reflecting an impact of around -3.3%. Typically, it is accepted across the industry that estimated trading impacts in the order of 10% are considered to be moderate, with impacts around 5% or below considered minor or negligible.
- xi. Estimated impacts are therefore considered to be minor and within the normal bounds of competition. Such impacts will be temporary in nature, are expected to dissipate within 1-2 years given the strong population and retail market growth expected, and are highly unlikely to affect the ongoing viability of the Camden Town Centre. Indeed, the estimated trading levels in Camden Town Centre are projected to be higher in 2016/17 than they are currently, even with the proposed neighbourhood centre development.

- xii. In addition to providing local convenience shopping facilities for trade area residents, the proposed 1,000 sq.m neighbourhood centre and supporting medical and child care uses will also result in a range of very important economic benefits, including additional employment, increased convenience, choice and amenity for local residents, as well as reduced private vehicle kilometres travelled for local top up shopping and medical visits.
- xiii. The neighbourhood shops could support up to 40 jobs, and 16 multiplier jobs. The construction of this component could support an additional 23 jobs for the period of construction. Furthermore, additional jobs could be generated during the construction and operation of the medical centre and childcare centre.

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Introduction

This report presents an independent assessment of the demand for, and the likely economic impacts of the proposed rezoning of land at 5 Smalls Road, Grasmere that would allow a collection of neighbourhood shops and ancillary non-retail uses within a B1 – Neighbourhood Centre zone.

The report has been prepared in accordance with instructions received from Michael Brown Planning Strategies Pty Ltd and is structured as follows:

- **Section 1** describes the local and regional context of the proposed development site in Grasmere, as well as the current and proposed zoning of the site, outlining the proposed uses that could be enabled through the rezoning.
- **Section 2** examines the trade area of relevance to the centre, including current and projected population levels; the competitive environment within which the neighbourhood shops would operate; the retail market gap that currently exists within the trade area; the indicative sales potential and estimated trading impacts that could result from the proposed development; as well as detailing other economic impacts and net community benefits.

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Section 1: Background

The subject site is located at 5 Smalls Road (Lot 201 in DP 734620) in the suburb of Grasmere, approximately 3 km west of the Camden Town Centre, as illustrated on Map 1.1.

Smalls Road connects with Werombi Road, which is the main route to access the Camden Town Centre for residents of the suburbs of Grasmere and Ellis Lane. Furthermore the subject site is located adjacent to the Carrington Centennial Care, aged care facility on the northern side of Werombi Road (refer Map 1.2).

The Smalls Road site is presently zoned R5 – Large Lot Residential under the Camden Local Environmental Plan (LEP) 2010 (gazetted 3 September 2010).

This report seeks to examine the potential economic impacts were the subject site to be rezoned to R2 – Low Density Residential, which would reinstate the previously permissible use of seniors housing, with part of the site to be rezoned B1 – Neighbourhood Centre. The B1 zone would allow small scale retail uses, up to 1,000 sq.m. We understand that a range of community and convenience based services including health services facilities, a child care centre and neighbourhood shops are being considered for the subject site.

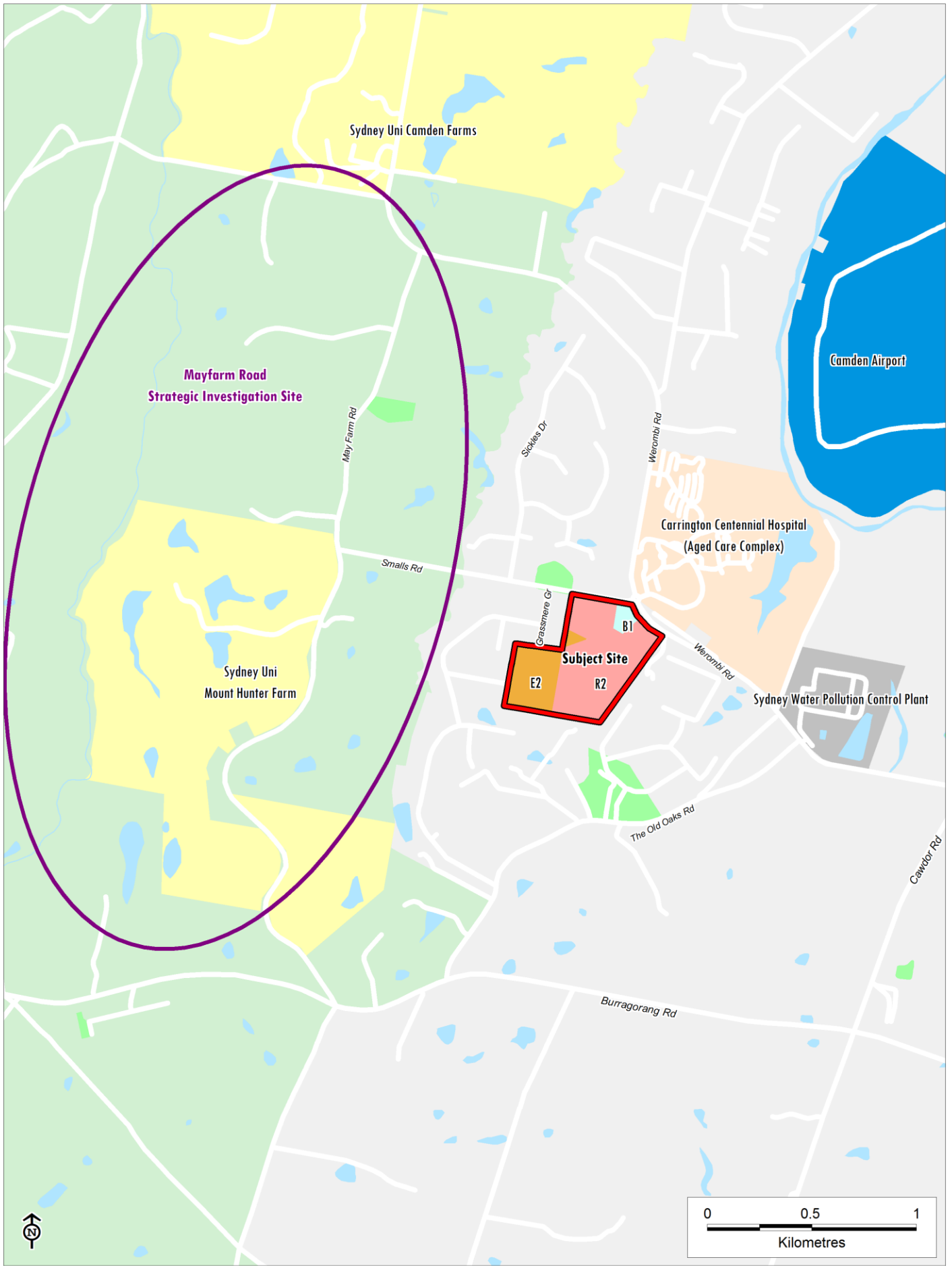
The potential impact of the proposed neighbourhood shop component forms the basis of the analysis presented throughout this report.

The key assumption that underpins the analysis in this report is that a 1,000 sq.m floorspace restriction would apply to the B1 zoned land. The impacts of this 1,000 sq.m of retail have been examined in this report.

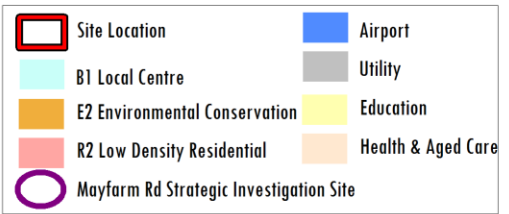


Map 1.1: Grasmere

Regional Context



Map 1.2: Grasmere
Site Location & Proposed Zoning



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Section 2: Retail potential and impacts

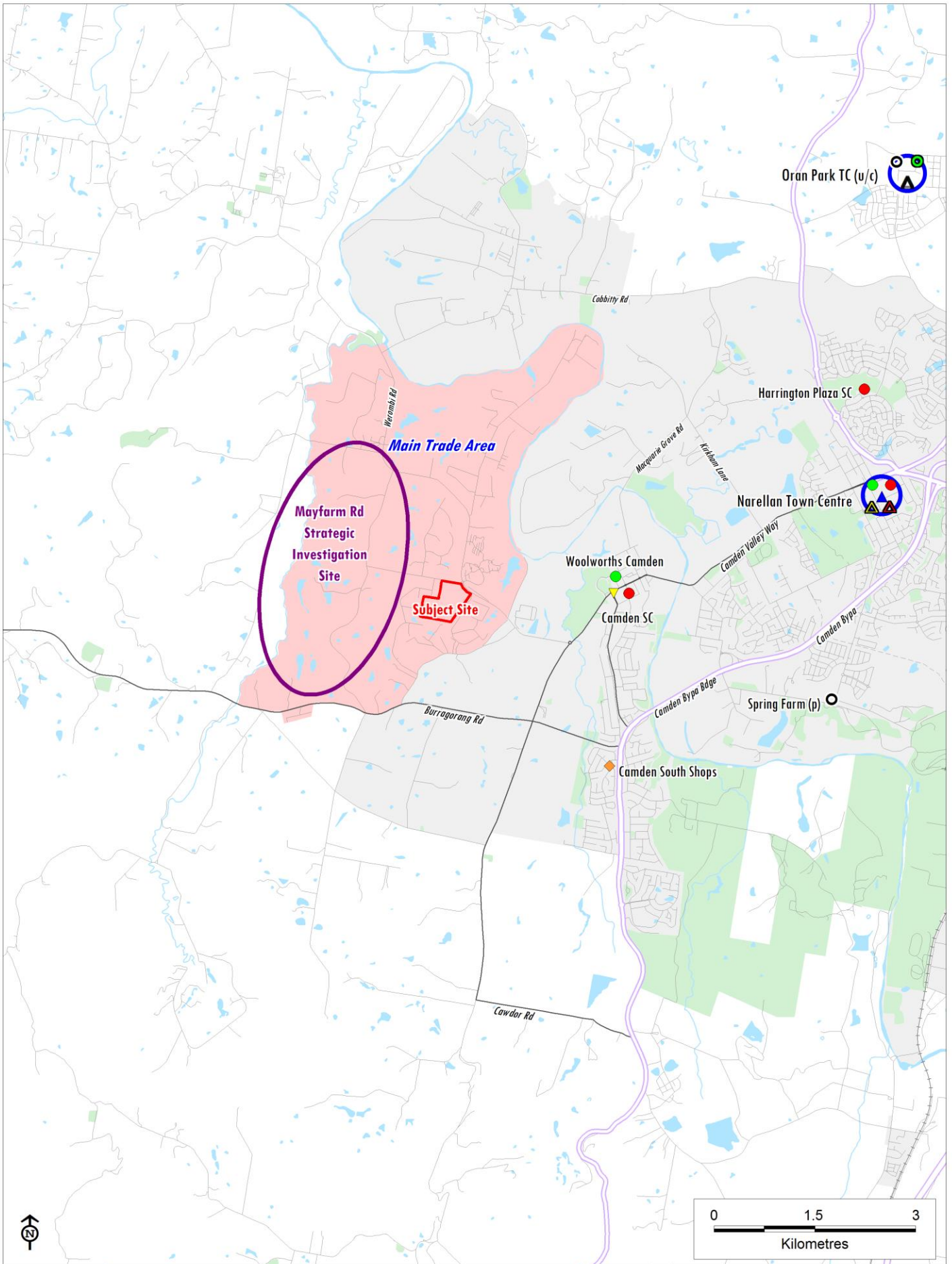
This section of the report reviews the trade area that could potentially be served by retail facilities at the subject site, then examines the estimated market gap for retail facilities and the potential economic impacts and net community benefit that could result from the development of retail facilities at the subject site.

2.1 Trade area population

The extent of the trade area or catchment that is served by any shopping centre, or retail facility, is shaped by the interplay of a number of critical factors. These factors include:

- The relative attraction of the centre, in comparison with alternative competitive retail facilities. The factors that determine the strength and attraction of any particular centre are primarily its scale and composition (in particular the major trader or traders that anchor the centre); its layout and ambience; and carparking, including access and ease of use.
- The proximity and attractiveness of competitive retail centres. The locations, compositions, quality and scale of competitive retail facilities all serve to define the extent of the trade area which a shopping centre is effectively able to serve.
- The available road network and public transport infrastructure, which determine the ease (or difficulty) with which customers are able to access a shopping centre.
- Significant physical barriers which are difficult to negotiate, and can act as delineating boundaries to the trade area served by an individual shopping centre.

Having regard to all of the above as they apply to the subject site, Map 2.1 illustrates the potential trade area that would likely be served by retail facilities at the subject site.



Map 2.1: Grasemere Trade Area & Competition

Sub-Regional Centre	Big W	Woolworths
Mayfarm Rd	Target	Coles
Camden South Shops	Kmart	Aldi
	Target Country	Proposed Smkt

**Hollow symbols indicate proposed stores*

The main trade area likely to be served by retail facilities at the subject site incorporates the suburbs of Grasmere and Ellis Lane, as well as part of Brownlow Hill.

Table 2.1 details the current and projected population levels within the main trade area. This information has been collected from a range of sources, including:

- Australian Bureau of Statistics Census of Population and Housing data (2006 and 2011);
- Australian Bureau of Statistics New Dwelling Approval Data (2006-2013)
- NSW Department of Planning and Environment (DPE) Household and Population projections (2006-2036);
- Australia Bureau of Statistics Estimated Resident Population (ERP) for 2013; and
- Other investigations of future residential development, undertaken by MacroPlan Dimasi.

The main trade area population is estimated at 3,550 persons as at June 2014. Over the most recent inter-censal period (2006-2011), the main trade area population grew at an average rate of 3.0% per annum.

The main trade area population is estimated to grow at an average annual rate of 2.9% to reach 5,000 by 2026. This growth will be driven by the proposed aged care development at the subject site and new rural-residential development throughout the main trade area.

The main trade area also includes the Mayfarm Road area, which has been identified as a strategic investigation site under the New South Wales Government's review of potential housing opportunities. It is mooted that this area could yield up to 3,250 dwellings, however, there is no certainty in regards to the development potential of this precinct.

Furthermore, retail facilities at the subject site could also serve the outlying rural areas to the west of the main trade area, including Theresa Park, as well as the Carrington Care workforce employed on the adjacent campus and those that will work at the proposed Smalls Road campus.

Table 2.1
Grasmere trade area population, 2006-2026*

Trade area sector	Estimated population			Forecast population		
	2006	2011	2014	2016	2021	2026
Main trade area	2,730	3,160	3,550	3,750	4,500	5,000
Trade area sector	Average annual growth (no.)					
	2006-11	2011-14	2014-16	2016-21	2021-26	
Main trade area	86	130	100	150	100	
Trade area sector	Average annual growth (%)					
	2006-11	2011-14	2014-16	2016-21	2021-26	
Main trade area	3.0%	4.0%	2.8%	3.7%	2.1%	

*As at June

Source: ABS Census 2011; NSW Department of Planning and Infrastructure 2008; MacroPlan Dimasi

2.2 Competition

There are currently no retail facilities provided within the defined main trade area, however, the Camden Town Centre, which is located approximately 3 km to the east of the subject site, provides around 15,000 sq.m of retail floorspace.

The Camden Town Centre provides a range of retail facilities, including the Camden Shopping Centre, which includes a Coles and Target Country; a stand-alone Woolworths supermarket; as well as a significant provision of food catering, general retail and retail services. The Camden Town Centre is the primary civic and community hub in the region and provides a range of medical, education, entertainment, business and retail uses.

Narellan Town Centre, which is located approximately 7.5 km north-east of the subject site, is the highest order retail facility within the Camden LGA. The Narellan Town Centre is anchored by a Big W discount department store, as well

as Coles and Woolworths supermarkets, and provides around 33,500 sq.m of total retail floorspace. There is approval for this centre to expand considerably, with a recent approval for the rezoning of the “triangle site” adjacent to this centre to allow for further retail development. In total, Narellan Town Centre could potentially accommodate an additional 56,000 sq.m of retail floorspace.

At Camden South, there is a small set of shops located on Flinders Avenue. These facilities are a considerable distance from the subject site. Elsewhere throughout the broader Camden area, there are small amounts of retail floorspace provided at service stations, however, these types of facilities tend to provide a very limited range of goods. The sale of goods at these facilities tend to be associated with the purchase of fuel and generally they are of little competitive relevance to traditional neighbourhood shops, such as those proposed at the subject site.

2.3 Trade area market gap

To assess the need and demand for the proposed development, this sub-section presents an analysis of retail floorspace demand generated by the main trade area population and compares this to current and future retail supply to determine the retail market gap that exists.

Table 2.2 below presents our analysis of the current and future market gap for retail floorspace provision. We have assessed this as follows:

- Estimated current population and future growth in this population in the main trade area from 2014 to 2026.
- Applied a supermarket floorspace provision of 0.35 sq.m per capita and a retail floorspace provision of 2.2 sq.m per capita, which is the estimated current average per capita provision across Australia.
- Multiplied retail provision per capita by the trade area population to estimate current retail floorspace demand of 7,810 sq.m, including 1,243 sq.m of supermarket floorspace.

Section 2: Retail potential and impacts

- Estimated growth in retail floorspace demand of 3,210 sq.m by 2026, or about 266 sq.m per year. Supermarket demand is estimated to reach 1,750 by this time.
- Estimated the existing supply of supermarket and retail floorspace within the trade area, allowing for any approved and planned future additions in retail supply over the period to 2026. There is currently no retail floorspace within the defined trade area, nor any approved or planned retail development aside from the proposed development at the subject site. Therefore the estimated demand generated by the trade area residents represents the estimated market gap.

Currently all retail demand generated by main trade area residents escapes to Camden, Narellan and other centres. The proposed rezoning, which will allow small scale retail facilities to be developed at the subject site will contribute to the retention of some of this retail demand, to the benefit of local residents.

Factor	2011	2014	2016	2021	2026
MTA population	3,160	3,550	3,750	4,500	5,000
<u>Retail floorspace demand (sq.m)</u>					
Supermarket sq.m per capita (Aust. Avg.)*		0.35	0.35	0.35	0.35
Total retail sq.m per capita (Aust. Avg.)*		2.2	2.2	2.2	2.2
Total supermarket floorspace demand		1,243	1,313	1,575	1,750
Total retail floorspace demand		7,810	8,250	9,900	11,000
<u>Retail floorspace supply (sq.m)</u>					
Supermarket floorspace (estimate)		0	0	0	0
Retail floorspace (estimate)		0	0	0	0
<u>Retail Gap (sq.m)</u>					
Supermarket floorspace gap		1,243	1,313	1,575	1,750
Total retail floorspace gap		7,810	8,250	9,900	11,000

* Assumes no growth in retail provision per capita
Source: MacroPlan Dimasi

2.4 Estimated trading impacts

This section of the report presents the estimated sales and trading impacts that could potentially result from the development of the proposed neighbourhood centre.

2.4.1 Indicative sales

Table 2.3 presents the estimated sales potential for the retail component of the proposed the neighbourhood centre. We have assumed that the proposed rezoning could enable the development of up to 1,000 sq.m of gross floor area, as this is the floorspace restriction that council has indicated it might apply were the site rezoned to B1. However we understand that the proponents only seek to provide a small general store, a cafe/restaurant, and one other convenience based retail shop, which would total much less than 1,000 sq.m of retail floorspace.

We estimate the retail component to generate a total sales volume of \$6.0 million at 2016/17, reflecting an average turnover density of \$6,000 per sq.m, which is considered to be a typical trading performance for a small neighbourhood facility.

Factor	GLA (sq.m)	Estimated sales potential	
		(\$/sq.m)	(\$M)
Estimated retail floorspace	1,000	6,000	6.0

**Constant 2013/14 dollars & including GST
Source: MacroPlan Dimasi*

2.4.2 Estimated impacts

Table 2.4 presents our assessment of the estimated retail trading impacts that could result from the proposed development at the subject site.

The factors that are most likely to determine the extent to which surrounding centres will be impacted by the proposed development include the proximity of the centre to the subject site, the direct competitive relevance of the centre in question, as well as accessibility, carparking and amenity of the centre.

The proposed development that would be permissible under the B1 zoning would be small scale and would serve the top up shopping needs of the immediate population. Presently main trade area residents would generally need to travel to Camden Town Centre to access their closest convenience retail facilities. Indeed, there are not many other retail facilities in the region.

On this basis, we estimate that Camden Town Centre, as the closest centre to the subject site, will absorb the majority of impacts resulting from the proposed development at the subject site. However residents in the main trade area may access convenience goods elsewhere as part of an employment trip, a trip to collect children from school, a social/sporting engagement or combined with a petrol station refuelling stop. Therefore, a significant proportion of estimated sales would also be likely to come from a redirection of trade from a broad range of retail facilities across the region.

We estimate that impacts on the Camden Town Centre will be in the order of \$4.0 million in 2016/17, reflecting an impact of around -3.3%. Typically, it is accepted across the industry that estimated trading impacts in the order of 10% are considered to be moderate, with impacts around 5% or below considered minor or negligible.

Centres	Est. sales 2013/14 \$M	Projected sales 2016/17		Est. Impacts 2016/17		
		Without Development \$M	With Development \$M	\$M	%	Share (%)
Camden Town Centre	115.9	123.0	119.0	-4.0	-3.3%	67.0%
South Camden**	2.3	2.3	2.3	0.0	0.0%	0.0%
Other centres	-	-	-	<u>-2.0</u>	-	<u>33.0%</u>
Total	-	-	-	-6.0	-	100.0%

*Constant 2013/14 dollars & including GST
** Does not include service station as this is not considered a traditional retail facility
Source: Shopping Centre Council; MacroPlan Dimasi

Estimated impacts are therefore considered to be minor and within the normal bounds of competition. Such impacts will be temporary in nature, are expected to dissipate within 1-2 years given the strong population and retail market growth expected, and are highly unlikely to affect the ongoing viability of the Camden Town Centre. Indeed, the estimated trading levels in Camden Town Centre are projected to be higher in 2016/17 than they are currently, even with the proposed neighbourhood centre development.

2.5 Other economic impacts

Table 2.5 presents the estimates of employment that could potentially be supported at the subject site were it to be rezoned B1. We have relied upon various data sources including data from retailers, the ABS and several state and local government agencies as well as 30 years of experience as consultants to the retail and property development industries to estimate the employment impacts. We estimate that the proposed rezoning could result in the addition of approximately 40 jobs.

Table 2.5
Grasmere - Estimated employment levels

Type of use	Estimated employment per '000 sq.m	Grasmere subject site	
		GLA (sq.m)	Employment (persons)
Retail	40	1,000	40

Source: MacroPlan Dimasi

Furthermore, the construction phase of the project will support employment during the period of construction as well as additional jobs through the broader economic supply chain (i.e. multiplier impacts).

An estimated construction cost of \$2 million (\$2,000 per sq.m) over a period of one year, would generate 23 jobs during the construction phase of the project, including 9 created directly and a further 14 resulting from multiplier induced effects (see Table 2.6).

As detailed previously, the proposed development could support 40 retail jobs. Based upon ABS Input/Output multipliers for the relevant industries, we estimate this would also lead to a further 16 multiplier induced jobs across the broader economy.

Table 2.6
Grasmere - Estimated future additional centre employment levels*

Original stimulus	Direct employment (long-term)	Direct employment (const'n period)	Multiplier employment	Total	
Retail employment ¹	40		16	56	
Construction of project (\$2m. est. capital costs)		9	14	23	Job years ²

* Employment totals include both full-time and part-time work

1. Indicates the estimated number of permanent jobs as a result of the proposed development

2. Indicates the estimated number of jobs over the life of the construction project, for the equivalent of one year

Source: MacroPlan Dimasi

Additional employment would be created at the subject site with the provision of a child care centre and medical facilities. Furthermore, employment would be generated through the construction period of these ancillary facilities.

2.6 Other community benefits

The proposed rezoning of the subject site to B1 – Neighbourhood Centre, allowing a 1,000 sq.m neighbourhood centre to be developed, would provide a range of additional community benefits to residents of the surrounding area, including:

- Increased choice, and convenience for the population of the trade area, as well as those residents who live in the outlying rural areas to the west of the trade area. The retail facilities proposed to be provided at the subject site would also serve the surrounding workforce in the area.
- A retention of retail demand within the locality and a likely consequent reduction in vehicle kilometres travelled by local residents to access convenience based retail facilities.
- The provision of retail and medical facilities within a walkable distance from existing seniors living and proposed aged care facilities.
- A social meeting place that will improve community cohesion for the existing and future residents of the main trade area.

